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MARITIME DOMAIN AWARENESS PILLAR FOR SUSTAINABLE DEVELOPMENT OF MARITIME TRANSPORTATION

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ABSTRACT

This research is an innovative approach to assess the application of sustainable development principles into the socio-technical domain of maritime surveillance by investigating potential governance models for expanding the Nation-state sectorial Maritime Domain Awareness arrangement towards regional and global integrated cooperative data sharing approach based on the need-to-know and responsibility-to-share principle.

The investigation was performed using a variety of complementary qualitative methodologies centered on Action Research. The resulting data was analyzed and structured with the use of the "Framework for Sustainable Strategic Development" tool-kit. The methodology was first applied at regional (European Union) level and then expanded to develop a model for the Global Maritime Domain Awareness governance arrangement.

The outcome suggests that the existing model of nation-state maritime surveillance is not able to cope with the new maritime challenges of international dimensions, such as high-sea piracy or massive illegal immigration, and a change towards regional and global cooperative models is more suitable to support the sustainable development of maritime transportation. Potential solutions for moving towards the proposed governance arrangements are provided in the form of model-diagrams and supported by a set of guidelines, which map the recommended actions against the principles of sustainable development. The European Union regional model is complemented by a draft Directive as potential implementation tool.

Key words: Governance, Maritime Domain Awareness, Sustainability, Globalization, Security.

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RESUMO

Esta pesquisa é uma abordagem inovadora para avaliar a aplicação dos princípios do desenvolvimento sustentável para o domínio sociotécnico da vigilância marítima, investigando potenciais modelos para a expansão do modelo existente de governação baseado na abordagem sectorial do estado-nação, para modelos regionais ou globais com base na partilha de dados e de cooperação responsável das partes interessadas.

A investigação foi realizada utilizando uma variedade de metodologias qualitativas complementares centradas na pesquisa-ação. Os dados resultantes foram analisados e estruturados com o uso da "Estrutura para o Desenvolvimento Sustentável Estratégico". A metodologia foi aplicada pela primeira vez a nível regional (União Europeia) e, em seguida, expandiu-se para desenvolver um modelo para o arranjo de governança global da vigilância marítima.

O resultado da pesquisa sugere que o modelo existente de vigilância marítima do Estado-nação não é capaz de lidar com os novos desafios marítimos de dimensões internacionais, tais como a pirataria em alto mar ou a imigração ilegal maciça, e uma mudança para modelos de cooperação regional e global é mais adequada para apoiar o desenvolvimento sustentável do transporte marítimo. Soluções potenciais para avançar para as disposições de governação propostos são fornecidos sob a forma de modelos-diagramas e apoiada por um conjunto de indicações que mapeiam as ações recomendadas contra os princípios do desenvolvimento sustentável. O modelo regional União Europeia é complementado por um projeto de diretiva como um potencial instrumento de implementação.

Palavras-chave: Governação, Consciência do Domínio Marítimo, Sustentabilidade, Globalização, Segurança.

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PREAMBLE

For more than 5000 years, maritime transportation was and continues to be the backbone of world development and trade globalization. Generated by the human need to explore and discover new territories, maritime transportation is nowadays moving 90% of the worldwide trade goods and acts as one of the main pillars of globalization and sustainable development.

One of the core activities of the United Nations[1], Sustainable Development has become hot topic under international debates in the context of development policies for the future. Sustainable Development promotes a holistic system-approach perspective where the social, environmental and economic aspects of the world are inter-connected through space and time to create a safe and secure living environment continuously developing and progressing within the limits of our Earth's natural resources. The Sustainable Development theory is linked to the "*global commons*" concept used to describe the Earth's natural resources shared by humanity, such as: the oceans, the atmosphere and the outer space, the Polar regions and lately the cyberspace.

The "*tragedy of commons*" as metaphorically coined by Hardin (1968) refers to conflicts between the availability of the collective resources and individuals (people, companies, countries) striving for optimal use of the commons for their own interest. Maritime transportation domain is framed in the "*tragedy of commons*" as it strives to find a balance between the globalization of trade, the increasing needs for international commerce, expanding offshore activities, fishing demands and the sustainable use of oceans and space resources associated with the maritime domain.

[1] http://www.un.org/en/sections/what-we-do/promote-sustainable-development/index.html - accessed 12.03.2015

The International Maritime Organization (IMO) has issued the concept of Sustainable Maritime Transportation System outlining the need of structured international cooperation of all actors active in this domain (IMO, 2013). One of the main elements of the concept is the need of suitable Maritime Domain Awareness supporting the safe, secure, efficient and reliable transport of goods across the world. From concept to delivery, the first critical step is to set-up "*good governance*" (Gisselquist, 2012) model as powerful tool of ensuring the continuous commitment and engagement of all participating actors. Underpinned by the principles of openness, participation, power sharing, accountability, partnership and effectiveness, good governance must also conform to the principle of "*subsidiarity*" – the notion that decisions should be taken at the most effective level and as close as possible to the citizen. This can be achieved through a system of multi-level governance where competences are shared between various levels of authority. In practice, multi-level governance is a system of agreed, binding and crosscutting networks that operate between regions, national authorities and international institutions, as well as between labor and business associations and other non-governmental organizations. Yet, at the end of the day, good governance will be judged by its results. Surveys consistently show that the public has high expectations from governance structures in sensitive policy areas as security, terrorism, energy and climate change. The maritime transportation governance structures should rise to these challenges by developing a more results-oriented rationale, avoiding rhetoric and explaining in plain language how it adds value to its citizens' lives.

Starting from the above concepts of sustainable development and good governance, this research addresses the area of Maritime Domain Awareness (MDA) as a critical pillar for the future development of maritime transportation activities. Two definitions are used as reference postulates within the content of this thesis, as quoted below:

> "*A Sustainable Maritime Transportation System (SMTS) should provide seamless and reliable service in the most efficient manner, delivering safe, secure, efficient and reliable transport of goods across the world, while minimizing pollution, maximizing energy efficiency and ensuring resource conservation.*"
>
> (IMO, 2013)
>
> *"Maritime Domain Awareness (MDA) is the effective understanding of anything associated with the maritime domain that could impact the security, safety, economy, or environment."* (IMO, 2013)

Whilst most of the maritime transportation aspects have constantly improved over time, the aspects of maritime security have lately degraded due to unexpected surge of unlawful acts at sea (piracy, illegal immigration and illicit traffic). The modern piracy, which made a comeback at the end of the 90s, has become a scourge of maritime transport, with significant human and economic cost (UNOSAT, 2014). Lately, the Mediterranean Sea has become a scene of tragedy under the assault of thousands of illegal immigrants trying to reach the European Union (EU) coastlines, often at the price of losing their life by using improvised unsafe sea-crafts. The aggravating security issues risks to change the maritime transportation from stable, safe and secure commercial activities to a dangerous environment of illegal activities threatening the sustainability of maritime economic order and the global trading. The traditional, nation-state centric approach to MDA seems unable to cope with the increasing complexity of maritime security issues, especially within international waters, outside of the national jurisdiction of a single state. A new MDA approach is needed to face the evolving maritime security challenges and this research investigates potential innovative solutions for addressing this paradigm.

The research follows a two-dimension approach:

a) The **regional MDA** model – where the investigation focuses on the transition from traditional nation-state and sector-based approach towards a regional cooperative framework. The regional dimension is explored by using the European Union Integrated Maritime Surveillance (EU IMS) initiative as a representative case study.

b) The **global MDA** model – aims to assess the feasibility of expanding regional cooperation towards a word-wide concept. This approach uses the international response to the Somalia piracy phenomena, including the leading role of the IMO, as the main source of investigation.

The research relies on qualitative methodology and the use of the back-casting "*Framework for Strategic Sustainable Development*" (FSSD). To my knowledge, it is the first attempt of using the FSSD within the socio-technical domain of maritime surveillance, as the tool was mainly developed for assessing the sustainability of socio-environmental systems. The FSSD back-casting approach starts from an imagined outcome, which we want to achieve, followed by evaluating what we need to do to reach that vision of success. This is a more creative approach as it is free of the boundaries and limitations of the present and may result in innovative solutions.

Using the FSSD to analyze and define MDA raise the challenge of understanding how the back-casting methodology works and adapting it to a domain where the environmental aspect was replaced by the socio-technical factors associated with safety and security at sea. I took this challenge stimulated by the enquiring objective of the researching process, aiming to find new perspectives by testing innovative ways of using the available tools.

The research process also incorporate knowledge, inputs and reflections accumulated during the last 10 years as a maritime professional actively involved in developing maritime governance structures at National and International levels. This was assimilated along the principles of "*action research*" - planning, acting, observing and reflecting – within the framework of my professional activities at the Romanian Maritime Administration and the European Maritime Safety Agency.

The thesis is structured in seven main chapters:

Chapter 1 consists of a brief introduction to the maritime transportation, its role in supporting the progress of the human civilization over time, including the globalization of trade, and the importance of a safe and secure environment for its sustainability. The aim of this chapter is to set-up the general context of the research and to prepare the linked background information for the nature of the perceived problem and the associated research questions.

Chapter 2 provides the justification of the research. It starts with the identification of the issues to be investigated and the arguments for the actuality and pertinence of the research and continues with the research questions and the objectives to be achieved. The core hypothesis of the research is revolving around governance issues and is based on the assumption that changing the MDA governance model from Nation-state sectorial systems and restricted data access policies towards an integrated cooperative data sharing model based on the need-to-know and responsibility-to-share principle may substantially improve the safety and security aspects. As such, the dissertation deals with the complex and actual topic of international cooperation and common responsibilities, both at the heart of sustainable development principles.

Chapter 3 covers the research methodology and explains why I have chosen the qualitative approach, provides details on the main investigation tools and procedures and how these are used throughout the project. It is worth mentioning that the research include the first time use of the "Framework for Sustainable Strategic Development" in the socio-technical domain of maritime surveillance, which is one of the original contributions of the work.

Chapter 4 consists of a critical analysis of the EU Integrated Maritime Policy (EU IMP) implementation process during its first decade. The outcome suggests that while the EU IMP has stirred a lot of interest for a new maritime vision and has initiated important steps towards its implementation, so far it failed to promote the necessary changes to boost the cooperative and sustainable environment it has claimed to do. Furthermore, for the particular pillar of EU Integrated Maritime Surveillance, the implementation approach used so far has not been able to provide the expected results, thus failing an important milestone towards sustainability.

Chapters 5 and 6 provide the core part of the research where governance models are investigated using the methodology of back-casting analysis developed under the Framework for Strategic Sustainable Development (FSSD). The FSSD methodology is applied both at regional (EU) and global level, and the outcome is presented in the form of model-diagrams of Maritime Domain Awareness arrangement. For the EU case, a draft EU Directive detailing how the proposed model might be implemented in practice complements the model-diagram. The use of the back-casting approach and the sustainable development principles in the socio-technical domain of maritime surveillance has revealed potential new governance models for better implementation of policies.

In the end, **Chapter 7** summarizes the main conclusions of the research and outlines directions for potential future investigation.

The outcome, in terms of original contribution, consists of:

a) the first attempt to apply the FSSD methodology to the socio-technical domain of maritime surveillance; and

b) drafting new governance models for implementation of complex integrated maritime domain awareness systems, both at regional and global levels.

I do hope that the outcome may provide new insights on the MDA issues and associated governance arrangements, which eventually can contribute to or inspire new visions for the 21st century maritime policies. A new European Commission has started its mandate beginning of 2015 stating that its mission is to build "*A New Start for Europe*" (Juncker, 2014). Within this context, I hope that the results of this research may be a useful input for a new implementation approach of the EU Integrated Maritime Surveillance System. Furthermore, the proposed model-diagram for the Global Maritime Domain Awareness (GMDAS) system can be also a source of inspiration for the new Secretary General of the International Maritime Organization elected in June 2015, when developing the future global maritime policies.

I wish to express my acknowledgement to the ISEG Development Studies professors, especially to Prof. Jose Antonio Correia Pereirinha, the programme coordinator and to my supervisor, Prof. Joaquim Ramos Silva, for their guidance and support during the challenging "exploration voyage" of my PhD project. I also thank my wife for her patience and kind sacrifice of weekends and holidays for allowing me enough time and space to do the research in due time.

PREÂMBULO

Por mais de 5000 anos, o transporte marítimo foi e continua a ser a espinha dorsal do desenvolvimento do mundo e da globalização do comércio. Gerado pela necessidade humana de explorar e descobrir novos territórios, o transporte marítimo move hoje em dia 90% das mercadorias comerciais em todo o mundo e atua como um dos principais pilares da globalização.

Uma das atividades centrais da Organização das Nações Unidas, o Desenvolvimento Sustentável tornou-se tema quente sob debates internacionais no contexto das políticas de desenvolvimento para o futuro. O Desenvolvimento Sustentável promove uma perspetiva holística de sistema-abordagem, onde os aspectos sociais, ambientais e económicos do mundo estão interligados através do espaço e tempo para criar um ambiente de vida seguro e protegido continuamente desenvolvendo e progredindo dentro dos limites dos recursos naturais da nossa terra. A teoria do Desenvolvimento Sustentável está ligada ao conceito de "*global commons*" usado para descrever os recursos naturais da Terra compartilhados pela humanidade: os oceanos, a atmosfera e o espaço, as regiões polares e, ultimamente, o ciberespaço.

A "*tragédia dos comuns*", como metaforicamente mencionado por Hardin (1968) refere-se a conflitos entre a disponibilidade dos recursos colectivos e os indivíduos (pessoas, empresas, países) que se esforçam para uma utilização óptima dos bens comuns para o próprio interesse. Domínio dos transportes marítimos está enquadrado no "tragédia dos comuns", como ele se esforça para encontrar um equilíbrio entre a globalização do comércio, as crescentes necessidades para o comércio internacional, a expansão das atividades offshore, demandas de pesca e a utilização sustentável dos oceanos e dos recursos espaciais associadas ao domínio marítimo.

A Organização Marítima Internacional (IMO) emitiu o conceito de Sistema de Transporte Marítimo Sustentável delineando a necessidade da cooperação internacional estruturado de todos os atores ativa neste domínio (IMO, 2013). Um dos principais elementos do conceito é a necessidade de uma adequada Consciência do Domínio Marítimo (MDA), apoio à segurança do transporte, seguro, eficiente e confiável de produtos em todo o mundo. Do conceito à entrega, o primeiro passo crítico é a criação de um modelo de "boa governação" como ferramenta poderosa de garantir o empenhamento continuado e a mobilização de todos os intervenientes (Gisselquist, 2012). Apoiada nos princípios de abertura, participação, partilha do poder, responsabilidade, parceria e eficácia, a boa governação deve ainda estar em acordo com o princípio da "subsidiariedade" - a noção de que as decisões devem ser tomadas ao nível mais eficaz e quanto mais perto possível do cidadão. Isto pode ser conseguido através de um sistema de governação a vários níveis onde estão partilhadas competências entre os vários níveis de autoridade. Na prática, a governação a vários níveis é um sistema de redes de ligação e redes transversais acordadas que operam entre as regiões, as autoridades nacionais e instituições internacionais, bem como entre associações empresariais e de trabalho e outras organizações não-governamentais. No entanto, ao final do dia, a boa governação será julgada por seus resultados. Os inquéritos mostram consistentemente que o público tem expectativas elevadas no que diz respeito as estruturas de governação em domínios políticos sensíveis como a segurança, o terrorismo, energia e alterações climáticas. As estruturas de governança do transporte marítimo devem enfrentar estes desafios através do desenvolvimento de uma forma mais lógica e orientada para os resultados, evitando a retórica e explicar em linguagem simples como isso acrescenta valor à vida dos seus cidadãos.

A partir dos conceitos acima do desenvolvimento sustentável e da boa governação, esta pesquisa aborda a área da consciência do Domínio Marítimo (MDA) como um pilar fundamental para o desenvolvimento futuro das atividades de transporte marítimo. Duas definições são usadas como postulados de referência dentro do conteúdo desta tese, como citado abaixo:

> "*Um Sistema Sustentável dos Transportes Marítimos (SMTS) deve prestar um serviço contínuo e confiável da forma mais eficiente, proporcionando transporte seguro, eficiente e confiável de produtos em todo o mundo, minimizando a poluição e maximizando a eficiência energética e garantindo a conservação dos recursos*."
>
> (IMO, 2013)

> "*Maritime Domain Awareness é o entendimento eficaz de qualquer coisa associada com o domínio marítimo, que poderia afetar a segurança, a economia ou o ambiente*." (IMO, 2013)

Embora a maioria dos aspetos do transporte marítimo têm constantemente melhorado ao longo do tempo, os da segurança marítima ultimamente têm-se degradado devido ao aumento inesperado de atos ilícitos no mar (a pirataria, a imigração ilegal e o tráfico ilícito).

A pirataria moderna, que fez um retorno no final da década dos 90, tornou-se um flagelo dos transportes marítimos, com um custo humano e económico elevado (UNOSAT, 2014). Ultimamente, o Mar Mediterrâneo tornou-se uma cena da tragédia sob o assalto de milhares de imigrantes ilegais que tentam chegar às costas da União Europeia (UE), muitas vezes à custo de perder a vida porque usam barcos improvisados. Os problemas de segurança agravantes ameaçam uma mudança do transporte marítimo de atividades comerciais estáveis e seguras para um ambiente perigoso de atividades ilegais que ameaçam a sustentabilidade da ordem económica marítima e o comércio global.

A abordagem tradicional, centrada no estado-nação para MDA parece incapaz de lidar com a crescente complexidade das questões de segurança marítima, especialmente em águas internacionais, fora da jurisdição nacional de um único Estado. É necessária uma nova abordagem MDA para enfrentar os desafios em evolução da segurança marítima e esta pesquisa investiga possíveis soluções inovadoras para lidar com esta paradigma. A pesquisa segue uma abordagem em duas dimensões:

a) O **modelo regional MDA** – onde a investigação centra-se na transição da abordagem tradicional estado-nação e a abordagem setorial no sentido de um quadro de cooperação regional. A dimensão regional é explorada usando a iniciativa da Vigilância Marítima Integrada da União Europeia (EU IMS) como um caso de estudo representativo.

b) O **modelo global MDA** – tem o objetivo de avaliar a viabilidade de expandir a cooperação regional em direção a um conceito amplo da palavra. Esta abordagem utiliza a resposta internacional aos fenómenos de pirataria da Somália, incluindo o papel de liderança da IMO, como a principal fonte de investigação.

A pesquisa baseia-se numa metodologia qualitativa e no uso de *back-casting* "Quadro para o Desenvolvimento Sustentável Estratégico" (FSSD). No meu conhecimento, é a primeira tentativa de usar o FSSD dentro do domínio sociotécnico da vigilância marítima, sendo que a ferramenta foi desenvolvida principalmente para avaliar a sustentabilidade dos sistemas sócio-ambientais. A abordagem *back-casting* FSSD começa a partir de um resultado imaginado que queremos alcançar, seguido da avaliação do que nós precisamos fazer para alcançar essa visão de sucesso. Esta é uma abordagem mais criativa, pois é livre dos limites e as limitações do presente e pode resultar em soluções inovadoras.

Usando o FSSD para analisar e definir MDA elevou-se o desafio de compreender como a metodologia *back-casting* funciona e adaptá-lo a um domínio onde o aspecto ambiental foi substituído pelos fatores sociotécnicos associados à proteção e segurança no mar. Assumi este desafio estimulado pelo objetivo do processo de pesquisa, querendo encontrar novas perspectivas, testando formas inovadoras de utilizar as ferramentas disponíveis. O processo de pesquisa também incorpora o conhecimento e as reflexões acumuladas durante dos últimos 10 anos como profissional marítimo ativamente envolvido no desenvolvimento de estruturas de governação marítima a nível Nacional e Internacional. Este foi assimilado ao longo dos princípios de "*pesquisa-ação*" - planeamento, ação, observação e reflexão - no âmbito da minha atividade profissional na Administração Romena Marítima e da Agência Europeia da Segurança Marítima.

Portanto, a tese está estruturada em sete capítulos principais:

Capítulo 1 consiste de uma breve introdução ao transporte marítimo, o seu papel no apoio ao progresso da civilização humana ao longo do tempo, incluindo a globalização do comércio, bem como a importância de um ambiente seguro para a sua sustentabilidade. O objetivo deste capítulo é de estabelecer o contexto geral da pesquisa e de preparar a informação teórica para a natureza do problema percebido e as questões associadas a investigação.

Capítulo 2 fornece a justificativa de minha pesquisa. O capítulo começa com a identificação das questões a serem investigadas e os argumentos para a atualidade e a pertinência da investigação e continua com as questões de pesquisa e os objetivos a serem alcançados. A hipótese central da pesquisa gira em torno das questões da governação e baseia-se no pressuposto de que a mudança do modelo de governação da Consciência do Domínio Marítimo dos sistemas sectoriais do estado nacional e as políticas restritas de acesso ao dados em direção a um modelo integrado,

cooperativo de compartilhamento de dados baseado no princípio de tomar conhecimento e da responsabilidade de compartilhar, pode melhorar substancialmente os aspectos de segurança do transporte marítimo. Como tal, a dissertação aborda o tema complexo e atual das responsabilidades comuns e de cooperação internacional, ambas no centro das princípios do desenvolvimento sustentável.

Capítulo 3 abrange a metodologia da pesquisa e explica por que escolhi a abordagem qualitativa; fornece detalhes sobre as principais ferramentas e procedimentos de investigação e como estes são utilizados em todo o projeto. É importante ressaltar que a pesquisa inclui a primeira utilização do "Quadro para o Desenvolvimento Sustentável Estratégico" (Framework for Strategic Sustainable Development - FSSD) no domínio sociotécnico da vigilância marítima que é uma das contribuições originais deste trabalho.

Capítulo 4 consiste numa análise crítica do processo de implementação da política marítima integrada da União Europeia (UE IMP) durante sua primeira década. O resultado sugere que, embora a UE IMP provocou um grande interesse para uma nova visão marítima ao nível da UE e deu início a importantes passos para a sua execução, incluindo um novo paradigma de governação marítima, até agora este não conseguiu promover as mudanças necessárias para impulsionar a cooperativa e o ambiente sustentável que pretendeu fazer. Além disso, para o pilar particular de Vigilância Marítima Integrada da UE, a abordagem de implementação utilizada até agora não tem sido capaz de proporcionar os resultados esperados, falhando assim um passo importante para a sustentabilidade.

Capítulos 5 e 6 introduzem a parte principal da pesquisa onde os modelos de governança são investigados utilizando a metodologia de análise *back-casting* desenvolvida no âmbito do Quadro para o Desenvolvimento Sustentável Estratégico (FSSD). A metodologia FSSD é aplicada tanto a nível regional (UE) como global, e o resultado é apresentado sob a forma de arranjo de diagramas-modelo de MDA. Para o caso da UE, o diagrama é complementado por um projeto de diretiva da UE detalhando como o arranjo MDA proposto pode ser aplicado na prática. A utilização da abordagem *back-casting* e os princípios do desenvolvimento sustentável no domínio sociotécnico da vigilância marítima revelou potenciais novos modelos de governação para uma melhor aplicação das políticas.

No final, o **Capítulo 7** resume as principais conclusões da pesquisa e descreve instruções para uma futura potencial investigação.

Os resultados de pesquisa, em termos de contribuição original, podem ser resumidos como:

a) a primeira tentativa de aplicar a metodologia FSSD para o domínio sociotécnico da vigilância marítima;

b) elaboração de novos modelos de governação para a implementação de sistemas integrados e complexos da consciência de domínio marítimo, tanto a nível regional e global.

Eu espero que o resultado pode fornecer novos *insights* sobre as questões MDA e mecanismos de governação associados que eventualmente possam contribuir para ou inspiram novas visões para as políticas marítimas do século 21.

Uma nova Comissão Europeia iniciou o seu mandato em 2015, afirmando que a sua missão é construir "Um novo começo para a Europa" (Juncker, 2014). Dentro deste contexto, espero que os resultados desta pesquisa podem ser um contributo útil para uma nova abordagem na implementação do Sistema Integrado de Vigilância Marítima da UE. Além disso, a pesquisa também simula a extensão do modelo EU IMS a escala global e propõe um projeto de diagrama-modelo para o sistema de Consciência Global no Domínio Marítimo (GMDA), que pode ser também uma fonte de inspiração para o novo Secretário-Geral da Organização Marítima Internacional, eleito em Junho de 2015, no que diz respeito ao desenvolvimento das futuras políticas marítimas globais.

Desejo expressar meu reconhecimento aos professores ISEG, especialmente ao Prof. José António Correia Pereirinha, o coordenador do programa e ao meu supervisor, Prof. Joaquim Ramos Silva, por sua orientação e apoio durante o desafiador "viagem de exploração" do meu projeto de doutoramento.

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ABBREVIATIONS

AB	Administrative Board
AIMS	Africa's Integrated Maritime Strategy
AIS	Automatic Identification System
ARF	ASEAN Regional Forum
ARTES	Advanced Research in Telecommunication Systems
BIMCO	Baltic and International Maritime Council
BLUEMASSMED	Blue Maritime Surveillance System in Mediterranean Sea
BMP	Best Management Practice
CISE	Common Sharing Information Environment
COLREG	International Regulations for Preventing Collisions at Sea
COM	Commission
CGSP	Contact Group on Somali Piracy
CG	Contracting Government
CSN	Clean Sea Net
CSDP	Common Security and Development Policy
DC	Data Centre
DDP	Data Distribution Plan
EC	EU Commission
ECGFF	European Coast Guard Functions Forum
EDA	European Defence Agency
EEA	European Environmental Agency
EFCA	European Fishery Control Agency
EP	EU Parliament
ERCC	European Response Control Centre
EU	European Union
EUCG	European Union Coast Guard
EU IMS	European Union Integrated Maritime Surveillance
EMSA	European Maritime Safety Agency
e-NAV	Electronic Navigation
EOS	European Organisation for Security
ESA	European Space Agency
EST	Environmentally Sustainable Transportation
ESDN	European Sustainable Development Network
EEDI	Energy Efficiency Design Index
EU NAVFOR	European Union Naval Force ATALANTA
EU SDS	European Union Sustainable Development Strategy
EUROSUR	European External Border Surveillance System
EUROPOL	European Police Office
FMC	Fisheries Management Centre
FRONTEX	European Agency for the Management of Operational Cooperation at the External Borders of the Member States

FS	Flag State
FSSD	Framework for Strategic Sustainable Development
GDP	Gross Domestic Product
GISIS	Global Integrated Shipping Information System
GGML	Global Governmental Maritime Layer
GMDSS	Global Maritime Distress and Safety System
GMDA	Global Maritime Domain Awareness
GMDAS	Global Maritime Domain Awareness System
GMP	Global Maritime Partnership
GPS	Global Positioning System
GPML	Global Private Maritime Layer
HAZMAT	Hazardous Material report
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
HLSG	High Level Steering Group
ICAO	International Civil Aviation Organization
ICT	Information and Communication Technology
IDE	International Data Exchange
IMDatE	Integrated Maritime Data Environment
ILO	International Labour Organization
ILC	International Labour Conference
IMP	Integrated Maritime Policy
IMO	International Maritime Organization
IMS	Integrated Maritime Surveillance
IP	Implementation Plan
ICZM	Integrated Coastal Zone Management
ISG	Inter-Services Group
ISS	Internal Security Strategy
ISM	International Safety Management Code
ISPS	International Ship and Port Facility Security Code
JRC	Joint Research Centre
LRIT	Long Range Identification and Tracking
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973
MARSUNO	Maritime Surveillance in the Northern Sea
MDGs	Millennium Development Goals
MIC	Monitoring and Information Centre
MKB	Marine Knowledge Base
MLC	Maritime Labour Convention
MDA	Maritime Domain Awareness
MPTF	Maritime Policy Task Force
MSC	Maritime Safety Committee
MSFD	Marine Strategy Framework Directive
MSP	Maritime Spatial Planning
MSPs	Maritime Service Portfolios

MSS	Maritime Security Strategy
MTS	Maritime Transport Strategy
NATO	North Atlantic Treaty Organization
NCC	National Coordination Centre
NGO	Non-Governmental Organization
NSDS	National Sustainable Development Strategies
OECD	Organisation for Economic Co-operation and Development
PDCA	Plan, Do, Check, Act
POLREP	Pollution Report
PSI	Proliferation Security Initiative
PSC	Port State Control
PTT	Post Trial Transfer
R&D	Research and Development
RECAAP	Regional Cooperation Agreement against Armed Robbery and Piracy
SAR	Satellite Radar Aperture
S-AIS	Satellite Automatic Identification System
SDG	Sustainable Development Goals
SEEMP	Ship Energy Efficiency Management Plan
SIMS	Sustainable Integrated Maritime Surveillance
SIP	Strategy Implementation Plan
SHADE	Shared Awareness and De-confliction
SOLAS	International Convention for the Safety of Life at Sea, 1974, as amended
SMTS	Sustainable Maritime Transportation System
STCW	Standards of Training, Certification and Watchkeeping
SSN	Safe Sea Net
TAG	Technical Advisory Group
TAXUD	EU Directorate General Taxation and Customs Union
UN	United Nations
UNITAR	United Nations Institute for Training and Research
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
UNOSAT	United Nations Operational Satellite Applications Programme
USCG	United States Coast Guard
VHF	Very High Frequency
VTS / VTMIS	Vessel Traffic System / Vessel Traffic Maritime Information Services
VMS	Vessel Monitoring System
WETREP	West European Tanker Reporting System
WG	Working Group
5LF	Five Levels Framework

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

1.1 MARITIME TRANSPORTATION AND THE WORLD

The history of the world is a history of exploration, conquest and trade by the sea. Started by antiquity civilizations as short coastal sailing within the sight of land, the navigation and ships have been constantly evolving and supporting longer and further expeditions throughout the world. Maritime discoveries reached their culmination point in the 15th century with the discovery of maritime routes to Asia by the Portuguese explorers, closely followed by discovery of Americas by the navigator Christopher Columbus working for the Spanish Crown. "*The discovery of America, and that of a passage to the East Indies by the Cape of Good Hope, are the two greatest and most important events recorded in the history of mankind*" (Smith, 1776).

This period, although known as the Age of Explorations, is mainly identified with sailing wooden ships driven by wind, using seasonal maritime routes dependent on weather condition and wind direction, and using the compass and the sextant as the main navigation instruments. The 15-16th centuries marks the main discoveries of the world: America (North and South), South Africa, India, Japan, China and the set-up of the European overseas colonies and the first regular cargo trading routes between the continents. By 18th century, most of the world's territories were controlled by Europe, providing wealth to their thriving metropolises through a system of colonial trade which would define the world development over the next 300 years.

The 19th century brings the technical and industrial revolution beginning with the steam engine and iron-hull screw-driven ships and continuing with diesel-powered ships and complex and large volume cargo vessels dedicated to specific trade, such as bulk cargo ships (oil and dry bulk cargo), container carriers, general cargo and passengers' vessels. By establishing commercial links between continents, the maritime transportation system has become the backbone of the world cargo trading and a key driver of globalization (Figure 1).

Kumar and Hoffman (2002) named maritime transportation as one of the four cornerstones of globalization, along with communications, international standardization, and trade liberalization.

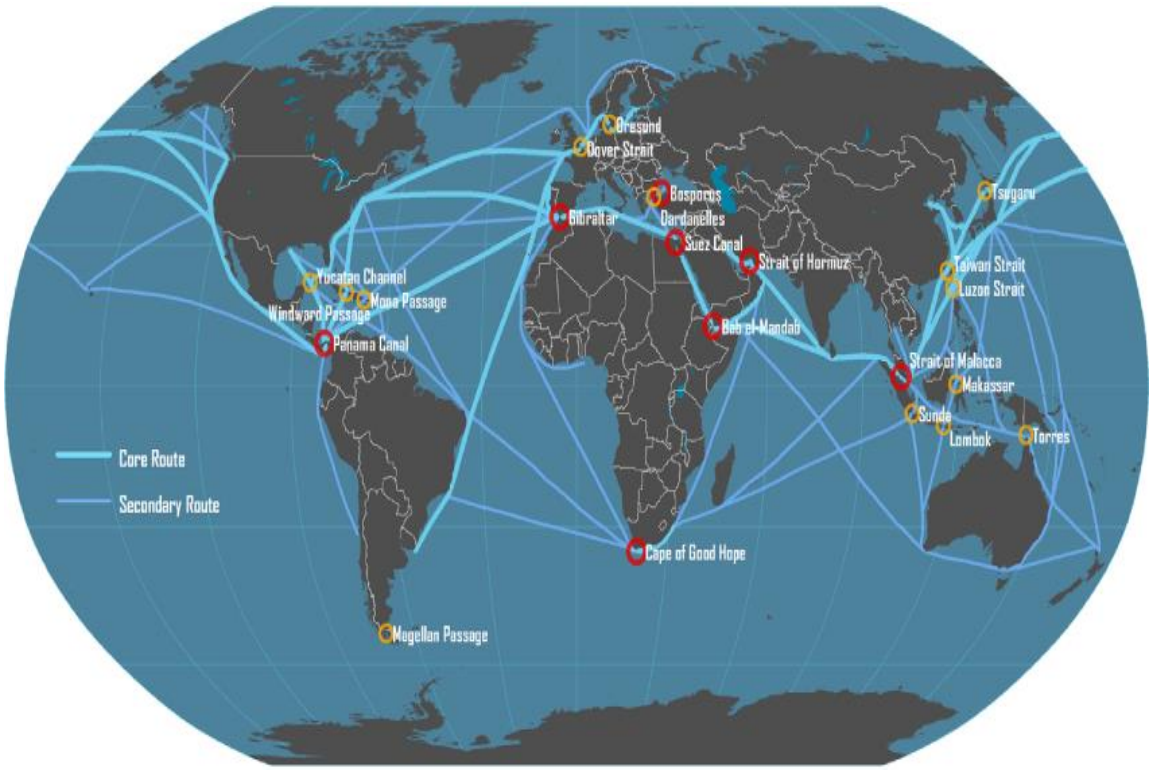

Figure 1 - Main maritime routes of the world
(Source: THE GEOGRAPHY OF TRANSPORT SYSTEMS)

It is generally accepted that about 90% of global trade is carried by sea. Throughout the last century the shipping industry has supported, in the context of the international division of labor, a general trend of increasing volume of trade. Increasing industrialization and the liberalization of national economies have fuelled free trade and a growing worldwide demand for consumer products. Advances in technology have also made shipping an increasingly efficient and swift method of transport. The world is well along the road to an integrated global economy and shipping is playing a crucial and highly effective part in the process. The global society and economy of today simply could not function if it were not for ships and the shipping industry (Stopford, 2010).

Since 1950, the sea-trade grew constantly at an annual average rate of 5%, and today around 8 billion tons of goods are transported by ships during a year. There are over 50,000 merchant ships trading internationally, transporting every kind of cargo. The world fleet is registered in over 150 nations, and manned by over a million of seafarers of every nationality. If the growing rate is maintained, the volume of cargo will double in the next 10 years, which means, more ships, more ports, new routes and more dependency on maritime transportation. The recent expansion of the Suez Canal, the main water link between Asia and Europe aims to double the transit capacity whilst shortening the waiting time (SCA, 2015) and Panama has also started the expansion of the Panama Canal, the water link between Atlantic and Pacific Oceans, for the same reason of double transit capacity in the near future (PCA, 2015). These latest on-going investments (range of billions) are strong indications of the expected increasing demand for maritime transportation. A famous quote from the former Secretary-General of the International Maritime Organization (IMO) says that "*Without international shipping, the import-export of food and goods would not be possible - half the world would starve and the other half would freeze*!" (Mitropoulos, 2005).

Within this growing perspective, the question of how to ensure sustainability of maritime transportation is an increasingly important topic on the agenda of the policy and governance debate. Governments and industry are aware of the need to include sustainability principles in their transport policies not only in respect of environmental protection but also addressing other important factors, such as the safety and security, the responsible use of common resources and the need of international cooperation in support of a global industry.

1.2 SUSTAINABLE MARITIME TRANSPORTATION

The Brundtland report "*Our Common Future*" (UN, 1987) has defined sustainable development as "*the development that meets the needs of the current generation, without compromising the needs of future generations*". This definition is quite wide and ambiguous since the needs, both current and future, are determined by complex cultural, ecological and economic factors that can be weighted in many different ways. During the last two decades, the sustainable development has developed into a complex long term, multi-level, multi-actor process revolving around three main components or 'pillars': **environmental**[2], **social** and **economic,** all inextricably linked in time and space within a safe and secure environment driven by good governance and the rule of law. Although not stated explicitly as pillars of sustainable development, the Governance and Security aspects are recognized as critical conditions of development: "*Democracy, **good governance and the rule of law** at the national and international levels, as well as an enabling environment, are essential for sustainable development including sustained and inclusive economic growth, social development, environmental protection and the eradication of poverty and hunger."* (UN, 2012).

Transportation is one of the main domains of sustainable development activities and the maritime transportation in particular has an important role in supporting globalization and international trade development on sustainable basis. The principles of sustainability and the environmental, social and economic dimensions are recognized and addressed in any policy, strategy, regulatory framework or action within maritime transportation domain.

Environmentally, shipping is a small contributor to the total volume of atmospheric emissions compared to road and air transport modes (Figure 2). The significant improvements in engine efficiency and hull design, and the use of ships with larger cargo carrying capacities have led to a

[2] Bold words are self-authored through the thesis to outline important aspects

reduction in emissions and increased fuel efficiency. So far, shipping is the only major industrial sector, which has agreed on a binding global agreement to reduce its CO_2 emissions (IMO, 2013). This includes the application of Energy Efficiency Design Index (EEDI)[3] by new ships and the Ship Energy Efficiency Management Plan (SEEMP)[4] by existing ships.

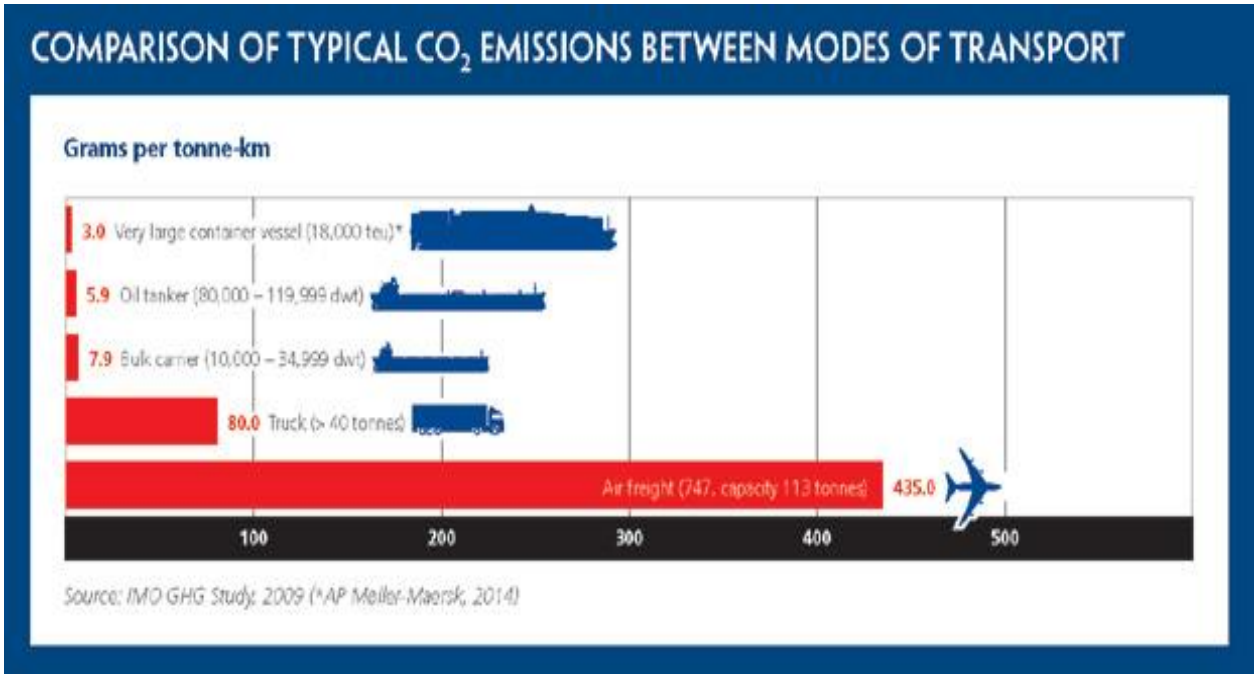

Figure 2 - CO_2 emissions by mode of transport

With the impetus provided by this package of technical and operational measures, the industry expects a 20% reduction of CO_2 emissions by 2020. The shipping industry is also committed to the implementation of numerous other IMO environmental requirements such as: anti-fouling paints, garbage disposal, NO_x emissions, sewage and volatile organic compounds, ballast water treatment, to list but a few. All these efforts need to be supported by shore-based infrastructure and services able to provide similar level of efficiency in terms of fuels, port services, loading-discharging operations and the associated logistic chains.

[3] http://www.iacs.org.uk/document/public/publications/procedural_requirements/pdf/pr_38_pdf2107.pdf - accessed 08.04.2014
[4] http://www.iacs.org.uk/document/public/Publications/Resolution_changes/PDF/UI_MPC102_New_pdf1873.pdf - accessed 08.04.2014

In respect of **social sustainability** the highest priority of the international shipping industry remains the safety and security of life at sea. The use of the oceans is becoming more intensive as a result of the increasing activities of maritime transport and other industries, such as offshore exploration and the exploitation of traditional and renewable energy sources, sea-mining, fishing and tourism. More crowded seas, with greater traffic density, larger ships and new structures and activities at sea, need to be supported by better information systems to achieve the required efficiency within a safe and secure environment. There are more than 1 million people working within maritime transportation domain only and the safety, security and quality of life for seafarers is an important aspect for maintaining and developing the maritime transport industry as an attractive career option for the future generations. The retention of qualified professionals is a challenge for the sector due to recurring issues such as criminalization of seafarers, denial of shore leave, lack of recreational facilities and worse living conditions when compared with that enjoyed by shore-based professionals. The Maritime Labour Convention agreed by the International Labour Organisation (ILO) addresses a wide range of social matters including shipping companies' obligations regarding seafarers' contractual arrangements, oversight of manning agencies, working hours, health and safety, crew accommodation, catering standards, and seafarers' welfare. In addition, the International Maritime Organization (IMO) addresses issues such as seafarer training, improvements to navigational safety and on-board security, the promotion of an effective safety culture fostered through global standards and their rigorous enforcement. Many more millions are working in maritime related activities on shore (ports, maritime related industries). The major ports have transformed regions of the world in clusters and special economic areas for maritime development (North Europe, Singapore, Shanghai, USA). Furthermore, some countries have developed shipping business areas as national strategic pillars for development (China and South Korea as world leading ship-building industries, Norway as provider of navigational electronic equipment, Sweden and Germany as ship engine

manufacturers, Panama, Liberia, Cyprus, and Malta – as Flags of Registry). A full two-thirds of the world's population live within 400 kilometers of a seacoast; whilst just over half the world's population occupy a coastal strip 200 kilometers wide (Portugal included), representing only 10 per cent of the Earth's land surface. This is a clear indication of the strong Social Development component directly influenced by the oceans and maritime transport through social cohesion, cultural and economic exchange, access to opportunities, high quality of employment and life. The maritime transportation system is subject to a wide array of security threats, ranging from piracy and armed robbery against ships, to threats from global terrorism and the unlawful trade in weapons, smuggling, trafficking in narcotics and in persons, and illegal or unreported fishing. In order to ensure sustainability, seafarers, ships and shipping lanes must be protected by and for the communities that rely on them and benefit from sea trade. Account must be taken of the increasing costs of providing security, which is also an eroding factor for sustainability.

The issue of costs brings us to the **economic dimension** of the maritime transportation. Shipping is not only the most energy efficient mode of transport but also the least costly one. The cost element in the price of consumer goods varies from product to product, but is ultimately marginal. For example, transport costs for a television set (typical shelf price of $700.00) amount to around $10.00 and only around $0.15 for a kilo of coffee (typical shelf price $15.00). The cost of transporting crude oil from the Middle East to USA, in terms of the purchase price of gasoline at the pump, is about one US cent per liter. The typical cost of transporting a 20 foot container from Asia to Europe carrying over 20 tones of cargo is about the same as the economy airfare for a single passenger on the same journey (IMO, 2012). However, contraction in the world's economy directly affects the supply-demand balance of the total transportation capacity of ships, and the profitability of the shipping industry. A sustainable maritime transportation should be supported by available, sound financing for construction of new ships or conversion of existing ships in order to meet requirements for safety and environmental protection, bearing in mind the

cyclical nature of the shipping sector. While shipping's regulators have a responsibility to protect the environment and the interests of wider society, they also need to be practical and have an understanding of the impact that their actions can have on the industry's own long term sustainability. Industry must be an equal partner when building a sustainable development, as the economic pillar is critical to achieve the goals and objectives of sustainability. It is expected that until 2020, the market, stakeholders, customers, and regulatory pressures related to sustainability will drive significant changes in the way international shipping operate and do business. Environmentally motivated regulations are likely to become the most important cost-driver in the coming years, as governments and corporations raise the bar on air emissions, ballast water discharge, ship design, and ship recycling. Similarly, regulatory changes related to security, business ethics, health and safety, and labor standards will put additional pressure on international shipping industry to increase sustainability performance. The developing pressures of the aforementioned areas will have tremendous impact on the international shipping industry. In addition, there is already a shift in the global trading pattern towards Asia and South America, resulting in new economic and cultural paradigms competing and/or complementing existing ones. The rise of the South and East will transform supply chains differently. Changes will result in more complex models that blend globalization and localization all at once. Socio-economic changes will have several important implications for the international shipping industry: congestion will increase rapidly around major port cities, resulting in more pollution, which, in turn, will trigger more regulation; new trade routes will be more south-south resulting in opportunities for serving new underserved markets; and new transportation models will ensure the effective delivery of products to distribution channels. Failure to adapt will have significant cost implications and may determine the successful future or the bankruptcy of a company. A durable sustainability strategy needs to consider long-term trends and drivers, while taking into account today's competitive realities.

The benefits of the shipping sector as an enabler of world trade cannot be underscored sufficiently, especially for the benefit of the developing world and its participation in new trading patterns around the world. Since the beginning of the age of discoveries until today, the maritime transport was a main contributing pillar of development:

- It facilitates global commerce and the creation of wealth and prosperity among nations;
- It creates a wide variety of jobs on board ships and ashore, with direct and indirect beneficial impacts on the livelihoods of others;
- It provides the most environmentally sound and energy-efficient means of moving huge quantities of cargoes and people;
- With more than half the world's population living near the coast, the importance of integrated coastal zone management, including port development and the protection of coastal and marine resources, is of particular importance to sustainable development;
- Social aspects - employment in the shipping industry provides access to foreign currency for the developing countries that are major suppliers of seafarers. The regular salaries that seafarers earn and remit to their respective countries have a direct impact on the economic viability of their communities and their countries contributing to social inclusion.
- Technical development – shipbuilding and associated industries are driving technical development in maritime domain with remarkable results reflected in the new type of sophisticated ships (super-tankers, mega-containers, cruise ships like floating city).

The safety and security of maritime transportation are critical aspects for enabling the active supporting role for development and the equal access of all countries to the global maritime transportation network. This thesis associates the safety and security topics within the wider concept of Maritime Domain Awareness (MDA) and investigates the impact of MDA on the sustainability of maritime transportation, together with potential ways for improvement.

1.3 MARITIME TRANSPORTATION LEGAL FRAMEWORK

Merchant shipping is one of the most regulated industries and was also amongst the first to adopt widely implementation of international standards. Because of its international nature, it is vital that is subject to globally uniform regulations on matters such as construction standards, navigation rules, standards of crew competence and the preservation of the environment. The regulations are wide ranging and take a number of forms such as laws, codes of practice, rules, and agreements at international, regional and national level. At international level, the United Nations Convention on the Law of the Sea (UNCLOS)[5] establishes the general rights and obligations of the Flag State. Within the United Nations two specialized agencies deal with maritime affairs; the International Maritime Organization (IMO)[6] and the International Labour Organization (ILO)[7], and they have the responsibility for developing conventions and guidelines under which ships can be regulated. In general, matters concerning safety and security at sea, pollution prevention and training of seafarers are dealt with by IMO, whereas the ILO deals with matters concerning maritime labor, working and living conditions for seafarers worldwide. IMO global mandate is to ensure "*safe, secure, environmentally sound, efficient and sustainable shipping through cooperation*". While IMO and ILO set the international regulatory framework for ships, each State bears the responsibility for enforcing the international conventions it has ratified on the ships flying its flag (Flag State Inspection). In addition, each State can inspect and enforce international conventions for all ships visiting its ports through the Port State Control mechanism. The two instruments together ensure a high level of compliance with international maritime regulations.

[5] http://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf - accessed 12.04.2014
[6] http://www.imo.org/en/Pages/Default.aspx - accessed 12.04.2014
[7] http://www.ilo.org/global/about-the-ilo/lang--en/index.htm - accessed 12.04.2014

a. International Maritime Organization

IMO – the International Maritime Organization – is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships. Having a membership of 170 Member States, IMO is based in London, United Kingdom, has around 300 international staff-members, and focuses on the technical work to update existing legislation or develop and adopt new regulations. The Organization consists of an Assembly, a Council and five main Committees: the Maritime Safety Committee; the Marine Environment Protection Committee; the Legal Committee; the Technical Co-operation Committee and the Facilitation Committee. The global regulatory framework provided by IMO consists, so far, of 52 adopted treaties regulating ship design, construction and operation. The most important of them – concerning the safety and security of life at sea and the protection of the environment – apply to 99% of the world's merchant fleet. The major conventions managed by IMO include:

- International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78). This covers accidental and operational oil pollution, pollution by chemicals, packaged goods, sewage, garbage, and air pollution.
- International Convention for the Safety of Life at Sea 1974 (SOLAS, 74), as amended, is the most important of all treaties concerning the safety and security of merchant ships. It specifies minimum standards for the construction, equipment and operation of ships.
- International Convention on Loadlines, 1966, sets the minimum permissible free board, according to the season of the year and the ship's trading pattern.
- Convention on the International Regulations for Preventing Collisions at Sea, (COLREG, 1972) lays down the basic "rules of the road" and actions to avoid collisions.
- International Convention on Standards of Training, Certification and Watchkeeping (STCW), 1995, establish the minimum requirements for certification of seafarers.

- International Safety Management (ISM) Code, 1998, addresses the responsibilities of the ship-management company and ship's crew for the safe operation of the ship.
- International Ship and Port Facility Security (ISPS) Code, mandatory by 2002 SOLAS amendments, establish a comprehensive security regime for international shipping.

It is important to note that IMO was established to adopt legislation by worldwide agreement and that governments are responsible for the implementation of the agreed international conventions. When a government becomes a Party to an IMO Convention it agrees to make it parts of its own national laws and to enforce it just like any other law. The principal responsibility for enforcing IMO regulations rests with the flag states (i.e. the countries in which merchant ships are registered). Flag State (FS) enforces IMO requirements through inspections of ships conducted by a network of international surveyors, often delegated to specialized organizations called classification societies. The flag state enforcement is supplemented by what is known as Port State Control (PSC), whereby officials in any country, which a ship may visit, can inspect foreign flagships to ensure that they comply with international requirements. Port State Control officers have the power to detain foreign ships in port if they do not conform to international standards. As a consequence of the combined FS and PSC actions, most IMO regulations are well enforced on global basis.

IMO fully supports the UN approach to sustainable development. Since 2013, a special program on Sustainable Maritime Transportation System (SMTS) was initiated by IMO to promote sustainability principles within maritime transportation domain. The program highlights the importance of maritime transportation and the role of all stakeholders and actors involved, focusing on the following sustainability goals to be achieved under IMO coordination:

- Safety culture – foster global standards and Corporate Social Responsibility principles;
- Protection of marine environment by promoting uniform implementation and enforcement of IMO Conventions, principally through the provision of technical assistance;
- Energy efficiency, including port-ship interface through the development of market-based measures, reductions in fuel consumption and in emissions of pollutants;
- Maritime traffic support systems - for navigation, the use of intelligent routing and aids for weather routing, including e-navigation, to optimize safety and fuel efficiency;
- Maritime Security - seafarers, ships and shipping lanes must be protected against the threats posed to sea trade. Due account must be taken of the increased cost of providing security which erodes the sustainability of shipping;
- Technical cooperation and innovation – through partnerships between governments, ship builders, classification societies, manufacturers, R&D and academic institutions;
- Education and training of seafarers;
- Promotion of shipping as an attractive and rewarding career for the young generations;

b. International Labour Organization

The International Labour Organization (ILO) is the only tripartite UN agency with government, employer, and worker representatives. This tripartite structure makes the ILO a unique forum in which the governments and the social partners of its 185 Member States can freely and openly debate and elaborate labor standards and policies. One of the main domains of the organization is the maritime domain and the associated Maritime Labour Convention (MLC). The main focus of ILO's maritime program concerns the promotion of the maritime labor standards, which has resulted in the adoption of codes of practice, guidelines and reports, which address seafarers' issues. The Joint Maritime Commission advises the Governing Body on maritime issues and

special Maritime Sessions of the International Labour Conference (ILC) focus solely on the preparation and adoption of Maritime Labour Standards. The 94th Maritime Session of the ILC (February 2006) has adopted the MLC 200, which sets out the conditions for decent work in the maritime sector. The Convention is considered as the "*fourth pillar*" of the international regulatory regime for shipping, complementing the three key Conventions of the IMO – SOLAS, MARPOL, and STCW. The MLC 2006 provides global reference on maritime labor issues for all ships, including those of non-ratifying Members, based on:

- A comprehensive set of basic maritime labor principles and rights
- A strong enforcement regime, backed by a certification system
- Improved working and living conditions for seafarers
- A more secure and responsible maritime workforce
- A more socially responsible shipping industry
- Improved social dialogue at all levels
- Improved supervision at all levels: ship and company, flag and port state
- Positive impact on the protection of the environment
- Protection against unfair competition from substandard ships
- Clear identification of who is the ship-owner with overall responsibility
- Additional flexibility for implementation, making the Convention easier to ratify

"MLC 2006 is a unique accomplishment that combines no less than 37 ILO-conventions and corresponding recommendations in just one set of rules uniquely shaped for the shipping industry, making it the only business sector in the world that has a shared international framework dealing with all aspects of employment." (Danish Maritime Forum, 2014).

c. European Commission

European Commission (EC) is the executive arm of the European Union (EU) and is responsible for initiating legislation and the day-to-day management of the EU affairs. The Commission operates as a cabinet government, with 27 Commissioners for different areas of policy, one from each member state, though Commissioners are bound to represent the interests of the EU as a whole rather than their home state.

In 2007, the Commission began a strategic review of the EU's integrated maritime policy, examining the challenges European and international maritime transport will face in the next ten years. Maritime transport for the EU is seen as important because the EU is surrounded by five seas and two oceans with cross administrative borders shared by different countries. Most of maritime transport and marine issues should therefore be tackled at EU level and many policies, which impact on sea activities, have already been incorporated into EU Treaties and regulations. Maritime transport is vital to trade. Some 90% of EU external trade and close to 40% of EU internal trade is seaborne. Maritime transportation represents one of Europe's largest export industries, providing deep sea transport services between Europe and the rest of the world, as well as in cross trades between Member States and third countries. Maritime transport services, including offshore activities, are essential for helping European companies compete globally. Among EU Member States, short sea shipping is a key element in reducing congestion, ensuring territorial cohesion and promoting the sustainable development of the European continent. With more than 400 million sea passengers a year travelling through European ports, passenger ships and ferry services have a direct impact on the quality of life of citizens in islands and peripheral regions. Maritime transport activities' related employment in Europe amounts to over 1.5 million people at sea and onshore. Figure 3 provides the illustrative case of EU shipping added value to EU Gross Domestic Product (GDP).

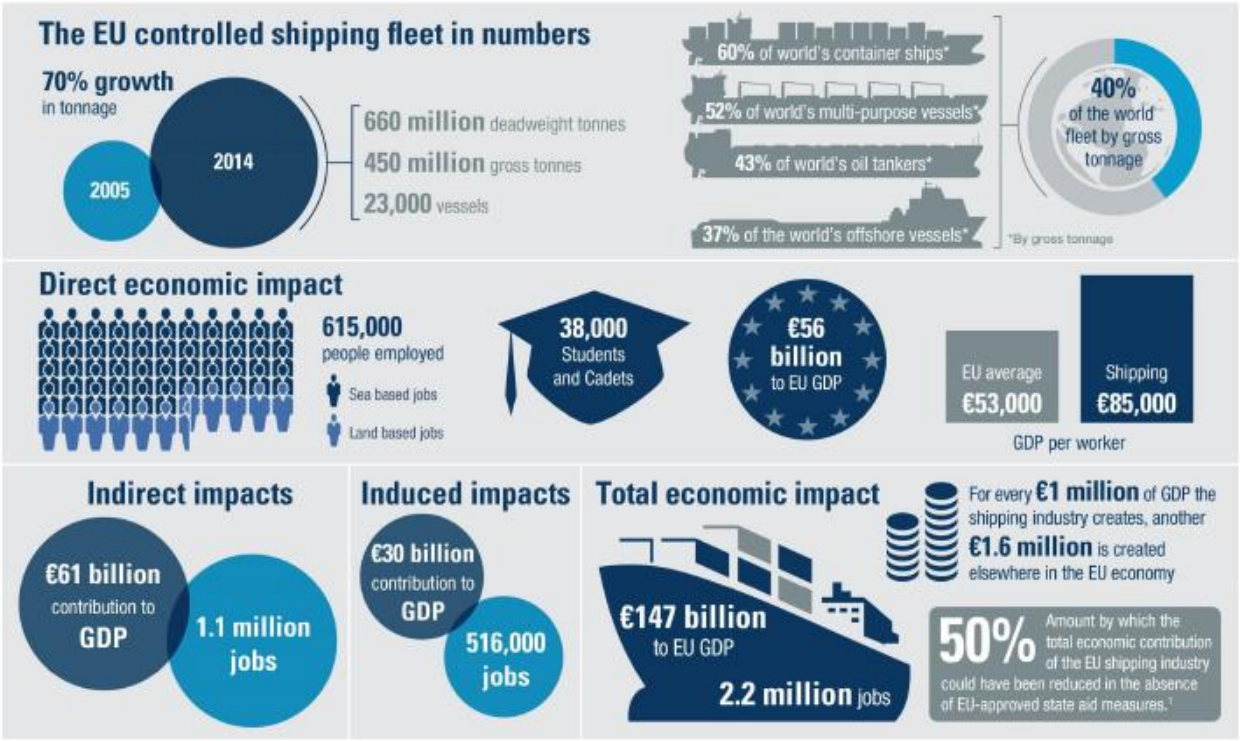

Figure 3 - The economic value of the EU shipping industry (Source: - Oxford Economics)

The continuous success of European shipping in world markets cannot be taken for granted. Experts consulted by the Commission have identified a number of major challenges. The current crisis of the international financial system, its impact on the real economy and the sluggish recovery prospects in different parts of the world has affected seaborne trade and thus the different branches of the shipping industry. Considerable resources are needed to develop new technologies for improving sustainable use of the seas. Synergies can be achieved by tackling these issues at EU level. The EC's October 2007 Action Plan outlined the following main maritime initiatives:

- A European Maritime Transport Space without barriers
- A European Strategy for Maritime Research
- National integrated maritime policies to be developed by Member States
- A European network for maritime surveillance
- A Roadmap towards maritime spatial planning by Member States

- A Strategy to mitigate the effects of Climate Change on coastal regions
- Reduction of CO2 emissions and pollution by shipping
- Elimination of pirate fishing and destructive high seas bottom trawling
- A European network of maritime clusters

Lately, the EU 2020 strategy represents the approach for stimulating growth during the coming decade, aiming to develop a smart, sustainable and inclusive economy. The IMP is part of this strategy and seeks to provide a more coherent approach to maritime issues, with increased coordination between different areas in a holistic and dynamic manner. Integrated Maritime Surveillance (IMS) is one pillar of the IMP aiming to infuse cohesion and commonality into Maritime Domain Awareness functions and provide interoperability in the surveillance systems. The objective of IMS is to share information across borders and sectors, providing public authorities with means for better understanding of activities and events at sea. This should be achieved through the development and implementation of a Common Information Sharing Environment (CISE) based on the "need to know, responsibility to share" principle.

CHAPTER 2: GOVERNANCE - A RESEARCH TOPIC

2.1 GOVERNANCE' RELEVANCE AS RESEARCH TOPIC

Traditionally, governance was associated with government, understood as the formal institutions of the state and its monopoly of legitimate coercive power (Stoker, 1998). During the last years the concept of governance has become a very popular subject within the social sciences, politics and society in general, reflecting the interest in shifting the concept towards new methods and styles by which society is governed. Changes have taken place in the forms, location and mechanisms of governance, the governing capacities and styles of governance (Van Kersbergen and Van Waarden, 2004). Review of the literature indicates that governance is used in a variety of ways (Rhodes, 2006) and with different meanings (Stoker, 1998). There is however a general agreement that the essence of governance is the creation of a structure or an order process which cannot be externally imposed but is the result of the interaction of a multitude of governing and inter-influencing actors (Kooiman, 1993), combination of different management principles, organizational models and behavioral patterns (Seppo, 2004).

The governance process involves complex sets of decision making institutions, systems and mechanisms in which the state, markets and actors of society have the right to engage in a democratic and transparent manner according to their defined roles and means. Networks and partnership are the new ways in breaking the barriers between the rulers and the ruled, through a holistic approach and continuous growth and diversification of the governance methods. A multi-level governance approach focuses more on negotiated policies between all jurisdictional levels and encourages the active involvement of stakeholders - industry, politicians, the media and individuals/groups.

The rapid development of globalization during the last two decades of the 19th century has further extended the concept of governance by adding the international dimension. The development of international regulations and agreements for trade, development assistance, regional economic and political organisations (like EU) and sector specific international systems of regulations (like the IMO in the maritime sector) are clear examples of Global Governance systems. However, the establishment of good governance systems is a long-term process and implementation of effective networking, informal interaction and horizontal governance mechanisms takes time and continuous effort. Van Leeuwen (2010) argues that four shifts have become features of the modern governance, namely: multiple actors, multiple levels, multiple rules and multiple steering mechanisms. These have led to new emerging spheres of authority that challenge, transform and complement the traditional ones and dilute the boundaries between state, market and civil society. Over the last decades the EU integration project was the primary medium for development of a new system of multi-level governance. The policy-making process has changed fundamentally as a result of the European integration creating "*a polity with multiple, interlocked arenas for political contest, of which the European level is one, where state executives, but also European institutions and a widening array of mobilised interests, contend*." (Scharpf, 2000)

Other scientists and researchers are addressing the evolution in the theory of governance, searching for new concepts and models which go beyond the conventional approach based on nation-state political systems, like I also do in this research. These investigations should use analytical categories and concepts that address the properties of governing modes rather than starting from the a-priori assumption that governance is based on command-control regulation under a state owned framework. Governance is conceived as spheres of authority at all levels of human activity that amount to systems of rule in which goals are pursued through the exercise of control within the relationship between the controller and the controlee (Rosenau, 1997).

This approach is heavily based on compliance and on the readiness of those towards whom authority is directed to comply with the rules and policies promulgated by the authorities (Rosenau, 2006). Other researchers have a more arrangement-based approach to governance which is seen as the temporary stabilization of the organization and substance of a policy domain at a specific level of policy making (Van Tatenhove et al, 2006) where the substance refers to the concepts, ideas, views that give meaning to that certain domain. Relevant in the context of my research is the concept of policy innovation attached by the authors of this approach, defined as the renewal of policy making process through the day-to-day interaction within the arrangement (Van Tatenhove et al, 2006). The opportunities provided by this approach for studying governance changes constitute one of the core principles of my research. Starting from the allegation that the EU maritime governance arrangements fails to address effective implementation mechanisms, I tried to combine the complementary elements of policy-making and implementation processes within the overall framework of the sustainable development principles. By using the Framework for Strategic Sustainable Development (FSSD) methodology I tried to develop a new perspective of the concept of "*policy innovation*" as a process influenced by the ideal goals and objectives to be achieved rather than by the on-going realities of the governance arrangement. The approach is also using the theory of social learning where individuals (myself through this research), groups or organizations (EU maritime communities and MSs) question and reflect on the values, assumptions and policies that drive their actions and through this, change them. This form of learning about complexity has become an important part of societal steering process, because the uncertainty and the increasing complexity in governance processes are often of a structural nature. This is not so much cognitive learning, but social learning – developing interaction with others from an alternative perspective on reality (Loorbach, 2007). This combined process approach should eventually determine the good governance changes needed to achieve the expected results through effective implementation.

Delivering "*good governance*" is one of the most powerful means of ensuring the continuous commitment and engagement of actors and citizens. Underpinned by the principles of openness, participation, power sharing, accountability, partnership and effectiveness, good governance must also conform to the principle of "*subsidiarity*" – the notion that decisions should be taken at the most effective level and as close as possible to the citizen. Good governance can be delivered on these principles through a multi-level system where competences are shared – rather than split – between various levels of authority. In practice, multi-level governance is a system of agreed, binding and crosscutting networks that operate between regions, national authorities and institutions, as well as between labor and business associations and other non-governmental organizations. Yet, at the end of the day, good governance will be judged by its results. Surveys consistently show that the public has high expectations from governance bodies in sensitive policy areas as security, terrorism, energy and climate change. The governance arrangement should rise to this challenge by developing a more results-oriented rationale, avoiding rhetoric and explaining in plain language how it adds value to its citizens' lives.

Within this context, the Governance is defined as the complex of formal and informal institutions, mechanisms, relationships, and processes between and among states, markets, citizens and organizations, both inter- and non-governmental, through which collective interests of the Maritime Domain Awareness are articulated, rights and obligations are established, and differences are mediated in the absence of an overarching political authority. An integrated approach to maritime affairs seeks to provide the necessary crosscutting governance perspective and tools to be able to minimize impacts and optimize efficiency and outputs. For integrated governance of maritime affairs to work fully, it is crucial to develop a degree of coordination across borders, allowing exchanges of best practice and closer cooperation between states in critical areas, such as those relating to protection of the marine environment, to the safety,

security and surveillance of vast open maritime areas. In addition, non-political actors (industry and civil society) are claiming a more important role within a diversity of society-centered forms of governance. Maritime governance has increased in complexity to embrace issues of safety, security, environmental protection, sustainability, social responsibility, competition and technological development, which have implications on a global scale. The global nature of the industry calls for global responses and indeed much of the regulation is drafted by international organizations such as IMO. Application and compliance, however, takes place on a regional and national level. This can cause problems both of implementation and of conflict between the international and local issues, as it already happened on the implementation of environmental regulations between IMO and EU. To improve the cooperation and coordination at governance level, the EC has issued '*Guidelines for an Integrated Approach to Maritime Policy: Towards best practice in integrated maritime governance and stakeholder consultation'* (EC, 2008/395)[8].

Whilst the guidelines recognize that each government has its own specific priorities for its maritime policy, these should take into account the International and European visions for the oceans based on the principles of subsidiarity, competitiveness and economic development, the ecosystem sustainable approach and participation of all interested stakeholders. The guidelines require MSs to assign clear responsibility at political and public administration levels to leaders acting as catalyst for the integrated approach; to consider the opportunity of developing regional policies that adds value at EU level and with the EU's neighbors; to promote and facilitate appropriate structures allowing broad participation of stakeholders in governance of maritime affairs, and to share information and lessons learned about the steps they are taking towards integrated maritime governance. A governance framework model that applies the integrated approach at every level, as well as horizontal and crosscutting policy tools are also included in the guidelines (Figure 4).

[8] The second number after the year of publication represents the code of the specific EC document

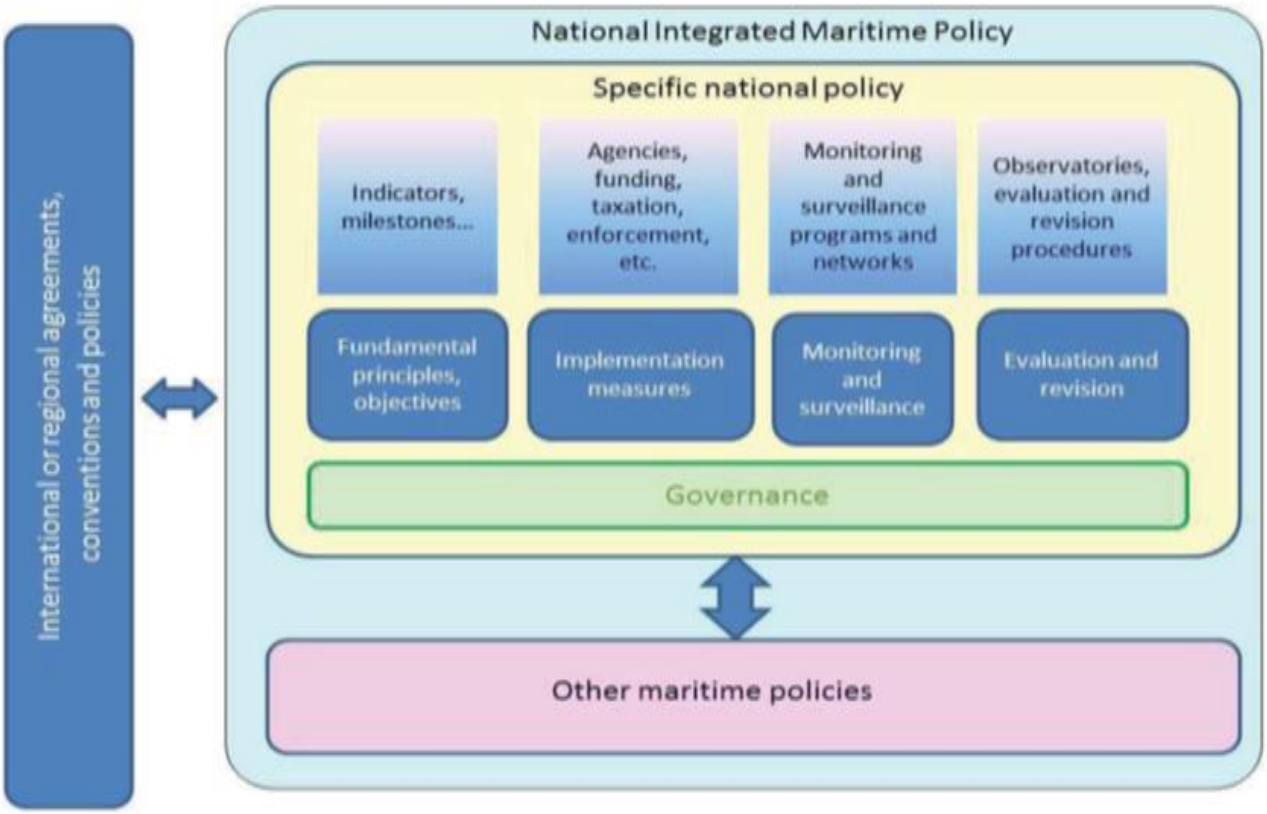

Figure 4 - IMP governance framework model
Source: - (Atkins, 2012)

Still, we are not there yet.

The EC Communication "*A sustainable future for transport: Towards an integrated, technology-led and user-friendly system*" (EC, 2009/279) indicates that with respect to the goals of the sustainable development, the European transport system is still not on a sustainable path on several aspects. **Lack of leadership and good governance is often mentioned as one reason of slow progress**. At international level, the UN report "*Sustainable Development in the 21st Century*" (UN, 2012) states that: "*we have largely failed in adjusting international rules and institutional structures to the mounting challenges and changes of the last two decades. Opinions may differ on whether our current framework for action was never fully put to the test due to lack of political will or whether it was insufficient to succeed. The fact is that we have not succeeded. For these reasons, a new political deal is needed*."

The results obtained so far both at EU and international level in implementing the principles of sustainability in the governance mechanism are far below the initial expectations. **Further research** into understanding why the sustainability objectives are so difficult to be achieved and what can eventually be done to improve the governance mechanisms supporting sustainability **is** not just **relevant and justified by the poor results obtained so far**, but also an **urgent and demanding need** for supporting better implementation in the near future.

In the specific domain of maritime transportation, the latest increasing surge of piracy attacks have become a problem of concern with substantial social and economic impacts on the sustainability of the sector. The shipping lanes stretching from the Gulf of Suez through the Red Sea and on through the Indian Ocean where they unite with traffic from the Persian Gulf and continue until they wind into the Strait of Malacca, represents the world's most vital maritime highway. This southern corridor supplies Asia with the majority of the vital petroleum resources and raw materials that it requires to fuel its economic development. In return it carries consumer goods, petroleum and other raw materials to Europe and beyond. Bound by Suez in the West and Malacca in the East, the southern corridor also transverses some of the world's major chokepoints, the Bab el-Mandeb in the south and the Strait of Hormuz in the north. Around 35% of all seaborne trade of oil pass through the strait carried by super tankers with a capacity in excess of 150,000 deadweight tons. The major threat for international shipping as it enters the Gulf of Aden and the Indian Ocean stems from international piracy, operating out of ungoverned areas along the coast of Somalia and other littoral countries. Over the past years there have been thousands acts of piracy which have caused immeasurable harm to the world's maritime trade and the seafarers, including the deaths of over 54 individuals. In 2005, ransoms paid to pirates averaged around $150,000 per ship, by 2009, the average ransom rise to $3.4 million and in 2010, ransoms goes to average around $5.4 million (Oceans Beyond Piracy, 2014). The total cost

of ransom is estimated to be around double the value actually paid to pirates, duplicated by the costs of negotiations, repair to ship damage caused while held captive, and the physical delivery of the ransom money, often done by helicopter or private plane. Additional large costs result from ships being held out of service for long period, as well from the increased insurance costs attached to the sensitive areas. Finally, the piracy generates a new range of costs associated to the maritime transport, such as re-routing of ships, costs for using armed forces and navies (43 navy ships are operating in the Horn of Africa at an average cost of $80,000/day) to protect the sensitive areas, cost of prosecution procedures, including setting-up of dedicated regional agreements.

Figure 5 provides a representative picture of the global piracy evolution over the last years:

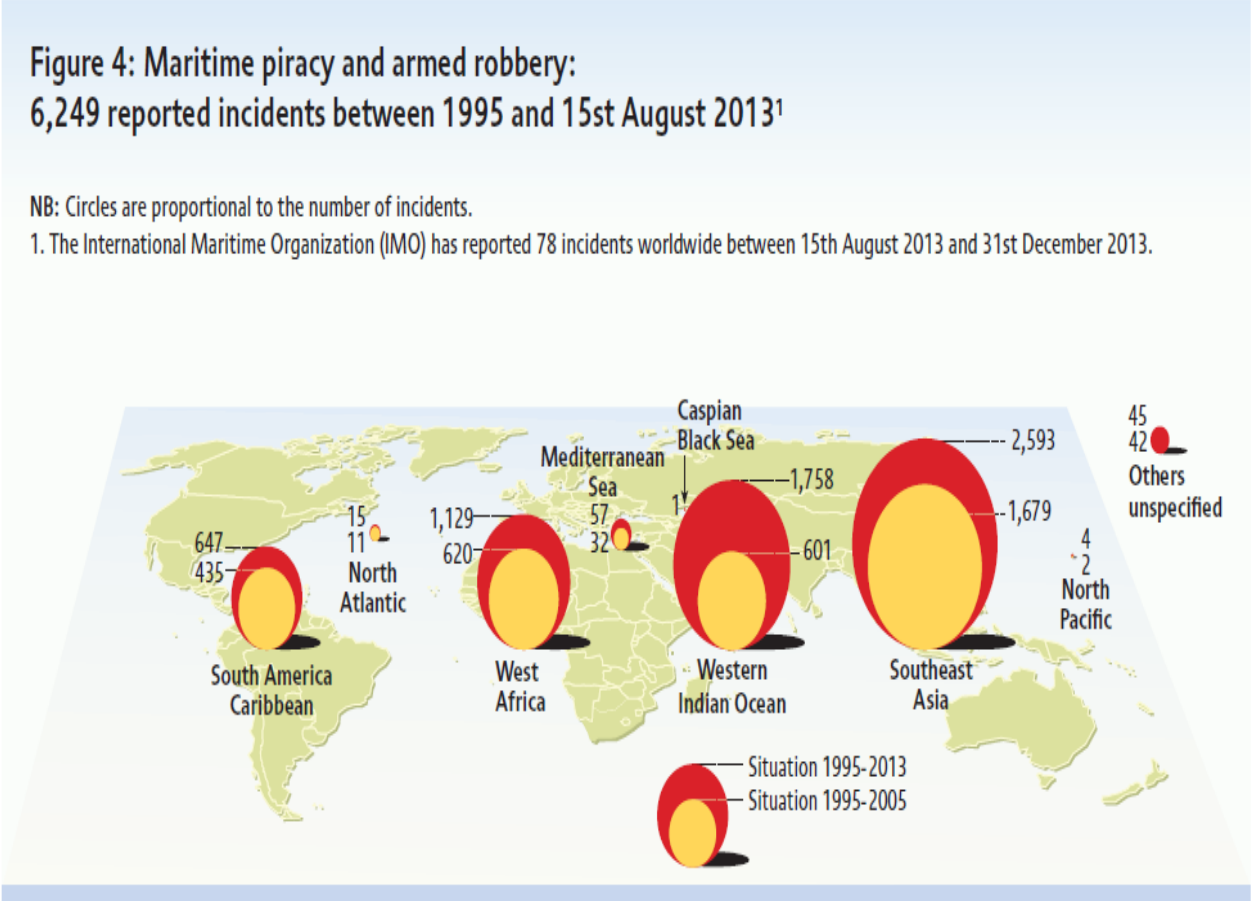

Figure 5 – Maritime piracy incidents
(Source: - UNITAR-UNOSAT Piracy report 2014)

In addition of the direct impact on the maritime transportation, many countries claimed secondary costs resulting as indirect consequence of the piracy, such as trading routes being altered, insurance premiums increased, cargo shippers using alternative ports to pick up and deliver their goods and substantial decrease of the fishing activities. For example, the Kenyan Shippers Council has estimated that piracy increases the cost of imports by $23.8 million per month, and exports by $9.8 million per month. These costs are then redirected to Kenyan consumers resulting in a price increase of imported goods by 10%. Seychelles' Minister for the Environment and Natural Resources has stated that – "*Maritime attacks pose a direct threat to our fishing and tourism industries, the two main pillars of our economy, reducing the Seychelles economy by around four per cent of GDP every year*" (Morgan, 2010).

Studies[9] conducted on the piracy costs outline the significant impacts it has on the maritime transportation: seafarers are killed at sea; additional $ 7 billion annual costs; re-routing ships to avoid the area; introduction of armed security guards on board merchant ships and extended military operations in specific areas; significant negative impact on stability and economic development of the countries in the area; impact on oil trading as the attacks are targeting high value loaded tankers. Whilst initiated as random attacks to steal goods from ships, this unprecedented development of the piracy acts was possible mainly due to the lack of proper governance and control over the high seas, which are outside of national jurisdiction of coastal states. In particular, the lack of internal authority and law enforcement capabilities in Somalia enable pirates to develop well organized shore-based arrangements for launching their attacks and subsequently bring back and retain the hostage ships and crews, whilst the lack of governance and monitoring of the high open seas provides a perfect environment for pirates to attack ships in areas which were not covered by any monitoring and alerting maritime systems.

9 THE ECONOMIC COST OF SOMALI PIRACY, 2011 – www.oceansbeyondpiracy.org – accessed 18.04.2014

The piracy phenomenon has triggered strong reaction within international maritime community, private, commercial and governmental stakeholders. The industry was heavily affected by the interruption of normal trading activity and the very high costs associated with piracy. Governments were also concerned, either by the direct impact on the regional development in case of West African countries or by the social and security impact on their citizens working as seafarers on board ships attacked and kidnapped by pirates. Secretary General of Gulf Petro-Chemical Association properly said, the "*piracy activities, if left undeterred, have the potential to interrupt, not only MENA [Middle East and North Africa] but also Asian-European trade routes as well. This is not only a Gulf issue, it's a global issue*." (Al-Sadoun, 2011)

The generally accepted conclusion is that the sustainability of the world maritime trade is actually threatened by piracy. Therefore a number of local, regional and international initiatives were initiated to address the piracy issues and to build various types of cooperation in this field, including joint anti-piracy missions. There are many reasons to believe that in the future we will have to expect other maritime attacks of the kind on a world-wide scale as illustrated in Fig. 5. Whilst the reactive international actions against piracy start showing some results, there is still need for pro-active approach and better governance of the maritime domain to ensure eradication of these acts. **The degradation of the safety and security aspects** due to the increasing piracy and the significant impact on the maritime transportation system **justifies the actuality and pertinence of further research into the maritime governance mechanisms**.

The latest evidence indicating the need of new governance approach to maritime domain is the exponential increase of illegal immigration in Mediterranean area. The detected flow of immigrants in 2014 was up by 170% in comparison with 2013 and is expected to surge again in 2015 as the first two months recorded an increase of over 200% against 2014 (Giuliani, 2015).

Figure 6 illustrates the huge difference between land and sea-based illegal immigration at EU level, demonstrating that sea-border governance and control is much more difficult to be achieved than ashore. This is a significant challenge for EU, which once again will test its capability of overcoming common problems through cooperation, solidarity and joint efforts. An effective and efficient EU Integrated Maritime Surveillance will be certainly a useful tool when dealing with this challenge, and I hope that this research is making a contribution towards this goal.

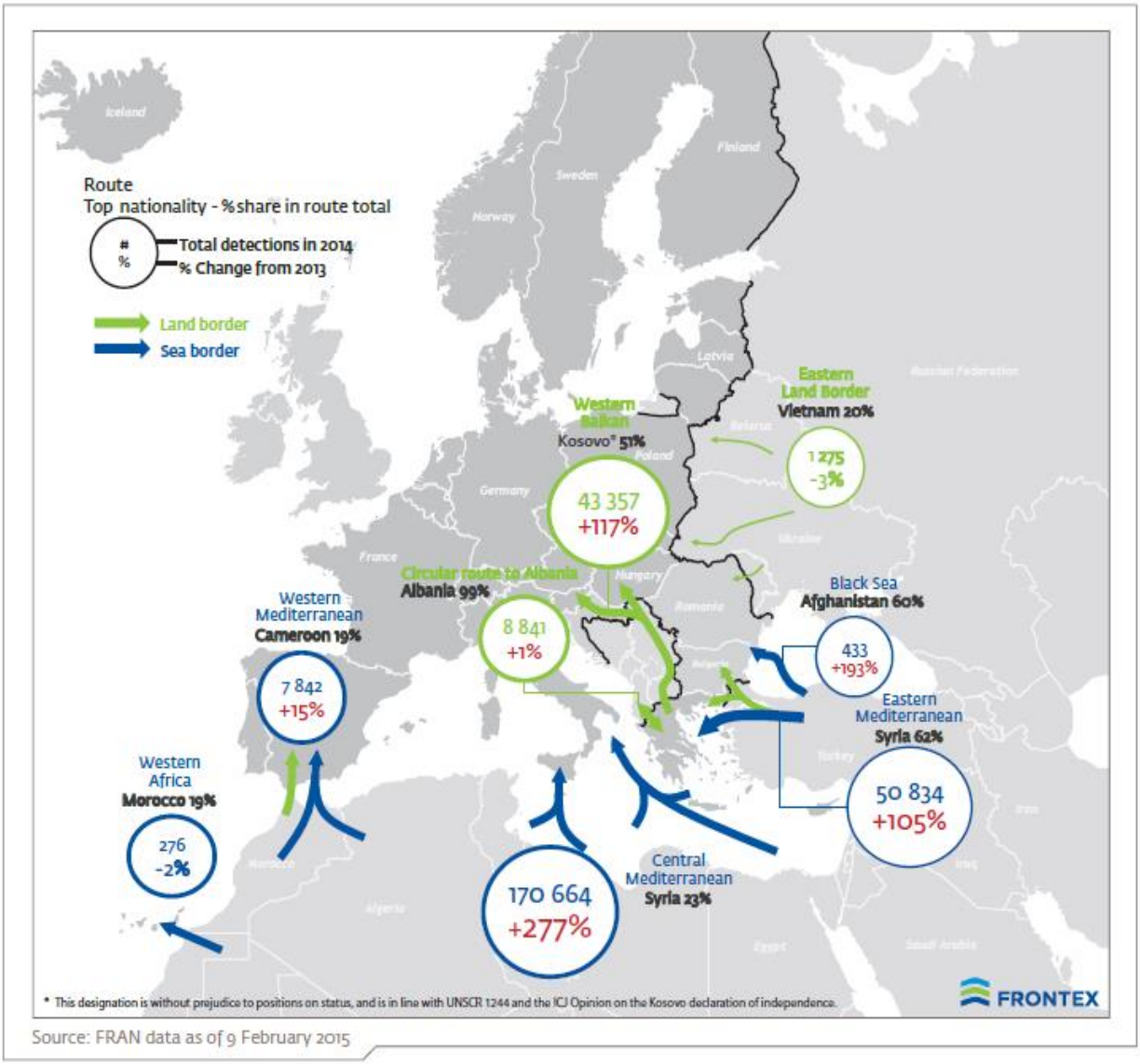

Figure 6 – Illegal immigration routes to EU

2.2 RESEARCH QUESTIONS AND HYPOTHESIS

Within the evolving geopolitical and economical context the importance of global maritime flows is increasing exponentially. Industries and commerce are ever more closely integrated as a result of globalization and critically dependent upon the flourishing network of maritime transportation system. The growing intensity of global maritime interaction means that different maritime regions across the world have become interconnected and developments in far apart regions increasingly influence each other. Critical maritime infra structure projects, such as the building and extension of canals and port infrastructure can impact maritime flows elsewhere and have important strategic consequences. Unfortunately, the growing density and importance of these global interactions has also encouraged the growth of illegal maritime activities, such as piracy and criminal syndicates. Insecurity and piracy around lawless zones can create bottlenecks that lead to a diversion of maritime flows around less frequented routes. These actors pose a viable threat to vulnerable maritime flows and infrastructure, by operating out of lawless maritime zones and exploiting the weaknesses of the fragmented global maritime governance system. Private commercial companies and under developed countries are also keen to exploit loopholes in the system (i.e. ship-owners vs. open registers). The international legal and institutional environment of the seas remains static and reactive, still based on structures and laws initiated over 50 years ago. Under the growing competition and the pressure of unexpected developments like piracy, many actors attempt to find their own way, at the risk of threatening the governance of the seas. It became apparent that new strategies are needed in order to tackle the complex challenges to the global shipping and trans-boundary maritime regions. Integrated maritime policies, regional agreements and pooling of resources, international cooperation with wide participation of all involved stakeholders emerge as potential solutions for the future.

The EU regional agreement and the adopted EU Integrated Maritime Policy (EU IMP) represent the European response to the maritime governance challenges and are used within the research as a representative case study as further detailed in chapter 4. Launched in 2007, the EU IMP is still in its initial phase and there is little experience with trans-boundary cooperation to develop integrated maritime policies and governance. Consequently, also associated literature that covers this theme is limited and under-developed, which justify the need for further research upon participation, integration and sustainable management as building blocks of the IMP. Currently, EU and national public authorities responsible for different aspects of maritime surveillance – e.g. border control, traffic safety and security, fisheries control, customs, environment, general law enforcement or defense – collect information and data mostly separately and do not share them systematically. Cross-border sharing of data within a sector has been advancing in the past years, often with the help of European Agencies like EMSA, EFCA and FRONTEX, but sharing information across sectors is still in its infancy. Sharing relevant cross-sector and cross-border information and data would enhance the maritime situational awareness of the public authorities and facilitate sound decision-making.

The research aims to investigate the mechanisms of Maritime Domain Awareness and identify better implementation solutions based on new governance models outside of the traditional nation-state sectorial framework. Using the principles of sustainable development and integrated system thinking, the research focuses on two main issues (layers 2 and 3 in Figure 7):

a) Development of regional MDA – by interconnection of the maritime surveillance systems of the participating nation-states; and
b) Development of a global MDA – through a collaborative participation of all involved actors.

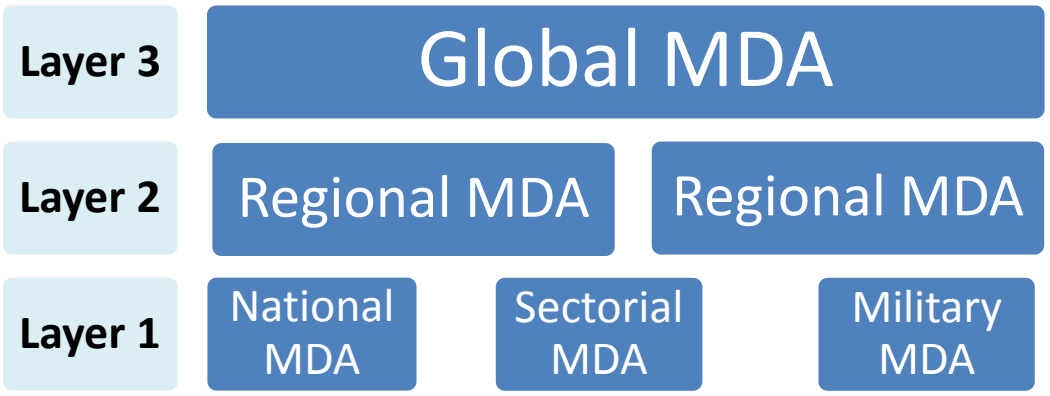

Figure 7 - High level architecture of integrated MDA

(Source: - self-authored during research)

Spawning from this approach, the research questions address these two dimensions of the Maritime Domain Awareness (MDA).

Research questions for regional MDA:

- Has the EU Integrated Maritime Policy changed the EU governance towards the cooperative and integrated model it claims in its objective (EC, 2007/575)?
- Is the EU Integrated Maritime Surveillance (EU IMS) on the right track for effective implementation? What can be done to improve the efficiency and effectiveness of the implementation process?

These questions are dealt with in chapters 4 and 5. Chapter 4 consists of a critical analysis which evaluates the implementation process of the EU IMP and IMS since the launching date in 2007 until the middle of 2015. The analysis is grounded on extensive literature research, including EC progress evaluation reports and on the results obtained so far when compare to the initial objectives and time-table. In addition, the analysis also considers the input and feedback of Member States participating in the Integrated Maritime Data Environment (IMDatE) project managed by the undersigned as part of the active research approach. The outcome was published as a stand-alone paper in the *Journal of Contemporary European Research* (Chintoan, 2014).

Chapter 5 introduces the innovative use of the Framework for Strategic Sustainable Development (FSSD) within the socio-technical domain of maritime surveillance as a tool to investigate potential improvements of the EU IMS implementation process. The goal is to address the implementation process from the back-casting perspective, trying to identify concrete steps for improvement based on sustainable development principles. The combined outcome of the two chapters provides the answers and conclusions on the regional MDA model approach.

Research questions for global MDA:

- What is the relationship between Maritime Domain Awareness (MDA) and sustainable development principles?
- How can MDA be extended from the nation-state responsibility towards a global shared common in support of sustainable maritime transportation development?

Chapter 6 expands the regional model of Maritime Domain Awareness to a global perspective proposing a new paradigm that seeks to build the MDA model towards the concept of integrated international cooperation. The surge of Somalia piracy and associated response is used as casestudy for international governance arrangement, whilst the FSSD is used as the tool to develop the Global Maritime Domain Awareness (GMDA) model.

Research hypothesis: is coupled with the research questions and claims that the change of MDA governance model from the nation-state and sector-driven maritime surveillance systems to regional and global cooperative arrangements based on the principles of sustainable development, trust and shared responsibilities, may improve the efficiency and effectiveness of safety and security aspects, critical factors for sustainable future development of maritime transportation.

So far, most of the sustainable development studies in the maritime domain have addressed mainly the environmental aspects. Maritime Domain Awareness was mainly considered an outcome of safety and security activities exercised by specialized governmental organizations and heavily relying on technical means, therefore influenced by politico-strategic factors, rather than being a subject falling under the principles of sustainable development.

The research intends to fill this gap by using the Framework for Strategic Sustainable Development to go beyond the classical approach described above and build a new perspective of the maritime domain awareness as a socio-technical echo-system integrated and interconnected within the holistic picture of maritime sustainable development. The nature of **the investigation falls within the multi-disciplinary approach** embedded in sustainable development studies because the MDA concept brings together many disciplines, actors and complex relationships. International polity and laws, the specialized field of Shipping Economy, technology and communications, ship and shore based management, geography and spatial planning, environmental impact, safety and security aspects, governments, industry, people, education and training, are all interlinked in complex and dynamic relationships within the wide concept of Maritime Domain Awareness.

The central objective of the research is therefore whether it is possible to develop an integrated governance approach based on the concept of sustainable development within the complex international maritime system, based on the assumption that the concepts of sustainable development and the chosen FSSD research methodology provides an integrative framework to analyse and understand the necessary changes towards sustainable progress. Hopefully, the research will contribute to the efforts of identifying and better understanding the maritime policy's key elements at a time when the implementation is still an on-going process.

"*The appropriateness of different governance styles in different contexts seems to* ***merit further investigation to identify best practice and inform future development in this area***. *Enormous and challenging questions still remain about the quantity, quality, availability, consistency and comparability of data across maritime space; the need for appropriate integrative multi-level maritime governance arrangements; and about the new demands we are placing on our maritime resources"* (ESPON, 2013).

The **innovative approach** of my research consists in the application of sustainable development principles to the safety and security aspects of the maritime transportation for developing a new Governance model supporting better maritime surveillance, which eventually can be used as the starting point towards the Global Maritime Domain Awareness (GMDA) information system as a main pillar for the sustainable development of the sector. When talking about the "*needs of the present"* in the context of the relationship between sustainable development and maritime transport it is clear that globalization of trade and continuous growth of international commerce is not possible without using the maritime transport as the main vehicle for bulk goods transportation (see chapter 1). Therefore there is an actual and future need to develop the maritime transport as a reliable, safe and secure pillar of sustainable development. Nowadays, there are serious gaps in the way the maritime transport security is ensured. The increase of piracy acts and illegal movement of drugs, human beings and arms, as well as the growing flow of illegal immigrants, particularly from Africa to Europe, raise the problem of effective maritime governance and border control, and are strong and undeniable evidence that the "*needs of the present*" are not properly met. The traditional nation-state maritime surveillance is not able to cope with the international dimension of the maritime transportation and associated security challenges. "*These threats are global in character and therefore necessitate a coordinated response, as no one state has sufficient resources to address them all alone*" (NATO SG, 2010).

CHAPTER 3: RESEARCH APPROACH

3.1 RESEARCH METHODOLOGY

The methodological approach is determined by the research objectives, the framework underlying the problems and the empirical considerations of the project. The qualitative paradigm is suggested as an adequate methodological framework for research, which seeks to understand the meaning and complexity of issues rather than measuring predetermined variables (Denzin & Lincoln, 2011). Governance, the main topic of my research, falls within the category of complex inter-linked social issues and therefore a qualitative based approach seems the most suitable choice because "*qualitative research is concerned with developing explanations of social phenomena*" (Hancock et al, 2009). Furthermore, the types of research questions and the research process of developing, co-producing, relevant knowledge based on a complex systems approach combined with participatory, action research activities, are also criteria associated with qualitative research methods (Maxell, 2005).

The research in this thesis has been a process along two-tracks. The first track was an analytical integrative process of theory development based on the concepts of sustainable development and governance within the interdisciplinary socio-technical domain of maritime surveillance. From the integrative theory that was developed, a number of concepts, ideas and tools were deduced into an operational model for governance of maritime domain awareness based on sustainability. The second track was more inductive and explorative and started from practical projects and contexts in which I was involved professionally. Based on the outcome of these projects, experiences herein and reflection on the use of operational tools, insights have emerged that contributed to the governance model derived partly from theory and from operational needs.

Other supporting factors for choosing the qualitative approach include:

- The exploratory nature of the work (inquiry from the inside) aiming to discover new elements which are not easily accessible for investigation.
- The sustained interaction with the people being studied in their own professional environment and on their own turf (Kirk and Miller, 1986). My research took place in the maritime transportation environment and with the maritime users' communities, which are actively involved in the implementation of the maritime policies and activities.
- My role as active learner trying to objectively analyze and integrate the opinions of the maritime end-users. Qualitative methods are appropriate to explore people's subjective experiences and the meanings they attach to those experiences.
- The need of an inductive analysis and creative synthesis - immersion in the details of the case to discover important patterns, themes, and interrelationships – in order to be able to build-up a holistic perspective upon the complex hypothesis of the research.

During the project, I have applied an iterative cycle of research based on the following qualitative methods and tools:

a. Case study

"*Case studies are the preferred strategy, when 'how' or 'why' questions are being posed, when the investigator has little control over events, and when the focus is on contemporary phenomena with real-life context*" (Yin, 2014). In general, a case study is used to illustrate, validate or explore theoretical concepts and hypotheses. Case study research is also good for contemporary events within their real life context when the relevant behavior cannot be manipulated. Typically case study research uses a variety of evidence from different sources, such as documents, artifacts, interviews and observation, and this goes beyond the range of sources of evidence that might be available in historical study. Case studies are at the same time also the place where

research findings can be transferred to practice and where new insights for theory are found, which match well with my research questions, as well as the scope of my research. In fact, a number of scholars (Siedentopf and Ziller, 1988) use, and frequently compare, case-studies as a highly appropriate method to describe, explain, and explore, either the EU policy making and implementation processes per se, or the role of governmental or non-governmental actors within these processes (Wallace and Wallace, 1996).

The case-study methodology was used on two-fold approach: first I used the EU Integrated Maritime Surveillance (EU IMS) as a representative case for the MDA regional model; and secondly, I used the case of Somali Piracy crisis to demonstrate the viability of new governance models in the maritime security domain. Both cases are representative and actual as the EU IMS is one of the three main pillars of the EU Integrated Maritime Policy, whilst the Somali piracy case is a unique example of international cooperation when faced with an urgent and new type of threat. In addition, working together with the representative maritime users from all EU Member States (MSs) added further representativeness in providing reliable data for accurate analysis of the topic and associated conclusions, which is also a requirement of a case-study methodology. The two research cases serve a wide range of goals of different nature: they test hypotheses, illustrate concepts, explore new ideas and innovative use of practical sustainable development tools (FSSD), and lastly produce meaningful results. The selected cases had scientific as well as practical operational goals. The research approach has emerged out of this iteration between theory and practice and the selection and use of appropriate use-cases and methods related to the context-requirements.

b. Data collection, analyses and validation

Three main data collection methods have been used within the research: documents analysis, interviews during working meetings with EU MSs representatives, and direct observation of IMS services and feedback analysis from end-users.

Document study is an indirect method of data collection that does not require participation of the subjects involved. The document studies might provide valuable insights into understanding how governance issues interact and influence the maritime transport domain. The document study will include international, EU and (national) governmental policies and associated legislative documents both on sustainable development and maritime transport, professional and academic studies, and policy documents from private maritime sector and associated NGOs, such as:

- UN and IMO Conventions, codes, guidelines and studies;
- EU Sustainable Development Policy documents, mainly (maritime) transport;
- EU Integrated Maritime Policy documents and projects;
- Maritime information systems and their use;
- Reports and feedback from Maritime Users;
- Documentation, reports and studies on maritime governance and sustainability;
- Research projects within maritime domain;
- Literature.

The literature review was conducted in several phases over a period of 3 years, from 2012 to 2014, as the thesis topic, questions and information evolved. During the initial stages of developing the thesis proposal, the initial research was conducted using the EC library and the Internet on-line search engines. The access to worldwide internet-based information ensured the internationalization of data, especially when analyzing the global MDA model. The focus was to research and document the origins of the EU IMP and to assess whether the disciplines of

"maritime surveillance" and "sustainability" had been linked together in terms of being mutually synergistic. In the second stage of consolidating the draft thesis, the review was extended to the main on-line research databases, EU IMP related studies, articles, books and publications on sustainable development and governance models available at the libraries and information resource centers of the Lisbon School of Economics & Management, European Maritime Safety Agency and the European Commission. Full list of literature and documents used within the context of the research is provided under the Bibliography section.

In contrast to document studies, interviewing requires direct interaction with the respondents and heavily relies on their involvement, participation, and contribution. Both formal and informal interviews have been carried out during the research. The formal interviews were of semi-structured type, which "*involve the implementation of a number of predetermined special topics but allow the interviewers sufficient freedom*" to express themselves (Berg, 1989). The formal interviews consist of four one-day meetings with delegated representatives from each EU MS to discuss relevant IMP and IMS related topics. The people attending these meetings were decision-making factors at national level on maritime policy and IMS matters. Burnham et al (2008) call this approach as "*the elite interviewing*" because the interviewees have the knowledge and the power to influence future actions. In addition of the governmental representatives, the attendance included as well representatives from the industry professional associations and other EU agencies which are active actors within the IMS sector, such as: the European Ship Owners Association, European Ports Association, FRONTEX, EFCA and EU NAVFOR. A discussion agenda was prepared for each meeting and minutes of meeting report was thereafter distributed and endorsed by participants.

Annex 3 – Agenda and Minutes of Meeting – provides a sample of the outcome of discussions.

In addition, informal discussions were conducted with representatives from various countries/organizations within the framework of other international maritime forums and meetings which I have attended during the research (Annex 4 – List of attended conferences). These face-to-face discussions were very useful for gaining direct insights into the perception of the end-users in respect of governance mechanisms and their interrelationship with sustainability principles and also to achieve a good understanding of the governance implementation models in various countries around EU. The meetings were complemented with a number of on-site visits and periodical reviews of the level of usage of the IMS services, which complete the third layer of data collection through direct observation. Data analysis was adapted to each phase and each specific type of data, whilst the validity of the findings and of the proposed way forward for improved IMS governance was done by collecting and analyzing the direct feedback of the end-users. In addition, peers within the Agency and other EU bodies have been debriefed and asked to validate the findings.

All three main principles of data collection have been used through the research. Data triangulation technique was applied both for the input and output data, meaning that data quality was crosschecked between various sources to corroborate the findings. Extensive databases have been developed and used, including minutes of discussions, analyses reports and feedback information. Finally, the chain of evidence was established and maintained with appropriate citation of relevant documents and evidence available in the databases.

c. Action research

Action research is a practice aiming to develop knowledge or solution to a particular topic based in a rather different form from the traditional academic research. It brings together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern (Reason and Bradbury, 2001). The process that the researcher goes through to achieve these themes is a spiral of action research cycles consisting of four major phases: planning, acting, observing and reflecting. As an action researcher I brought in certain skills and knowledge, and other actors have been involved bringing their own capacities and experiences to address the problem (Greenwood and Levin, 2006).

I have used the action research approach to demonstrate in a pragmatic manner how data sharing can be achieved within the context of Integrated Maritime Surveillance services and to use this demonstration as evidence supporting a new governance approach for the EU IMP/IMS. This was done through the EMSA Integrated Maritime Data Environment (IMDatE) project performed between 2012 to 2014, which has involved over 100 maritime users from various EU MSs and Agencies in an iterative cycle of designing, testing, reviewing and improving process aiming to set-up effective integrated maritime surveillance services. This was a voluntary process open to users willing to exchange data between themselves for the purpose of setting-up, testing and evaluating the potential added value of IMS services. An initial meeting took place in February 2012 where they have identified the main problems related to IMS services and has express opinions on potential solutions. Using the outcome of the meeting as problem-definition and business requirements for IMS services, I have coordinated the development of a technical platform based on EMSA existing systems and technology, named IMDatE, able to solve most of the problems and to deliver the required services. In October 2012 we had a second meeting of the volunteer user group where I introduce the IMDatE platform and its capabilities.

Following a new round of enlightening discussions and critical analyses of the proposed solution, prototype IMS services were established by the end of 2012 and open to those willing to take part in operational testing and evaluation.

An iterative operational use cycle was performed during 2013 with services being used for various purposes (ship traffic control, monitoring of fishery activities, anti-piracy purposes, maritime border control), feedback being provided by the effective users of each service, input assessed through a systematic learning process, both at operational and technical level and translated into continuous improvement of the services and practice. The next user group meeting of October 2013 has confirmed the viability of using the action research approach in support of IMS development. Over 100 participating users, from more than 30 organizations in 14 MSs have unanimously confirmed that using IMS services brings operational, technical and economic benefits against the traditional system-based and community constrained maritime monitoring approach (see Annex 3 – Minutes of IMDatE meeting). Consequently it was decided to continue the iterative improvement cycle for another year in order to reach a higher level of maturity and to use the successful outcome as evidence for influencing the policy-making process at European Commission level.

By the end of 2014, the IMS services provided by EMSA IMDatE platform have been established as permanent integrated services and widely promoted by their users as the type of services they would expect under the framework of the EU IMP and its IMS/Common Information Sharing Environment initiative. Figure 8 presents the high level cycle of the IMDatE action research activities:

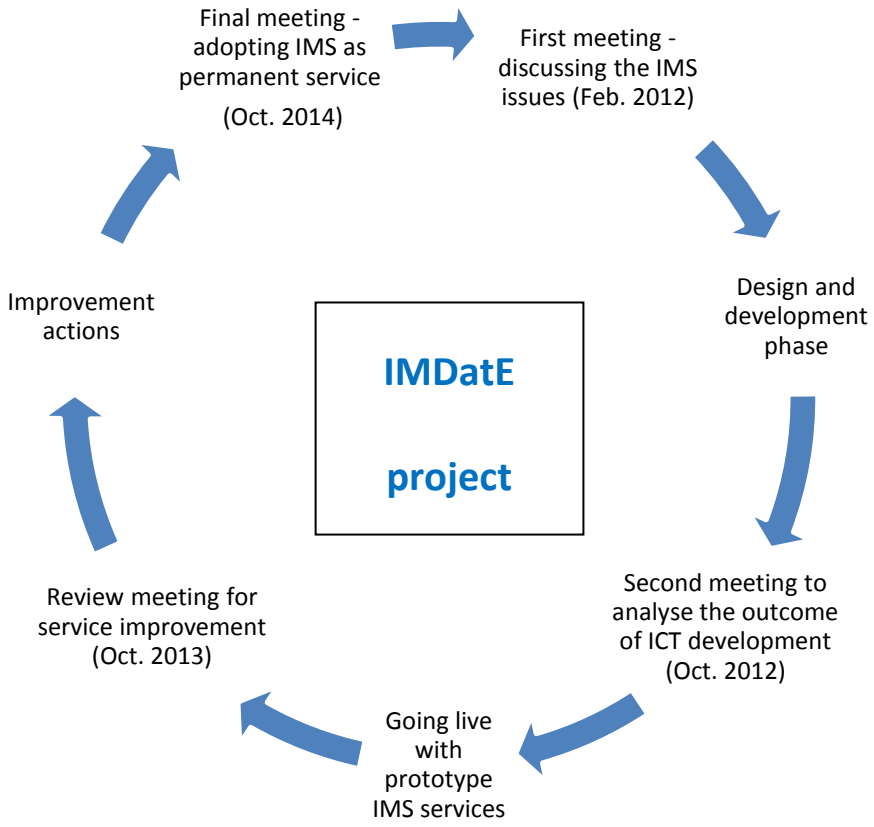

Figure 8 - IMDatE action research cycle

(Source: self-authored during research)

As illustrated above, the research and practice have constantly been followed through at the same time. It was a deductive process of formulating generic governance principles based on theoretical insights and an inductive process of formulating and implementing prescriptive models and integrated services based on practical experiences.

The research process was thus a co-evolution between theory and practice as illustrated by Figure 9.

Figure 9 – Bulding blocks of the PhD research process
(Source: - self-authored during research)

3.2 RESEARCH TOOL

Research and theories on policy processes (Lindblom and Woodhouse, 1993); (Sabatier and Jenkins-Smith, 1993) and on governance topics (March and Olsen, 1995); (Kohler-Koch and Eising, 1999); (Pierre and Peters, 2000); (Hooghe and Marks, 2001); (Kooiman, 2003) provide insights on how to deal with policy and governance in a modern, complex society. The basic principles underlying EU Integrated Maritime Policy – multi-level thinking, multi-actor and cross-border data sharing, coordination and harmonization, focus on learning and envisioning - have been refined and further developed within this research based on the sustainable governance principles. This was done through a two-stage methodology:

(i) first, a mid-term evaluation of the implementation status of the EU Integrated Maritime Policy, focusing on the Integrated Maritime Surveillance pillar, and then,

(ii) second, by developing a new Governance model starting from sustainability governance principles.

The framework used for the second phase was the so-called Framework for Strategic Sustainable Development (FSSD) designed as a tool to evaluate an initiative, system or organization from the larger context of sustainability. The core approach of the FSSD is the concept of "back-casting", which means that a targeted successful outcome is imagined in the future, and then the questions are asked and solutions identified on what needs to be done to reach that vision of success.

A four-step approach, called ABCD, is followed along this approach, as illustrated in Figure 10:

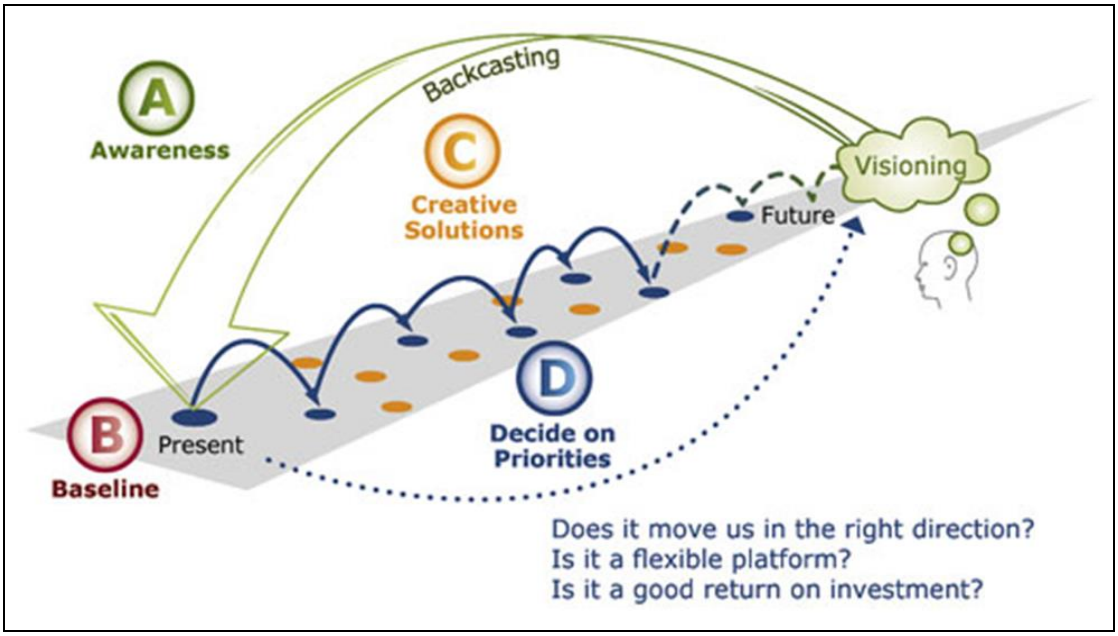

Figure 10 - Back-casting ABCD approach
(Source: - The Natural Step)[10]

The first step, the (A) Awareness and visioning, identifies the role of the IMP/IMS from the global vision of sustainability and creates a vision of how IMP/IMS framework should look like for a sustainable future.

The second step, (B) Baseline Mapping, analyses the current status of the system today by listing the current flows, practices and conditions that violate the sustainability conditions. I have used this to conduct a gap analysis of the IMP/IMS to see how its activities are running counter to sustainability principles.

[10] http://www.naturalstep.org/en/backcasting - accessed 22.08.2014

The third step, (C) Creative solutions, is a brainstorming process for potential solutions to the issues highlighted in the baseline analysis without any constraints. Starting from the vision of how IMP/IMS should be implemented to support sustainability, I have tried to develop strategies and solutions for going there. This is the back-casting process aiming to go beyond just solving the problems of today but instead, beginning with the end in mind, moving toward the vision of sustainability, with each action providing a platform for further improvement.

Finally, the last step, (D) Decide on priorities, is mainly to prioritize the measures that will move the IMP/IMS toward the chosen vision, while optimizing flexibility as well as maximizing economic, social and ecological returns. This step supports effective, step-by-step implementation and action planning. The whole ABCD approach is based on systems thinking, setting ambitious goals, and developing realistic strategies to achieve them.

Another feature of the FSSD which supports its use is the fact that it introduces a fourth dimension of the sustainable development – the principle of Good Governance and Security as critical enablers for the other three dimensions (economic, social, and environmental). As the topic of my research is governance within the maritime security domain, the FSSD emerged as a suitable methodology for the purpose of the project. Using this approach to evaluate the Integrated Maritime Surveillance domain is innovative, as the method was never used before for this type of activities, but rather for environmental based activities. This was however one of the objectives of my research, i.e. to look at IMP/IMS issues from a new, different perspective and using new, innovative methodology.

One core principle of the FSSD and ABCD framework is to start from a vision and build the (new) way and not to start from the status quo and try to find solutions to adjust or compromise towards the vision. The theoretical analysis of the research, exploratory by nature, was further

developed, tested and implemented in different pilot projects at different levels through participatory action research. The research was conducted in the context of policy-making processes at EU level in which the experimental model and approach to a new MDA model was implemented. Both the theoretical framework and the operational approach were iteratively developed. This part of the research was largely experimental, applied and problem-driven. Based on concrete operational problems in which new solutions were sought, and motivated by the explicit ambition to support governance-decision making, I could propose and later on organize and facilitate a MDA platform able to support and demonstrate how a new governance model can be applied in maritime domain. In such context my role changed from traditional researcher analyzing problems via co-producers of new operational systems, to facilitators and organizers of transition processes to a new governance paradigm.

Finally, I was involved in on-going policy-processes and projects in a more or less traditional role, providing knowledge and observing and reflecting on the process. A number of these projects are taken up in this thesis, while others are used more indirectly to support specific arguments, elements or concepts.

The inter-operability of the used research methods and the FSSD tool is represented in Figure 11:

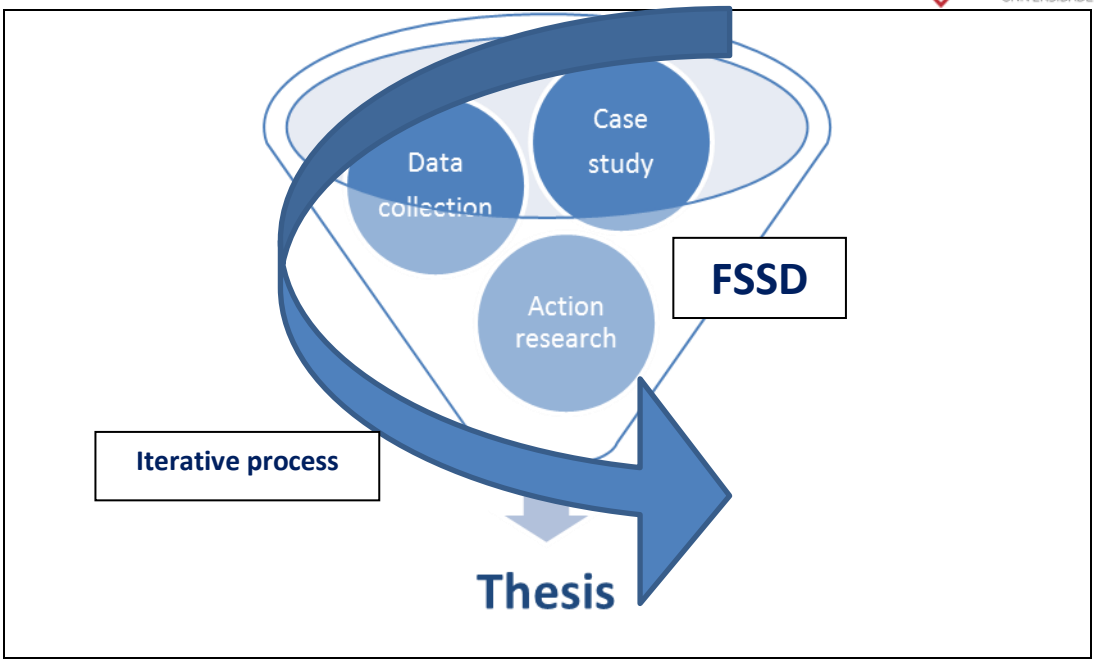

Figure 11 - main research methods of the project
(Source: - self-made during research)

The PhD-research was a semi-structured process. Starting from the general orientation dealing with the governance model of the EU IMS, the research was structured through the iterative test-reflect-learn processes which ends up with three different deliverables: the theoretical basis (the analysis of complex governance models using EU IMP/IMS use-case), the test-and-trial framework of the IMDatE project (for operationalizing maritime surveillance in the specific EU societal setting) and the potential new model developed to address the principles of sustainable development within maritime surveillance area. The theoretical basis was primarily inspired by and based upon literature review. The testing and transition framework originated from practical experiences with integrated surveillance services conducted as part of the EMSA IMDatE project. Finally, the potential new governance model emerged as an exercise of applying the Framework for Strategic Sustainable Development to the maritime surveillance domain.

CHAPTER 4: EU INTEGRATED MARITIME POLICY

4.1 EU SUSTAINABLE DEVELOPMENT POLICY

Since 1997, the principles of Sustainable Development became fundamental objectives of the EU Treaty, requiring the integration of sustainable development into all European policies to achieve an integrated way for meeting economic, environmental and social objectives (EU Treaty, 1997). The EU policy on sustainable development was released in 2001 through the EC Communication on "'*A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development (EU SDS)*" (EC, 2001/264). Starting from the definition of the UN World Commission on Environment and Development: *"**Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs**"* (Bruntland Comission , 1987) the EU strategy has set objectives and concrete actions for seven key priority challenges for the period until 2010:

- Climate change and clean energy
- **Sustainable transport**
- Sustainable consumption & production
- Conservation and management of natural resources
- Public Health
- Social inclusion, demography and migration
- Global poverty and sustainable development challenges

Unsustainable trends (global warming, food safety, poverty, ageing of population, bio-diversity, waste, and transport congestion) were identified and operational targets and specific measures were adopted at EU level to improve these issues, including a statement on EU Leadership in achieving global sustainable development.

The proposed starting point was to ensure internal housekeeping by requesting that all policies should be judged by how they contribute to sustainable development. The EU SDS wanted to be an inclusive strategy for the whole EU and therefore proposes mechanisms for coordination with all levels of governments and calls upon business, NGOs and citizens to become more involved in working for sustainable development. Education, research and public finance are stressed as important instruments in facilitating the transition to a more sustainable production and consumption patterns. Good Governance is essential to support and promote sustainable development and is required of all sectors of society: governments, businesses, and civil-society organizations.

The EU SDS strategy was supported by additional guidelines such as: the EC Communication on Governance and Development (EC, 2003/615) and the "EUROPEAN CONSENSUS ON DEVELOPMENT" (EC, 2005). In line with the UN Millennium Development Goals (MDGs)[11] the EU MSs aims to: eradicate extreme poverty and hunger; achieve universal primary education; promote gender equality and empower women; reduce the mortality rate of children; improve maternal health; combat HIV/AIDS, malaria and other diseases; ensure environmental sustainability and develop a global partnership for development. Both documents describe EU sustainable development as a complex long term, multi-level, multi-actor process that can neither be translated into the narrow terms of static optimization nor be conducive to strategies based on direct control, fixed goals and predictability. The real challenge for EU therefore was to develop a new form of governance based on sustainability principles that can be applied by all MSs in the context of long-term social, economic and environmental issues without a prescriptive or dogmatic approach. The 2006 revision of the EU Sustainable Development Strategy (EU Council, 2006/10117) focused on key issues which needs strong push at the highest political level to engage the public, speed up decision-making and action at all levels, encourage more

[11] http://www.un.org/millenniumgoals/ - accessed 20.05.2014

cooperative thinking and accelerate the uptake of new and better ideas. It also sets out an approach to better policy-making based on better regulation and on the principle that sustainable development is to be integrated into policy-making at all levels. Transport was on the list of key issues of the EU SDS, which has defined Sustainable Transport as "*transport systems that meet society's economic, social and environmental needs whilst minimising their undesirable impacts on the economy, society and the environment"* (EU Council, 2006/10117).

Other organizations or researchers use similar definitions of sustainable transport, i.e.:

1. *Environmentally Sustainable Transportation* (EST) *is transportation that does not endanger public health or ecosystems and meets mobility needs consistent with use of renewable resources at below the rates of their regeneration and use of non-renewable resources at below the rates of development of renewable substitutes* (OECD, 1999).

2. A *sustainable transportation system* is one that (Litman, 2008):
    - Allows the basic needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity between generations.
    - Is affordable, efficient, offers choice of transport and supports a vibrant economy.
    - Limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources, limits consumption of renewable resources to sustainable levels, reuses and recycles components, and minimizes the use of land.

Financial instruments and a two-years monitoring program to measure the progress toward the established objectives supported the EU SDS. The first progress report (EC, 2007/642) shows relatively modest achievement. Regarding the transport, the report states that Europe was not yet on a sustainable transport path. Energy consumption by transport and greenhouse gas emissions grew, the objective of achieving a balanced shift towards environmentally friendly transport modes has not been achieved and road congestion has been increasing. The following report

(EC, 2009/400) illustrates a positive trend towards sustainability goals, allegedly substantially slowed down by the economic and financial crisis of that moment. The report mentions the awareness created at EU level on sustainability, translated in sustainable development strategies at national levels. Almost all EU Member States have initiated their own National Sustainable Development Strategies (NSDS), in line with EU and international recommendations of best practice. A dedicated network called "*The European Sustainable Development Network*" (ESDN) [12] facilitates the exchange of good practices and experiences between Member States. Despite the efforts made towards achieving the main objective of the Lisbon Strategy to make the EU "*the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion*" (EU Council, 2000), many objectives were not achieved and the economic crisis had wiped out most of the progress achieved by the EU. The EC report "Lisbon Strategy evaluation document" (EC, 2010/114) attempted to provide an explanation on the reasons and circumstances behind the failure, outlining world economic crisis as the main reason. Starting from the new economic reality, the successor of the Lisbon Strategy is the EU 2020 Strategy[13], launched in 2010 with the main goal to "*emerge stronger from the crisis"* taking stock and applying many of the lessons learned during the last decade. In this regard, it aims to combine economic success with social inclusion and environmental responsibility to stimulate growth, employment and competitiveness, while addressing important challenges such as climate and demographic change. It also emphasizes improving coordination and implementation, although on paper the proposed governance mechanism has not been significantly altered. At the regional level, the Europe 2020 Strategy is a first and important milestone on the European path towards integrated economic and sustainable growth as it reflects the European commitment to work together for a

12 http://www.sd-network.eu – accessed 22.04.2014

[13] http://ec.europa.eu/europe2020/index_en.htm - accessed 22.04.2014

better future. It was important to ensure that the Strategy has enough popular and financial support. Without these two key elements, the Strategy was unlikely to fulfill its targets. On the other hand, the EU needs to take the necessary steps to overcome the existing internal tensions and problems. Policy-making itself has become highly complex in the context of the persistent problems of the EU, as different actors and perspectives need to be dealt with and clear solutions or mechanisms to assess progress and success are lacking. National and local governments need to build effective institutions and pursue sustainable development with transparency, accountability, clear metrics, and openness to the participation of all key stakeholders. The reality of policy-making has become that of governance; structuring and coordinating seemingly autonomous interactions between different actors at different levels that produce and reshape societal structures. The traditional policy-making paradigm of developing plans, strategies and implementing them in a rather straightforward manner has to be replaced by a more holistic, refined and integrated perspective on policy-making. In this respect the EC has issued a new set of guidelines in support of EU 2020 Strategy implementation process outlining a new governance model as illustrated in Figure 12:

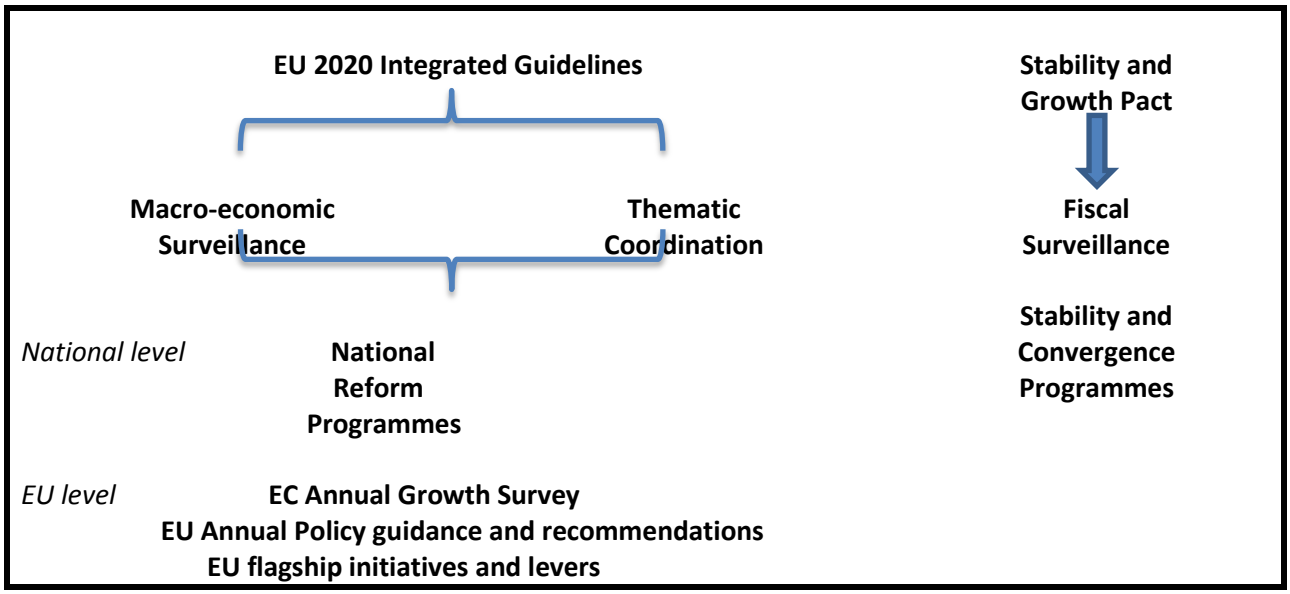

Figure 12 - Governance of the EU 2020 Strategy
(Source: - adapted from "Governance, Tools and Policy cycle of Europe 2020")

For the maritime transport domain, the EU 2020 Strategy includes the adoption of the Maritime Safety Package, the Maritime Transport Strategy until 2018 and the Integrated Maritime Policy setting a common framework for all EU maritime policy issues and introducing cross-cutting tools to ensure that the use of the marine environment is genuinely sustainable. Two Directorates - General (DGs) were established to implement the policies:

- DG MOVE, now re-named as DG Mobility and Transport[14] under the new 2015 EC, was assigned the responsibility for the Maritime Transport Strategy (MTS) 2018[15]; and
- DG MARE[16] tasked with the implementation of the Integrated Maritime Policy (IMP)[17].

However, no coordination mechanism was put in place to ensure that the two Directorates work together on the common horizontal issues, as suggested by the "Thematic Coordination" strand in the Figure 12 diagram. The implementation burden was left to DG MARE alone, which was supposed to build-up the necessary collaborative support for effective implementation. This is another indication of the persisting misalignment between the political declarations promoting holistic and cooperative policies and the implementation mechanisms and organizational arrangements which are not updated to support the new integrative policies, resulting in many blocking issues or failure to achieve the intended politic goals. This has happened in the case of maritime surveillance where both policies (MTS and IMP) include similar objectives:

- MTS - "*Looking ahead to 2018, the capacities of the EU's maritime transport system should be strengthened by putting in place an integrated information management system to enable the identification, monitoring, tracking and reporting of all vessels at sea and on inland waterways to and from European ports and in transit through or in close proximity to EU waters.*" (EC, 2009/538)

[14] http://ec.europa.eu/transport/index_en.htm - accessed 26.05.2014
[15] http://ec.europa.eu/transport/modes/maritime/index_en.htm - accessed 26.05.2014
[16] http://ec.europa.eu/dgs/maritimeaffairs_fisheries/index_en.htm - accessed 26.05.2014
[17] http://ec.europa.eu/maritimeaffairs/policy/index_en.htm - accessed 26.05.2014

- IMP - *"The EC will take steps towards a more interoperable surveillance system to bring together existing monitoring and tracking systems used for maritime safety and security, protection of the marine environment, fisheries control, control of external borders and other law enforcement activities."* (EC, 2007/575)

In the absence of effective "Thematic Coordination" for achieving the common objective of an integrated maritime surveillance and information system, the two DGs have initiated parallel and concurrent rather than complementary initiatives, marked by conflicting power-games and individual, sector-related, interests, as further detailed in the next section.

4.2 EU INTEGRATED MARITIME POLICY

This section provides a critical mid-term review on the status of IMP implementation, outlining the successes and failures of the implementation process from a governance perspective. The review focuses on the Integrated Maritime Surveillance, one of the pillars of the Integrated Maritime Policy, using this as a case study for evaluating the implementation progress against the stated objectives and the associated governance model. This section aims to provide answers to the first two research questions:

- Has the EU Integrated Maritime Policy changed the EU governance towards the cooperative and integrated model it claims in its objective (EC, 2007/575)?
- Is the EU Integrated Maritime Surveillance on the right track for effective implementation? What can be done to improve the efficiency and effectiveness of the implementation process?

a. EU IMP success and failures

The EU Integrated Maritime Policy (IMP) is a product of the EU Sustainable Development Strategy (SDS). The 2006 SDS revision introduced a Green Paper on the future Maritime Policy for the EU (EC, 2006/275). The Green Paper pointed out the strategic importance of the seas and oceans for the European economy. It highlighted the urgency of ensuring that future developments take account of the need to maintain its competitiveness while safeguarding the marine environment and protecting the well-being and livelihoods of those who depend on the maritime economy or live on the coast. An Integrated Maritime Policy at EU level is necessary as there are numerous EU policies that relate to the sea, but which have been developed and pursued until recently in a fragmented fashion. To name but a few: maritime transport and maritime security policy; border control and other law enforcement activities at sea; industrial policies in areas such as shipping, pleasure boats and tourism; the Common Fisheries Policy; naval strategy as part of the European Security and Defence Policy.

The initiative was then followed by a one-year consultation period, which saw some 230 events and over 490 written submissions. The stakeholders overwhelmingly agreed that the EU could not continue to manage its policy towards the oceans and seas through a series of unconnected sectorial policies. Decision-making is slow, potential synergies are not exploited and no-one has a clear authority to deal with cumulative effects or to look at the wider picture. Data collected on the state of the marine environment, human maritime activities and the health of the coastal economy are fragmented and largely inaccessible, and the different authorities entrusted with protecting our seas against pollution, illegal fishing and traffickers are independently developing similar systems to detect and identify anomalous behavior. As such the IMP forms an integrative discourse including the entire marine and maritime field of activities, sectors and stakeholders (Van Hoof and Van Tatenhove, 2009). Taking account of these reactions, the Commission has proposed an overarching maritime policy with the goals of:

(1) maximizing the sustainable use of the oceans and seas;

(2) building a knowledge and innovation base for the maritime domain;

(3) delivering the highest quality of life in coastal regions;

(4) promoting Europe's leadership in international maritime affairs; and

(5) raising the visibility of Maritime Europe (EC, 2007/575).

The challenges affecting the implementation of the IMP call for shared and integrated responses, rooted in improved maritime governance. This is particularly relevant when considering the ever-increasing demands for natural resources and pressures on the marine environment, as well as the continued need for growth and jobs in maritime sectors and regions. An integrated approach to maritime affairs should not undermine the tools and objectives that have been set for moving forward in specific areas of maritime relevance. On the contrary, it seeks to provide the necessary crosscutting governance perspective and tools to be able to minimize impacts and optimize efficiency and outputs. The IMP can be seen as one of the most comprehensive policy ever adopted by the EU as it intersects all maritime and marine areas. This is a very challenging approach from a management and coordination perspective, especially when considering that EU powers as a supranational organization are rather limited. The strong traditional maritime powers of European nation-states are posing resistance in achieving the targeted integrated EU governance making IMP implementation difficult to materialize. To make things even more complicated, the IMP was issued as a voluntary political initiative with no legal framework in support, so that implementation depends exclusively on the good will of each MS. To achieve the IMP goals, the COM has created a new Directorate (DG MARE) to enhance coordination between the sector-specific policy initiatives related to maritime affairs. Furthermore, the EU institutional structure includes a number of agencies to support the implementation of EU

policies, some of them working exclusively on sea-related matters (EMSA[18], EFCA[19]) and some with important projects or mandates related to the sea (Frontex[20], EDA[21]).

However, an Integrated Maritime Policy requires a governance framework that applies the integrated approach at every level, as well as horizontal and crosscutting policy tools. It will realize its full potential only if analogous arrangements are also adopted by Member States in line with the subsidiarity principle, to provide for the improved coordination of all maritime-related affairs. It is worth quoting the governance objective of the IMP: "*EU Integrated Maritime Policy will change the way we make policy and take decisions – at every level compartmentalised policy development and decision making are no longer adequate. Inter actions must be understood and taken into account; common tools developed; synergies identified and exploited; and conflicts avoided or resolved*." (EC, 2007/575)

The IMP relies on three main pillars:

- Integrated Maritime Surveillance (IMS) - critical for safe and secure maritime space;
- Maritime Spatial Planning (MSP) – as key planning tool for sustainable decision making;
- Marine Knowledge Base (MKB) - a comprehensive and accessible database of marine data and information.

To promote a more holistic approach towards maritime affairs throughout the entire EU, principles and guidelines were considered helpful. These have been provided through a number of documents released by the COM, the main ones being: the Integrated Maritime Policy (EC, 2007/575) and the accompanying Action Plan; the environmental dimension provided by the European Marine and Maritime Research Strategy (EC, 2008/534) of the IMP and the Marine

18 http://www.emsa.europa.eu/ - accessed 04.06.2014
19 http://cfca.europa.eu/pages/home/home.htm - accessed 04.06.2014
20 http://www.frontex.europa.eu/ - accessed 04.06.2014
21 http://www.eda.europa.eu/ - accessed 04.06.2014

Strategy Framework Directive (EC, 2008/56). The main goals of the EU IMP are to create optimal conditions for the sustainable use of the oceans, enabling the growth of maritime sectors and coastal regions, improving the efficiency of maritime transport in Europe and promoting a European Maritime Transport Space without barriers. The first progress report was conducted in October 2009 and revealed a number of positive developments that have taken place in various scales of governance within the EU maritime areas, including a good number of MSs that have started to move toward the integration of maritime policies, in line with the flexible guidance provided by the Commission. The report argues that all of the three IMP pillars (IMS, MSP and MKB) have been initiated, although the progress in integrated maritime surveillance and building of marine knowledge base could have been better (EC, 2009/540). The EC has reacted quite fast in providing further support by publishing a new guidelines for IMS: "*Towards the integration of maritime surveillance in the European Union*" (EC, 2009/538) which sets out the principles for the establishment of a Common Information-Sharing Environment (CISE) for the EU maritime domain, based on existing and new surveillance capacities. The IMP places a lot of importance in strengthening the EU's role in regional sea basins, all of which are very different from geographic, climatic, historical, political and human influence viewpoints. The EC has, therefore, embraced a sea-basin approach for the implementation of the IMP whose fundamental premise is that each sea region is unique and needs individual attention in balancing its uses in a sustainable manner. According to the progress report, the Commission for the Arctic and the Mediterranean Sea had put regional approaches forward, and a strategy was launched for the Baltic Sea. The progress report targeted six strategic directions for priority actions:

- Integrated maritime governance must be further enhanced. The progress registered so far needs to be turned into effective integrated structures at all levels of government further counteracting the prevalence of isolated sectorial policy thinking. The formation of cross-sectorial platforms for stakeholder dialogue on maritime affairs should be supported.

- Crosscutting policy tools are of utmost importance to enhance economic development, environmental monitoring, safety, security, and law enforcement on Europe's oceans and seas, and the Commission flags here the special importance of the MSP.
- The environmental component should develop the necessary cooperation between all relevant sectors.
- The sea-basin strategies are a key to successful implementation of the IMP, given that here the priorities and the tools of the policy can be adapted to the specific geographic, economic, and political contexts of each large maritime region.
- The international dimension of the IMP will require more attention. The EC affirms that Europe must take a leading role in improving global maritime governance, as it has done in the matter of piracy or with regard to destructive fishing practices. The priorities should focus on strengthening dialogue with the major maritime partners and its participation in international forums and informal processes.
- Finally, the Commission raises the challenges created by the present economic downturn, and re-affirms its commitment to a renewed focus on sustainable economic growth, employment and innovation.

Of the 65 actions in the original 2007 action plan, 56 have been launched or completed and financial guarantees have been put in place to secure the continuation of the other. What can be observed is that the IMP as a whole contains ambitious goals and principles, which, if implemented, would clearly improve ocean management in European waters. In the immediate and mid-term future, the IMP will need to face the full resilience of already existing sectorial institutions and legal frameworks in many levels of European governance. The challenge, of course, is to ensure that the IMP functions in the real world of institutional politics within the EU

but, more importantly, in the MS, with their long traditions of fragmented national maritime policies, laws, and institutions as highlighted by Rothwell and VanderZwaag (2006).

Will the national IMP be established on the basis of the guidance from the Commission, even though the MSs are not legally required to create them? This was and continues to be a critical question, which will certainly put the IMP to a difficult test (Koivurova, 2009). Even if there are some short- and mid-term challenges, it is clear that policies as broad and overarching as IMP try essentially to effect a paradigm shift toward more holistic ways of perceiving and understanding the oceans and thereby enabling us to come up with new political solutions to the problems the sea areas face (Juda, 2003). The IMP also forges a new vision of the EU's maritime areas. Before IMP there were no "EU oceans"—the seas, which also many times form the external borders of the Union—but only MS national seas, which could at most be understood as regional seas shared by the other littoral states. Now it is possible to view these European seas as part of the territory of the EU, and with this the IMP has certainly contributed to a vision of a more unitary EU, which will likely promote the process of its further integration (Koivurova, 2009). With the IMP, the EU's position as a major maritime actor will likely solidify, probably resulting in incremental process whereby the international maritime policy is increasingly made at the EU level. Based on the evaluation of progress made and new challenges, the European Parliament (EP, 2011/1255) supported the EC intention to continue financing the IMP with EUR 50 million over the next 2 years in order to build upon previous projects in the areas of policy, governance, sustainability and surveillance. The new financial programme targets the following objectives:

a. to foster the development and implementation of integrated maritime governance;
b. to contribute to the development of cross-sectorial tools in order to develop synergies and to support sea policies, particularly in the fields of economic development, employment, environmental protection, research, maritime safety, energy and the development of green maritime technologies, taking into account existing tools and initiatives;

c. to promote the protection of the marine environment, in particular its biodiversity, and the sustainable use of marine and coastal resources and to further define the boundaries of the sustainability of human activities that have an impact on the marine environment, in particular in the framework of Directive 2008/56/EC (Marine Strategy Framework);
d. to support the development and implementation of sea- basin strategies;
e. to improve and enhance external cooperation and coordination in relation to the objectives of the IMP, on the basis of advancing debate within international forums; in this respect, third countries shall be urged to ratify and implement the UNCLOS;
f. to support sustainable economic growth, employment, innovation and new technologies in maritime sectors and in coastal, insular and outermost regions in the Union.

Based on the new financial support, the COM has issued a new Work Programme for further development and implementation of the IMP during 2011 – 2013 covering the following actions:

- Maritime Spatial Planning in the Mediterranean Sea and Black Sea;
- Development and implementation of sea-basin strategies;
- External cooperation and coordination of international dimension;
- Development and implementation of integrated governance and visibility of the IMP;
- Impact Assessment Studies as part of the implementation of the CISE Roadmap;
- Sharing of best practices on Integrated Coastal Zone Management (ICZM), in a context of adaptation to climate change in coastal areas;
- Knowledge base for growth and innovation in ocean economy. Assembly and dissemination of marine data and seabed mapping through internet portals;
- Protection of marine environment and sustainable use of marine and coastal resources;
- Sustainable economic growth, employment, innovation and new technologies;

By the end of 2012, the IMP implementation process was re-evaluated through a second Progress Report. This time, the conclusion was not as positive as of the first report, mentioning that "*The Commission is setting the best possible conditions for sustainable economic development to come from the sea. Building on those achievements, Blue Growth is the objective for the coming years"*. (EC, 2012/491). The report address each of the IMP 2011-2013 actions and the general outcome is that related activities have continued at theoretical level, with many studies and pilot projects trying to demonstrate how IMP can provide added value to different maritime and marine sectors, but little to no progress is mentioned of effective implementation of an IMP activity which has really changed (improved) a particular domain.

This is also reflected in the "Limassol Declaration" which states "*Europe's seas and oceans offer unexplored areas for innovation, sustainable growth and employment*" and "*Call on European Institutions to support sustainable development of marine and maritime activities in the context of the Multiannual Financial Framework 2014-2020*" (EC, 2012). The statement of "*unexplored areas for innovation, sustainable growth and employment*" is in my opinion a tacit recognition that the IMP activities have not provided the expected outcome. This conclusion is also supported by the fact that the maritime policy framework has not changed over the last years, *i.e.* the implementation of EU fisheries policy continue to face problems at national level, the development of coastal and maritime tourism are mainly a national and local responsibility with little EU coordination, while decisions about commercial shipping, offshore oil and gas production are taken both at international and national level (2011). Relationships within government bodies, or horizontal fragmentation, are the main challenges for integration. Gaining agreement between government agencies with competing and sector-driven views on the marine domain is more difficult than finding agreements between governments on single issues such as marine protection. This is because in horizontal governance, the absence of a clear policy leadership can be undermined by agency competition and a focus on narrow and safe agendas

within their own domain of responsibility and lacking overall coordination towards an integrated approach. In the absence of clear leadership, the IMP voluntary approach has failed to build the required level of cooperation and coordination. In this respect, the implementation approach should be revised towards more effective governance structure. Potential solutions are explored in the next section, using the Integrated Maritime Surveillance initiative as a use-case.

b. The EU Integrated Maritime Surveillance

Traditionally, the maritime surveillance approach is sector and system oriented both at national and EU level. Monitoring of commercial traffic is assigned to the Maritime Administrations at national level and to the European Maritime Safety Agency (EMSA) at EU level; monitoring of fishing vessels is assigned to Fishery Administrations and to the European Fishery Control Agency (EFCA), whilst monitoring of other activities at sea is entrusted to Coast Guards or other national border control agencies and to the European Agency for the Management of Operational Cooperation at the External Borders of the Member States of the European Union (Frontex). Each of these agencies has developed its own ship-tracking and monitoring systems and has safely guarded the information relevant for their activities.

Despite all good initiatives and concepts for a more integrated maritime approach, including the Integrated Maritime Surveillance (IMS) and the Common Information Sharing Environment (CISE) initiatives described in the previous section, the existing legal and operational maritime framework have not changed much over the last years. Still policies are formulated at EU level and implemented at national level, often without or with little EU coordination (2011). By the end of 2014 European Union does not have a EU Integrated Maritime Surveillance system and this domain is still covered at national or partially regional level by different sector-based authorities with limited cooperation between themselves. Whilst the political vision of IMS and its supporting CISE was quite well prepared and expressed by the EU political leaders, the practical implementation process was less successful. Two particular reasons are worth

mentioning as their combined effect has caused a negative impact on the IMS roadmap: (i) the voluntary implementation approach lacking the support of an EU legal framework (as is the case for the EU maritime traffic monitoring system); and (ii) the confusing and un-coordinated governance model used for the implementation of the policy which did not create the necessary willingness, cooperation and trust needed to promote the change towards a more cooperative environment. In the initial phase, the CISE project produced more resistance rather than support and cooperation of the user communities supposed to share the information, mainly because of cultural differences, misunderstanding of the concept and the lack of clear guidance. Multiple small initiatives and pilot projects have been made over the last five years but the big decisions on sweeping reform were avoided due to the fractured nature of the EU system. At European scale, there should be greater recognition of the importance of marine space within EU activities and greater integration of sectorial policies with maritime dimensions. Close collaboration between DGs Environment, Mare, Move, Energy and Regio should be encouraged (ESPON, 2013). The first phase of CISE initiative ended in July 2014 with the Communication (EC, 2014/451) providing future implementation activities until 2018, including:

- launching a project in 2014 under the EU's Seventh Framework Programme for Research to test the CISE application on a large scale;
- developing a non-binding CISE Handbook by the end of 2016 with best-practice recommendations for promoting a "*care to share to be aware*" culture;
- defining a technical reference architecture by the end of 2017 in line with European Interoperability Reference Architecture developed by the programme on "Interoperability Solutions for European public administrations" (ISA programme);
- finally, launching a review process by 2018 to assess the implementation status and the need for further action;

The conclusion of the Communication is that at this stage there is no need for a cross-sector legislative initiative and voluntary work should continue both at EU and national level based on the guidelines, recommendations and outcome of CISE related projects.

If no relevant changes were triggered by the top-down voluntary approach of the EC, the IMS bottom-up approach initiated by the European Maritime Safety Agency (EMSA) is worth to be presented as it provides examples of effective implementation of CISE-type of services. Established in 2002 (EP, 2002/1406) as a technical body to assist the EC and MSs in improving the maritime safety, security and anti-pollution standards, EMSA is recognized as the leading EU agency in the maritime domain (COWI, 2008). Since 2004, the Agency has developed and operated some of the most advanced cooperative maritime systems, such as:

- SafeSeaNet (SSN)[22] = is the EU short range ship traffic monitoring system using over 700 shore-based receiving stations distributed along the entire EU coast-line to track the Very High Frequency (VHF) radio signal from the Automatic Identification System (AIS) of all ships navigating around EU. The legal framework supporting the set-up and operation of the system is Directive (EC, 2002/59) establishing a Community VTMIS.
- EU Long Range Identification and Tracking Data Centre (EU LRIT DC)[23] = is a ship tracking system using communication satellites to track the EU ships all over the world, as well as all ships, irrespective of their flag, within a maximum radius of 1000 nautical miles from the EU coastline. Based on IMO mandatory requirements, the EU legal framework is provided by the Council Resolution for EU LRIT DC (Council, 2008).
- CleanSeaNet (CSN)[24] = is an earth-observation system which uses satellite radar pictures to detect pollutions within the EU waters. Based on Directive (EC, 2005/35) on ship-source pollution, CSN is used by all coastal EU MSs.

[22] http://www.emsa.europa.eu/ssn-main.html - accessed 11.06.2014
[23] http://www.emsa.europa.eu/lrit-home.html - accessed 11.06.2014
[24] http://www.emsa.europa.eu/csn-menu.html - accessed 11.06.2014

When the CISE communication was issued in 2009, EMSA has initiated the necessary technical developments to upgrade and interlink its systems into an Integrated Maritime Data Environment (IMDatE)[25] platform able to meet the new requirements. EMSA IMDatE platform has become operational and ready to deliver integrated maritime services in 2013. Using a bottom-up approach, EMSA invited all interested user communities and authorities to start setting-up cooperative services using IMDatE capabilities. By the end of 2013 the first CISE-type of services[26] were established and have been running since then, the most representative being:

- the EU NAVFOR IMS = the service integrating maritime and defense information to support the EU naval forces acting against piracy in the Horn of Africa area;
- the European Fishery Control Agency (EFCA) IMS = a service integrating maritime and fishery information in support of illegal fishing activities; and
- the FRONTEX IMS = the service integrating maritime and border control information in support of illegal migration activities at sea.

Whilst the CISE initiative has provided guidelines of how IMS can be achieved, the EMSA IMDatE services provide operational examples of implementation. Unfortunately, the two projects have been more in competition rather than supporting each other, both at political (DG MARE vs. DG MOVE) and technical level (CISE TAG vs. EMSA IMDatE WG), mainly because of the power-game between the two directorates in the absence of effective coordination mechanisms at EC level. A number of pilot projects were funded by DG MARE to demonstrate how cooperative maritime picture can be achieved, the most notable being MARSUNO[27], bringing together 24 authorities from ten countries around the North Sea basin and

[25] http://www.emsa.europa.eu/operations/maritime-monitoring/items.html?cid=86&id=2361 – accessed 12.06.2014
[26] http://www.emsa.europa.eu/combined-maritime-data-menu/operational-services.html - accessed 12.06.2014
[27] http://ec.europa.eu/newsroom/mare/itemdetail.cfm?subweb=342&lang=en&item_id=8669

BLUEMASSMED[28] with 37 authorities from six countries around Mediterranean Sea. EMSA has not participated in these projects and instead has developed the IMDatE project, using its own ICT platform to process, integrate, and share data within a correlated cooperative maritime picture. All seven user communities identified by CISE (border control, fisheries, defense, maritime safety and security, marine environment, customs, law enforcement) have tested and some are using on permanent basis the EMSA integrated maritime services. Whilst CISE pilot projects are now closed and a final communication document on the future of CISE was released in July 2014, most of the MSs (about 80 authorities from 12 MSs) are now using the EMSA IMDatE platform for achieving their maritime data integration needs, even if the platform is not labeled as CISE compliant by DG MARE. Many MSs were confused by the two parallel un-coordinated initiatives (CISE vs. IMDatE) and have asked the EC to clarify and synchronize the two, as outlined in the minutes of the SafeSeaNet High Level Steering Group meetings (HLSG, 2012). Lately, under the pressure of the end-users (MSs), the top-down (CISE) and bottom-up (IMDatE) initiatives start to aligned as reflected in the last CISE Communication: "*One example is the operational use of the integrated maritime services (enhanced maritime awareness picture) provided by EMSA to FRONTEX and EFCA. These could serve as inspiration for how cooperation at national level could be further pursued.*" (EC, 2014/451)

c. IMP Governance issues

One of the main objectives of the Integrated Maritime Policy is to promote maritime information exchanges and to enhance cooperation between national authorities responsible for monitoring and surveillance at sea within a EU Integrated Maritime Surveillance (IMS) system. This may improve the overall surveillance level in terms of information gathering and processing, thus allowing for better-coordinated responses at sea or in ports, and may also reduce surveillance costs by taking advantage of unexploited economies of scale. The rationale for IMS was firstly

[28] http://www.statewatch.org/news/2014/jul/eu-2012-bluemassmed-final-report.pdf

initiated in 2008 through a number of EU Council and COM documents[29] which describes the existing sectorial activities conducting to ensure maritime security and safety, border control, fisheries management and facilitation of trade.

On 13 July 2008, EU Ministers responsible for maritime affairs acknowledged the necessity to reinforce the **maritime governance**, in particular through the coordination of European agencies, a regional approach by maritime basins, and an enhanced role for the group of high-level national focal points, for the purpose of supporting the development of a European maritime surveillance network (EU Council, 2008/14942). The document enumerates the existing surveillance systems (Vessel Detection System, Vessel Monitoring System, Automatic Identification System, radar system) and outlines the lack of interoperability between these systems. It is important to note that the need of thorough consideration of diverse legal issues related to the exchange of information collected for different purposes and from different sources was identified from the very beginning as a blocking point for data exchange. This topic will continue to appear frequently during the future activities and evaluations as a hot and still **unresolved problem**. To clarify the legal aspects of maritime data sharing, the EC has ordered a study, which draws the following conclusions:

- the basic obstacle is the explicit nature of the confidentiality provisions in some of the key national, EU and international instruments relevant to maritime monitoring and surveillance (i.e. VMS Regulation EC/1224/2009, IMO LRIT rules);
- additional restrictions may be imposed by existing contractual arrangements, in particular for satellite-based information where some service providers are using restrictions for sharing or reproducing of data in order to protect their commercial interests;

29 http://ec.europa.eu/maritimeaffairs/policy/integrated_maritime_surveillance/index_en.htm - accessed 18.06.2014

- personal data protection law contains a number of significant use and purpose limitations to be complied with by those controlling and processing the data and therefore they have to be integrated within the maritime data sharing mechanism.

The study ends with a very important conclusion for the purpose of this research, stating that "*For the sake of the legal security of all the actors involved, it is suggested that* ***any mechanism aiming at the cross-border exchange of data from various existing databases is made subject to a clear legal framework*** *defining at least the nature of the data involved, the purposes (and the methods) of the exchange and the potential recipients of the data, as well as incorporating the necessary safeguards with regard to the confidentiality and security of (certain) data and the protection of personal data, where this may be relevant.*" (MRS, 2008)

Despite the recommendation for the **clear legal framework**, the EC latest conclusion is that at this stage there is no need for a cross-sector legislative initiative and work should continue on voluntary basis (EC, 2014/451). In support of the IMS initiative, the COM issued a communication document "*Towards the integration of maritime surveillance: A common information sharing environment for the EU maritime domain*" (EC, 2009/538) with the objective of providing guiding principles for the development of a CISE and to launch a process towards its establishment. The document explains the meaning of CISE providing guidelines on implementation, and proposes the establishment of an IMS Expert Group to coordinate the implementation and a number of pilot projects to test the most optimal solution. The Council recognized and approved the proposed way forward and calls upon COM to present a roadmap, including a step by step approach, for its development and implementation, before the end of 2010. The requested roadmap was timely provided by COM through the Communication on a "*Draft Roadmap towards establishing the Common Information Sharing Environment for the surveillance of the EU maritime domain*" (EC, 2010/584).

As stated by Maria Damanaki, the DG MARE Commissioner, in her introductory speech, the Common Information Sharing Environment will "*lead towards a new era in the governance of European Seas*". The CISE communication is quite a good document in providing a clear description of the concept and the intended actions through six practical steps:

(i) identifying all user communities by the end of 2010;

(ii) mapping data sets and performing the gap analysis for data exchange by end of 2011;

(iii) common data classification levels by mid-2012;

(iv) developing the supporting framework for the CISE by the end of 2012;

(v) defining access rights by 2012; and

(vi) providing a coherent legal framework by end of 2013.

This was a very challenging program and its effective implementation was expected to be supported by the commitment of all participating actors. Although not all of the objectives were achieved as planned, some good outcome was achieved so far as summarized below:

i. User communities have been identified according to seven maritime "functions" (about 400 public authorities as potential users).

ii. Some 500 data sets have been identified, most of which being not made systematically available or shared to other users.

iii. It has been identified that most data can be exchanged at a non-classified level and only few little data sets needs to be classified.

iv. A solid understanding of the diversity of the different existing and forthcoming IT tools provides the basis for proposing possible IT choices that allow for the interlinking of these systems in a decentralized manner.

v. Undergoing investigations of the relevance of structuring data into "purpose oriented data package services" with pre-defined access rights based on the maritime missions across the seven user communities.

vi. Mapping of requirements for necessary legal provisions to allow lawful data exchange is being conducted.

For the first time, CISE has clearly mapped all EU governmental actors involved in maritime surveillance activities, identifying around 400 authorities finally grouped under seven maritime surveillance user communities, as illustrated in Figure 13.

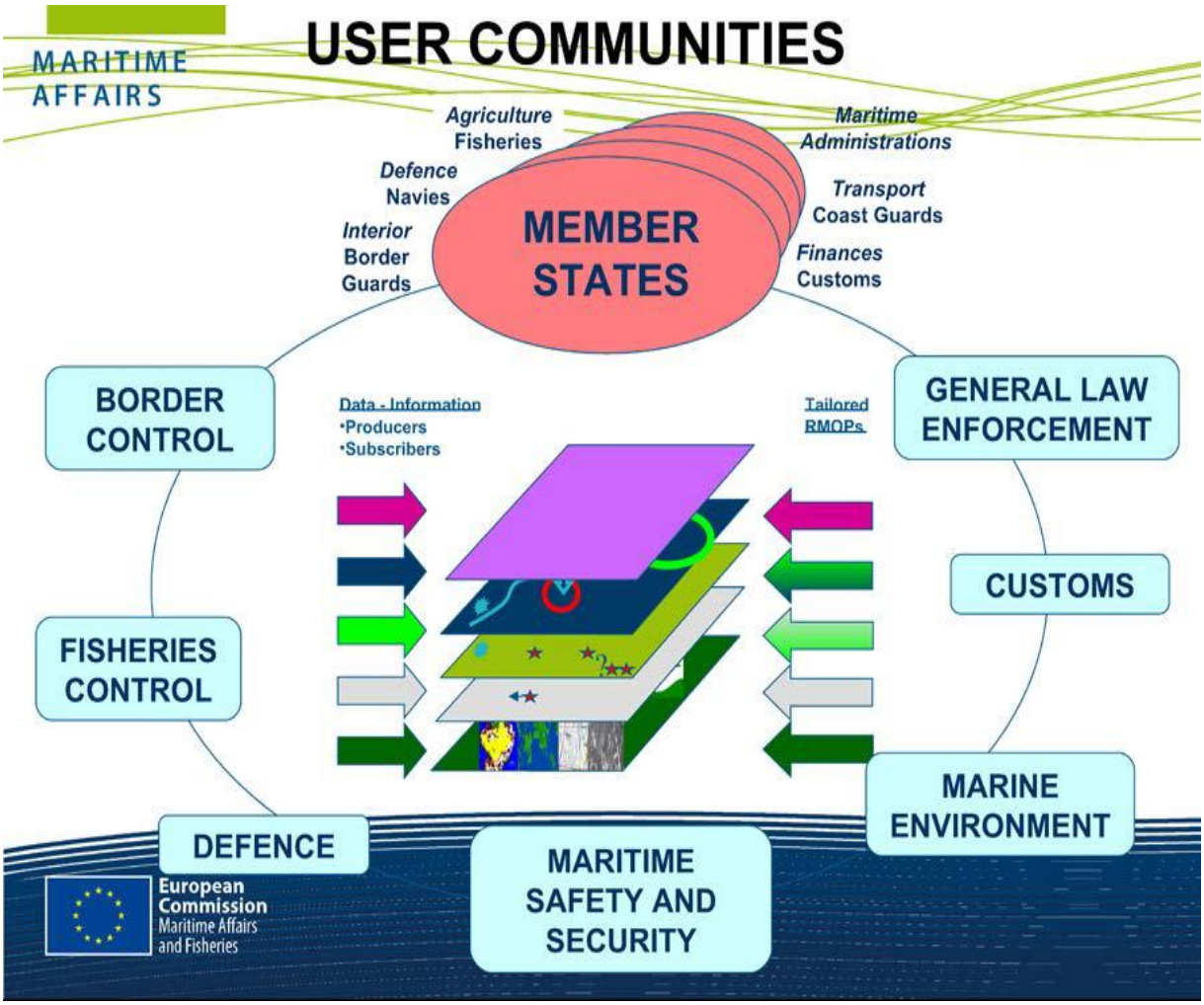

Figure 13 - EU maritime users communities

(Source: - DG Mare)

The following table summarizes the main functions of each user community:

Maritime function	Focus of function	User community
Maritime safety, security and prevention of pollution caused by ships	Maritime safety and security means the combination of preventive measures intended to protect shipping and port facilities. At the EU level, this function is already covered by the European Maritime Safety Agency.	The actors carrying out the role of maritime safety and security differ from Member State to Member State. Some of the main actors in most Member States, however, are the Ministry of Transport, the Ministry of Defence, the Navy, Maritime Administration, Ministry of Interior, the Police and Coast Guards.
Fisheries control	Focuses on supporting the operational coordination of fisheries control and inspection activities by the Member States, *i.e.* in the effort to prevent illegal fishing and ensure compliance with conservation and management measures. At the EU level, this function is covered by European Fisheries Control Agency.	Main authority responsible for fisheries control is the Ministry of Agriculture. Other authorities engaged in this activity include the Ministry of Food, the Ministry of Environment and the Ministry of Interior. In Denmark and Ireland, the Defence Ministry also plays a role while the Police carry out this task in Finland, Poland and Romania along with other responsible authorities. In five other Member States, Coast Guards oversee the coordination of fisheries control.
Marine pollution preparedness and response, marine environment	Focuses on planning, preparedness and coordinated response in connection with large-scale marine pollution incidents such as oil spills. While DG ECHO (MIC) and EMSA are mandated to upon request, to assist and top up the oil recovery capacity, some are dealt with through regional and bilateral cooperation.	The main actors are the Ministries of Environment and of Transport and they actively monitor incidents that could potentially cause large-scale pollution and coordinate emergency response when needed. In few MSs, the tasks are carried out by the Ministry of Defence, Coast Guards or the Ministry of Interior. In France, the Ministry of Justice works with other authorities to ensure the safety of the marine environment, while in Denmark the local municipalities have the obligation to act when pollution reaches their shores.

Maritime function	Focus of function	User community
Customs	Focuses on preventing the import or export of illegal goods. The customs authorities of the MS may monitor goods on board ships en route to or from EU ports as part of this. At the EU level, the customs function is covered by TAXUD.	Main actors are Customs Agencies and the Ministry of Finance. In many MSs, these authorities work in close cooperation to combat the unauthorized import of prohibited or restricted goods and in general to control the movement of goods into and out of the customs territory of the EU. In other MSs authorities include Police and Ministry of Justice.
Border control	Focuses on preventing illegal immigration and cross-border crime at EU borders. EUROSUR covers this function by providing MSs with increased situational awareness at their external borders thereby improving the national reaction capabilities.	Some of the authorities with activities in border control are the Ministry of Interior, Ministry of Defence, Immigration Ministry, Boarder Guard, Ministry of Transport, Maritime Affairs Administration and the Police.
General law enforcement	Focuses on the prevention of any criminal/illegal activity and on policy administrative activities in the EU maritime domain. International aspects are important here, and EUROPOL is a highly relevant agency. Also EUROSUR data are of relevance.	The main Member State authorities engaged in law enforcement are the Police, Ministry of Interior, Ministry of Defence, Ministry of Justice and Ministry of Transport.
Defence	The European Defence Agency (EDA) is the relevant EU agency and naval units can provide the deployable capabilities to enhance awareness regarding non-cooperative ships.	In all Member States, operational matters with regards to national defence are the preserve of the Ministry of Defence. In Finland, the ministry's activities may be complemented by the Coast Guard in times of war.

Table 1 – CISE user communities
(Source: adapted from EC - Communication to the Council and the EP on a draft Roadmap towards establishing the CISE for the surveillance of the EU maritime domain)

Two pilot projects MARSUNO and BluemassMed have been launched in 2009 and concluded by 2012 and they have delivered significant input and overview over the current situation on interoperability and exchange of information. An impact assessment study was finalized by the end of 2013 and used as an input for the White Paper (EC, 2014/451) on the EU CISE implementation, which provides a new timetable for achieving a fully operational information-sharing environment by 2020. Despite all the good initiatives, projects and funds available for implementation, Europe still does not have a EU Integrated Maritime Surveillance system and National sector-based authorities provide the maritime services with little cooperation between themselves. Whilst the political vision of CISE was quite well prepared and expressed by the EU political leaders, the practical implementation process has failed to achieve the intended objectives. This critical analysis seeks to understand the reasons of slow implementation process as the basis for proposing potential measures for improvement during the next phase until 2020.

The first specific particularity of the IMP is the **governance complexity**, both horizontal and vertical. Marine environment, maritime safety and security, spatial planning, knowledge sharing domains are brought together under a single governance political framework but without any change to the organizational and institutional framework supposed to facilitate the implementation. Initially, an Inter-Services Group (ISG) involving 28 Directorates-General of the Commission was supposed to support a Steering Group of Commissioners and monitors the day-to-day progress of the EU Integrated Maritime Policy. The ISG was scheduled to meet at 6-week intervals and to provide the core of the integrative nature of the IMP within the Commission. Unfortunately this structure has not worked in practice and implementation tasks were assigned to various Directorates under the leadership of DG MARE. For the specific IMS and CISE projects, a Technical Advisory Group (TAG) consisting of representatives from MSs and EU Agencies (EMSA, FRONTEX, EFCA, JRC) was set-up to provide the necessary forum

for cooperation. The attempt to establish a high-level coordination body was thus abandoned and the implementation of the new cross-sectorial IMP was therefore relying on the old (sector oriented) structures, mainly based on their "good will" to cooperate. Very often and in most of the countries, marine and maritime activities are regulated through independent sectorial laws, usually without taking into account – or only in a limited way - possible interferences and conflicts between distinct sectorial legislations. This is also emphasized by Tatenhove (2011) who submits that unless the organizational and structural issues are tackled at system level, the IMP implementation process will continue to navigate on "very rough seas", as the existing institutional settings have been optimized for classical, non-integrated policies whilst the IMP demands novel institutional arrangements.

Another governance issue was **the representation and the commitment** of participating parties. Marine environment, resources and space are common goods, whilst maritime zones are associated with many political and geopolitical assets (sovereignty, defense and security, international cooperation). The exploitation, management or protection of these assets must be based on transparent and generally accepted rules, which account for the opinion of citizens, either directly (individually or in stakeholders groups) or through democratic processes. It is essential for the countries and communities to be represented in these organizations, at the right level and by the right people. The implementation task was assigned to a sectorial organization (DG MARE) instead to a cross-sectorial new structure. Under time and political pressure to deliver, the implementation has soon become a DG MARE project driven and managed by the interests of the Directorate. Moreover, the presented CISE roadmap stipulate that only public sector authorities indicated by the Member States will have access to the data exchange environment, therefore excluding stakeholders from industry and civil society. This has generated questions of legitimacy of the outcome. Although the government and national administrations are key organizations for the elaboration and the implementation of maritime

policies and regulations the compliance with the legal framework has to be observed by all participating stakeholders therefore they should be part of the policy-regulation process making. Even at governmental level, many national authorities with maritime activities were not involved or not even aware of the CISE initiative as the MS participation was usually ensured by one representative from one sector only, therefore information has not reached all potential actors. Consequently, the participation in the first implementation phase of the IMP was week and very few MSs (France, Netherlands, UK and Sweden) have taken steps to establish inter-ministerial or national executive structures for coordinated management of the IMP related issues. Being kept outside of the Governmental initiative, the industry has started seeking parallel initiatives to build their own (private) data-sharing environment. The close-system approach limiting industry access to information is against the sustainability of an integrated governance model. A wider public-private exchange of information could create additional services thanks to the use of the CISE framework, data or an aggregation thereof, and the partnership could open up the CISE benefits to a variety of areas (EOS, 2012).

Consistency and completeness of the IMS through all stages (policy making, implementation, monitoring, and evaluation) has to be mentioned as well as a weak point of the implementation process. Whilst policy was quite clear, the implementation was focused on development of the theoretical concepts, lacking practical steps towards cross-sectorial coordination based on defined institutional and organizational principles. None of the outcomes of the CISE related pilot projects have been further used to develop and implement the EU IMS. The vague and undefined framework was used as pretext either to avoid any commitment to the IMP principles or to focus on own sectorial implementation path (see EMSA IMDatE project).

The **voluntary implementation** approach chosen for the IMP is inconsistent with the strong declaration of political support and the recommendation of the data-sharing legal study. The IMP was endorsed and strongly promoted at highest political levels: the Parliament and the Council, the Commission, the Ministers of MSs ("Limassol Declaration"). However, the approach for implementation is based on a voluntary rather than the usual mandatory implementation process through Directives. This has proved (once again) impractical and the poor implementation stage of the IMP suggests that the underlying voluntary framework has not yet achieved the appropriate level of maturity. The European Organisation for Security[30] (EOS) also concluded in their 2012 report on the EU IMS that only a top-down approach can develop and implement a consistent functional architecture, standards and procedures for a high degree of interoperability for the whole maritime surveillance sector (EOS, 2012) and the legal study has recommended a clear legal framework for data-sharing to overcome the existing limitations (EC, 2014/451).

The IMP implementation strategy has failed in many of its stated objectives and the reasons for failure were claimed to the unforeseen and unexpected world economic crisis. True or not, the results of the last decade have not strengthened the EU, but on the contrary. As pointed out by one author, the proposed multiplication of levels, rules and actors in the practice of governance points to the empirical and theoretical need to find new modes of legitimacy production (Scharpf, 2000). The IMP introduces a new governance (integrated) approach, which presupposes an integration of different bodies of knowledge, an integration of sectorial activities and policy domains. The building blocks integration, participation, and sustainable management are based on innovative initiatives within shipping governance and integrated coastal zone management (Integrated Maritime Surveillance, Marine Spatial Planning).

[30] www.eos-eu.com – accessed 05.07.2014

So far, the IMP was able to identify the relationship between the different maritime activities and the dynamics of the maritime policy domains, how they influence each other and what are the enabling and constraining conditions for integration. Whilst this is a good first step towards an integrated governance model, further challenges have to be tackled to ensure a successful implementation outcome. Two relevant issues have been identified so far: the challenge to adapt the internal EU structures and organizations to the new integrative multi-sector policies, and to expand the actual governance modeled around governmental actors to include industry, NGOs and civic organizations, beyond the simple consultative role as active members and contributors to the governance process and as beneficiaries of the outcome.

4.3 CONCLUSIONS ON EU IMS

The EU maritime policy failures have been increasingly pointing to the issue of revised governance arrangements and procedures as a solution (Roe, 2013). The Blue Paper featured significant discussion of the concept of governance and the EU Maritime Affairs Commissioner emphasized the need to ensure that the process of governance includes mechanisms for cooperation, coordination and integration. Although recognition of the need for improved governance is a step forward, this is not enough to achieve a better outcome within the maritime domain. The poor implementation stage of the IMS suggests that the underlying framework, which supports and directs policy generation and implementation, has not yet achieved the appropriate level of maturity. The 2000 – 2010 Lisbon Strategy has failed in many of its stated objectives and the reasons for failure were claimed to be the unforeseen and unexpected global economic crisis. True or not, the results of that decade have not strengthened the EU, rather the contrary. Learning from that experience and this time fully considering the economic crisis, the EU-2020 strategy is setting-up the framework for the on-going decade. Almost halfway through, are we happy with the progress?

Through IMP, the Commission has focused on developing crosscutting actions supporting the sustainable growth of coastal regions and maritime sectors. It has also given priority attention to implementing a more strategic and integrated approach to sea-related sectorial policy making that is expected to have a lasting positive impact and will continue to be developed further. The proposed multiplication of levels, rules and actors in the practice of governance points to the empirical and theoretical need to find new structures and modes of working. The IMP introduces a new governance (integrated) approach, which presupposes an integration of different bodies of knowledge, an integration of sectorial activities and policy domains. EU is still struggling to identify the relationship between the different maritime activities and the dynamics of the maritime policy domains, how they influence each other and what the enabling and constraining conditions for integration are. Whilst this is a good first step towards an integrated governance model, further challenges have to be tackled to ensure a successful implementation outcome.

So far, the IMP design does not fit the existing institutional arrangements and associated rules of the games. The governance objective of the IMP was to change the way EU makes policy and takes decisions. This has not been achieved yet and the IMP was not able to set-up the necessary structural setting to support the institutionalization of integrated horizontal governance. The proposed voluntary forms of cooperation do not connect to the interest, expectations and values of the participants and the public and private actors have not demonstrated their commitment for the IMP implementation. In the particular case of the Integrated Maritime Surveillance (IMS) pillar, the IMP CISE initiative has triggered a number of activities and projects towards data exchange and integration for a more enhanced maritime picture. Questions about the legal framework for data exchange have been answered in a number of studies funded under CISE framework and the positive outcome is that existing legal barriers can be overcome through a revised legal framework. Main user communities have been identified and dialog between

themselves initiated. Although a number of integrated maritime services have been set-up based on bilateral cooperation between EU Agencies (EMSA-EU NAVFOR, EMSA-EFCA, EMSA-FRONTEX), none were classified as a CISE service. Moreover, the framework for the EU IMS system is not defined and for the time being left at the voluntary will of the Member States.

With this approach, will the IMP be able to set up the necessary structural setting to support the institutionalization of IMS governance in the future? Do the proposed forms of cooperation connect to the interest, expectations and values of the participants and are the results in accordance with the desired outcomes of the actors involved? Finally, can the Integrated Maritime Surveillance be achieved at EU level? These are all questions and topics to be addressed by the IMP implementation process in the coming years.

A new Commission took over the IMS implementation responsibility by the beginning of 2015 with a time-horizon until 2018. This might be an opportunity for renewed commitment and enthusiasm or a delaying factor if the new IMP-IMS team decides to reassess the situation and adjust the proposed strategy. This is just another problem to complicate further the already overly complex EU and IMP frameworks. The future of the IMP is certainly a challenging task, both from the governance, political and operational management perspectives. The very dynamic evolution of maritime related activities (commercial transport, energy and resources exploration, fishery, cross-border illegal activities) requires similarly fast and pro-active decision-making and managerial processes to ensure the expected results. This is clearly missing within the existing EU mechanisms. Being able to change the governance paradigm and associated implementation tools might be the biggest challenge of the IMP and IMS over the coming years. At the time of writing, six months after the EC has taken the seats, no substantial changes can be noticed.

Other authors had reached similar conclusions on the implementation of the IMP:

"*The IMP has an inclusive perspective cutting across sectors and activities. Yet on a policy level it remains unclear how these different sets of policies are being integrated. This would require building bridges between spheres of authority or the development of one integrated sphere of authority. Moreover, differences in rules of the game, power relations and authority patterns complicate integration even further*." (Van Leeuwen et al, 2012)

"*While there are many efforts being made to improve understanding of maritime resources and their value, much still needs to be done to integrate efforts more effectively… At European scale, there should be greater recognition of the importance of marine space within EU activities and greater integration of sectorial policies with maritime dimensions. Close collaboration between DGs Environment, Mare, Move, Energy and Regio should be encouraged.*" (ESPON, 2013)

The EU Parliament (EP) also recognizes the need of further upgrading of the IMP in order to achieve its full potential. On 23 October 2008, the EP adopted a resolution on piracy at sea calling for the EU to respond to piracy activities off the coast of Somalia. In the resolution, the Parliament, among other things, calls for increased coordination between relevant EU agencies conducting maritime surveillance of international waters. Furthermore, the EP draft report on the maritime dimension of the Common Security and Defence Policy states that there is a need "*to address the shortcomings of the 2007 Integrated Maritime Policy, which* ***failed*** *to make use of the full potential of a truly integrated operational approach to all EU agencies, bodies and instruments which could assist in improving results and cutting/sharing costs".* (EP, 2013)

The EU Council conclusions on Maritime security strategy (EU Council, 2010) also stressed the need for the EU to take an active role in promoting global maritime security. According to the statement, this would require a combination of civilian and military capabilities involving both

the EU institutions and the member states. Within the geopolitical context, the importance of global maritime flows for the EU has exponentially increased. European industry and commerce are ever more closely integrated in and dependent upon a flourishing network of global maritime flows as a result of globalization and growing global interdependence. During the last years, the EU's maritime neighborhood has become more crowded, congested and competitive. Maritime traffic has grown constantly (from 3,4 billion tons in 2003 to 3,7 in 2013). Overcrowding and congestion heighten the risks of accidents, pollution and environmental degradation and impose new demands on European search and rescue responders.

Figure 14 illustrates the relationship between maritime traffic and accident density in EU waters against the rest of the world.

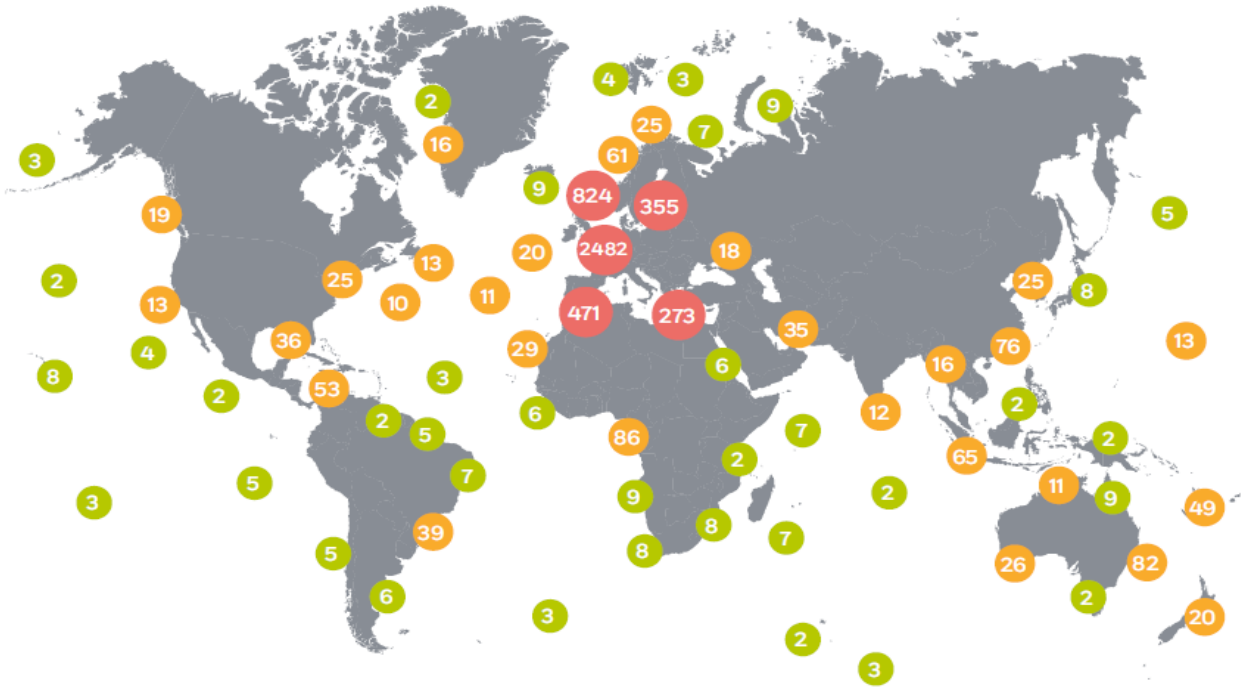

Figure 14 - Evolution of EU maritime accidents
(Source: - EMSA Annual Overview of marine casualties 2014)

Finally, European navies face a number of new security challenges in the neighborhood. Critical sea-based infrastructure, such as pipelines, submarine communication cables, oil platforms and wind parks need to be secured. Foreign fishing fleets, commercial traffic and private shipping

need to be monitored and controlled. Maritime non-state actors that have leeched onto critical global maritime flows, such as pirates, terrorists and criminal syndicates, need to be deterred and defeated. To be able to fulfill this growing tasks profile, working in cooperation with others is more important than ever. This does not only require the appropriate capabilities, but also confidence and coalition building measures and continuous dialogue. The ability to build maritime capacities, where they are lacking, through training and assistance, in particular on the North African continent, is furthermore needed. By adopting a comprehensive approach towards north-south maritime cooperation and drawing on the special ties developed by some of its member states, the EU is well placed to furnish greater regional cooperation.

In light of these developments, the EU requires a comprehensive maritime security strategy that takes account of the increasingly globalized nature of maritime threats and allows for greater synergies between the EU's IMP and the maritime dimension of Common Security and Development Policy (CSDP). On the subject of maritime governance, the EU's focus on effective multilateralism and its goal of achieving global membership for UNCLOS clearly signal the EU's preference for cooperative solutions.

The EU's vision of maritime governance also conditions its relationship with the rising maritime powers, above all China and Russia, and needs to explore ways of integrating these players further into the global maritime governance architecture and to accommodate their concerns, as long as they remain reasonable. High-level dialogues on maritime affairs that exploit the framework of the EU's Strategic Partnerships provide one way of exploring greater synergies with these actors. While the EU's neighborhood will always remain the most important focus for EU interests and actions, the global nature and interconnectedness of maritime affairs require the EU to also consider the wider global environment. This means that any effective EU strategy needs to provide a European vision of how to secure access to and govern the Global Commons.

"The EU's Integrated Maritime Policy (IMP), although valuable, includes only a very limited security dimension" (EP, 2013).

The EU has developed a number of comprehensive sea-basin strategies that address common maritime problems and governance issues in the territories adjacent to the EU. These strategies address soft security challenges, such as pollution, over-fishing, and maritime safety issues. In order to facilitate a more integrated and holistic approach, these strategies should be updated in order to include security and defense related considerations.

To fill-in this gap, the European Council adopted the EU Maritime Security Strategy (EU Council, 2014) for the global maritime domain. The objective of this strategy is to provide a common framework for relevant authorities at national and European levels to ensure coherent development of their specific policies and a European response to maritime threats and risks. Such a framework will provide the context and ensure consistency amongst different sector specific maritime policies and strategies, in particular with the IMP and the ISS (Internal Security Strategy). However, it seems that the EU Maritime Security Strategy might follow a similar poor implementation path as the IMP because the governance model supporting the implementation and correlation with other policies has not yet been defined.

CHAPTER 5: EU GOVERNANCE – CAN WE CHANGE?

The interim evaluation of the EU Integrated Maritime Surveillance implementation presented in Chapter 4 has concluded that the actual governance approach has failed to deliver the expected results mainly because of the Eurocracy and political power games between Directorates, the weak legal framework based on voluntary approach and the reactive static and sector-based governance model unable to adapt and respond in due time to the fast changing pace of the economic and social developments of the maritime domain.

Can we improve? Is there a better way forward? Can we achieve a better implementation rate of the EU policies based on a different governance model? Can we use the principles of Sustainable Development, Good Governance and dynamic adaptive response beyond the theoretical exercise and develop a pro-active governance model focusing on practical and beneficial results for the benefit of EU citizens?

These types of questions are explored within this chapter by using sustainable development principles and tools in the socio-technical domain of maritime surveillance. Trying to develop new perspectives, the research goes beyond the technical dimension of the maritime surveillance and analyzes it as a "living" system integrated within the wide concept of globalized maritime transportation perceived as critical pillar for sustainable use of the oceans and for international trade.

5.1 EU IMS GOVERNANCE MODEL

It is worth clarifying from the beginning that this chapter does not address the Governance model of the EU system as outlined in the EU Treaty, but it rather focuses on the particular governance model associated with the implementation of the EU Integrated Maritime Surveillance (IMS) initiative. The notion of policy implementation assumes that the policy cycle may be divided into several clearly distinguishable phases, ranging from problem definition and agenda-setting to policy formulation, policy implementation, evaluation and finally to policy termination or re-formulation. Policy implementation thus refers to the process of "*translating policy into action*" (Barret, 2004) which is crucial for providing effective solutions to the problems addressed by the policy and for assessing the way in which the policy is executed in practice. Moreover, EU legislation regularly leaves certain issues at the discretion of the member states in order to take account of specific national circumstances therefore the crucial decisions that may determine the success or failure of a particular policy are regularly taken at the implementation stage. This may become even more critical when policy implementation is based on the voluntary willingness of the member states to apply guidelines or recommendations issued by the Commission, as in the case of the EU IMS. The lack of clarity and the ambiguity surrounding the interplay between different actors and policies interlinked under the IMS cross-sectorial umbrella has caused uncertainty, differences in the understanding and interpretation of the Member States, controversies or erroneous implementation. Also it has been observed that the introduction of an integrated maritime policy requires a culture change among actors which usually takes long time for stakeholders to familiarize themselves with integrated policy thinking and thus requires patience and continuous dialogue.

The first phase of the IMS development – the problem definition and policy formulation – was well managed, in line with "good governance" practice and completed on time. After setting up a new directorate for maritime affairs in 2005, the EC has set-up a Steering Group of Commissioners supported by an Inter-services Coordination Group and a Maritime Policy Task Force (MPTF) tasked to perform an extensive analysis on a new vision for maritime policy in Europe. The MPTF took into account a large number of studies and reports on maritime policies from all over the world, organized visits to third countries, including Canada, Australia, the US and Japan, and engaged with a large number of stakeholders. The Commission also set up a group of Member State Experts with a view to gaining a better insight into maritime affairs at Member State level and to learn from their experience. Based on the inputs of the Commissioners Steering Group, the Inter-services Coordination Group, the desk analyses, study visits and exchanges with Member States, the MPTF distilled the key issues at stake and these formed the basis for the Commission's Green Paper "*Towards a future Maritime Policy for the Union: A European vision for the oceans and seas*" (EC, 2006/275). Some analysts argue that the Green Paper document has not taken into account all comments and suggestions received during the consultation process and the new policy is centered on state interests, failing to include the needs of those public interests which could not be easily integrated into the existing governance structures (Roe, 2009). However, it was generally accepted that the new holistic maritime policy is coherent, has included many of the maritime interests and has tackled for the first time the issues of governance arrangement suggesting a coordinated and cooperative model as a potential solution for future improvement.

Unfortunately, the IMS implementation process did not follow a similar successful path as the policy-making phase. The main problems which were identified to slow down the implementation of an integrated approach, apart from the alleged financial constraints, are

generally the lack of collaboration and coordination between the involved actors in the absence of a clear implementation strategy and supporting administrative structure at EU level. The lack of coherent policy implementation strategy for the transport governance framework at all levels, based on the obvious difficulties and shortcomings experienced by the EU transport policy implementation in the last two decades seems to be the major weakness at this stage. Lacking such vision, the IMS initiatives give the impression of a "wish-list" as it fails in offering concrete actions to achieve its goals and above all prioritization of actions and their time sequence. In addition, the long time it takes for administrations and stakeholders to internalize fully integrated thinking and change the working culture towards a cooperative and data-sharing environment is also an important delaying factor.

Table 2 provides a benchmark between the recommended governance framework and the models used during the policy-making and implementation phases, with blue indicating compliance and red non-compliance.

Governance framework	IMS policy-making	IMS policy-implementation
•**Political Leadership** - with suficient power to structure the dialogue between different groups •**Organisation Structure** - to support the political commitment •**Stakeholders participation** •**Allocation of responsibilities and resources**	•Steering Group of Commissioners •Inter-services Coordination Group •Maritime Policy Task Force •Experts from MSs and other stakeholders engaged in policy-making dialogue •Experts = input Commissioners = policy	•DG MARE (sector-driven) •Technical Advisory Group (restricted access) •Governmental stakeholders only •No distributed allocation (DG MARE sole actor)

Table 2 - "Good Governance" framework vs IMS implementation
(Source: - self-authored during research)

5.2 MARITIME DOMAIN AWARENESS – A SUSTAINABLE PERSPECTIVE

The ocean is one of the "*global commons*", a public good, which should be used by all countries without reducing its availability to others. "*Tragedy of the commons'* (1968) refers to the activity of people who are sharing public goods or common resources without one being responsible for the management of the resource. Under the United Nations Sustainable Development initiatives, effort has been made to find global governance and management structures for the use of global commons based on the principle of '*the common heritage of human kind'*. Common heritage resources have been defined as "*those resources that are owned by all nations, not one; that are managed multilaterally, not unilaterally, with the benefits of that management shared by all; and are used for peaceful purposes only*" (Speth and Haas, 2006).

The UN Convention on the Law of the Sea and the International Maritime Organization (IMO) provides the governance framework for the use of oceans for maritime transportation activities. The particular domain of maritime surveillance, the subject of this research, falls under the global jurisdiction of IMO which has driven over time the development of the main maritime traffic information systems, such as:

- Vessel Traffic Services (VTS) – providing rules and standards for establishment of ship traffic monitoring systems on the access channels of a port and in areas having high traffic density, navigational difficulties, narrow channels, or environmental sensitivity.
- The Global Maritime Distress and Safety System (GMDSS) – providing guaranteed assistance to any ship in distress anywhere in the world by using automatically transmitted distress message.
- The Global Integrated Shipping Information System (GISIS) – on-line information on various topics: Maritime Security, Recognized Organizations, Marine Casualties and Incidents, Port Reception Facilities, Contact Points, Pollution Prevention Equipment, Piracy and Armed Robbery, Arrival, Stay and Departure formalities.

- Automatic Identification System (AIS) – automatic ship position data exchange for collision prevention at sea and ship traffic monitoring along the coastline.
- Long Range Identification and Tracking (LRIT) system – satellite based system allowing Flag State authorities to track their ships all over the world and to exchange LRIT information with other authorities.

"*The mission of the International Maritime Organization (IMO) as a United Nations specialized agency is to promote safe, secure, environmentally sound, efficient and sustainable shipping through cooperation*" (IMO, 2011). This updated mission statement reflects the UN vision for sustainability and IMO commitment "*to further promote and develop measures to facilitate shipping, such as …. the creation of enhanced systems to facilitate seaborne trade, thereby ensuring that the appropriate balance is achieved between safety, security and environmental protection and efficiency of shipping so that the flow of seaborne trade continues to be smooth and efficient*".

Starting from this paradigm, this research applies Sustainable Development principles and tools to the specific domain of Maritime Domain Awareness (MDA). This is an innovative approach which according to my knowledge has never been used before. So far, the marine and maritime sustainable development studies are mainly focusing on the environmental and marine-resources aspects. The maritime surveillance and the associated safety and security aspects are generally regarded as ICT technical tools (systems) supporting the framework needed for sustainable growth. However, safety and security are intrinsic and mandatory features of a sustainable maritime transportation, which in turn is one of the main pillars of development and globalization. The approach of this research is that the MDA shall be governed by similar principles as those associated to the "global commons", meaning that the MDA shall be considered as a common service available to all actors involved in maritime transportation and

managed at regional and international levels through common efforts and cooperation based on sustainable development principles.

To develop a new vision of MDA not merely as a technical system but as a supporting tool of sustainable maritime transportation there is a need for an innovative approach. This is achieved by using the "*Framework for Strategic Sustainable Development"* (FSSD) methodology as the research backbone. I choose the FSSD because it is designed as a supporting conceptual model that can be used for planning sustainability in any complex system where there is an intended success outcome. A systemic approach offers a model to see relationships and underlying circumstances for system behavior, rather than focusing on individual events and actions (Montuori, 2000). The FSSD takes a whole-system perspective avoiding focus on a sub-set of issues, areas or topics and has a broader approach, which facilitates intellectual analysis of the interrelated elements and how they influenced one another within the relationship between the System, Success, Strategic Guideline and appropriate Actions and Tools to the endeavor. In addition, the FSSD promotes a strategic approach as it contextualizes the role of back casting from success principles as powerful way to maintain strategic direction towards success and to change processes that are complex and confusing. The key elements of the process are: a) the clear definition of system conditions for the successful outcome to be achieved, and b) the development of strategic guidelines to guide efforts towards success through selection of various actions and tools. The FSSD uses a generic five levels framework (5LF) that helps to identify, understand and evaluate what is really happening within a system – what is the intent, what it covers, the specific definition of success and whether or not the actions are executed in a strategic manner. This can be helpful for understanding the system's strengths and weaknesses, particularly in contributing to comprehensive efforts towards sustainability. Figure 15 illustrates how the FSSD 5LF is applied within the research.

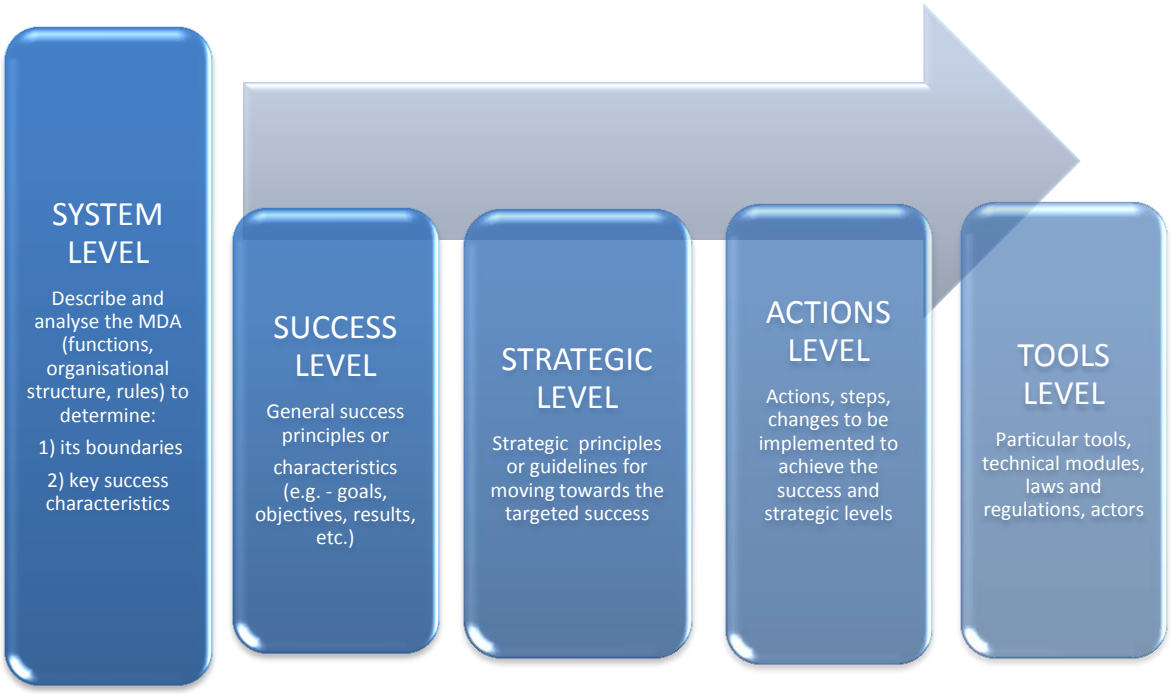

Figure 15 - MDA FSSD perspective

(Source: self-authored during research)

This approach combines a rigorous, science-based understanding of sustainability with a tested planning approach to create real and transformative change. Through the application of the FSSD and specifically, the 5LF process, the research identifies a number of actions that could lead towards a vision of sustainability for the EU MDA system in particular and which can eventually be used as a starting model for a global worldwide vision.

5.3 EU INTEGRATED MARITIME SURVEILLANCE

Defining Integrated Maritime Surveillance (IMS) from sustainability perspective is not a trivial exercise. Maritime Surveillance is generally regarded as a technical system set-up to identify and track ships at sea for safety and security purposes and therefore less related with sustainability principles. However, safety and security are imperative conditions for humanity development and progress (UN, 1994), including maritime transportation domain. The most important public

good is peace and security, including personal security. From this perspective, IMS can be identified as a core factor for sustainable maritime transportation as it provides the relevant information for safety and security purposes. Using the definitions of sustainable development (page 25) and the IMO concept of SMTS (page 3) as framework, I am defining the Sustainable Integrated Maritime Surveillance (SIMS) as the arrangement that:

a. Satisfy the needs for information of all involved stakeholders and promotes safety and security awareness for all sea regions of the world;
b. Offers good value for money, functions in a fair and efficient way, making available different types of information in support of a comprehensive maritime picture; and
c. Supports environmental monitoring, ship emissions and waste discharging control;

Ideally an integrated maritime policy should be supported by an integrated monitoring and surveillance system, designed in association with all direct actors and stakeholders, developed and operated on common specifications (conceptual models, interoperability, data format) with coordinated use of the multi-agencies resources, producing information made available to all authorized users (including all stakeholders for non-sensitive information) and contributing to the production of the policies indicators. Effective public policies must be supported by efficient mechanisms to enforce regulations: control of legal activities at sea and combating illegal activities (illegal fishing, smuggling, piracy, criminal pollution). For maritime policies, this is an important issue: interventions at sea are usually both technically difficult and expensive, and often risky. Beyond surveillance and intelligence systems, police operations at sea involve the use of boats and ships, airplanes or helicopters, which are very costly and must be operated by specialized people. The implementation of a SIMS is based on efficient coordination of the interventions at sea, and requires consistent systems (no redundancy, no gaps, interoperability, etc.) and coordinated implementation. The maritime operations in support of maritime policies

are frequently conducted solely with sectorial approaches: even when the resources used during an operation could be used for other purposes; there are often no coordination mechanisms to make multi-missions and multi-department operations possible. Rather than programming separately the maritime operations related to each maritime policy, using specialized human and technical resources, it is possible to develop a certain level of flexibility, allowing coordinated operations using resources from different administrations or agencies. This can be done either through a "Coast Guard" type of agency or by operational coordination of systems and resources operated by several administrations or agencies. At EU level, both ways are explored. The CISE initiative promotes the operational coordination of the existing EU and national systems. A parallel initiative was started in 2009 on the feasibility of an EU Coast Guard organization as a potential structure to improve the maritime cooperation at EU level. Heads of EU Coast Guards are meeting in an annual conference to promote better cooperation and a study on how this can be improved within the concept of EU Coast Guard was contracted by the COM and delivered in 2014. The study indicated the existence of 70 collaboration structures between the 316 public authorities acting in maritime domain in all EU MSs and outlines the "*sub-optimal level of collaboration and overall low efficiency and/or effectiveness of service delivery*" (ICF, 2014).

Factors explaining this sub-optimal situation include administrative and legal obstacles to collaboration, political or organizational priorities and institutional complexity. The study indicates viable opportunities for improving the cooperation on capacity building, asset sharing during joint operations, data sharing between various existing systems, common research and innovation projects. Considering EU principle of subsidiarity and the sustainability principle of reusing existing resources and reducing duplication, the most common sense approach for building the EU IMS system seems to be based on cooperation between existing systems within a clear EU governance framework based on trust and fairness. The EU IMS objectives are to

improve the efficient use of maritime surveillance resources at EU level and to provide enhanced maritime domain awareness information in support of sustainable safety and security environment for the maritime transportation system.

5.3.1 FSSD 1st Level – System analysis

This section describes and analyses the structure, organization and particularities of the EU Integrated Maritime Surveillance system aiming to determine its basic functions, boundaries, features, flows and mechanisms. The analysis covers the existing EU maritime information systems as a conglomerate of different actors, structures and practices across EU. System-thinking has emerged over the last decade in a number of disciplines such as ecology, economics, organizational sciences and sociology as a useful analytical framework for understanding how various components interact and influence each other within the larger context of a system. Figure 16 illustrates the high level approach.

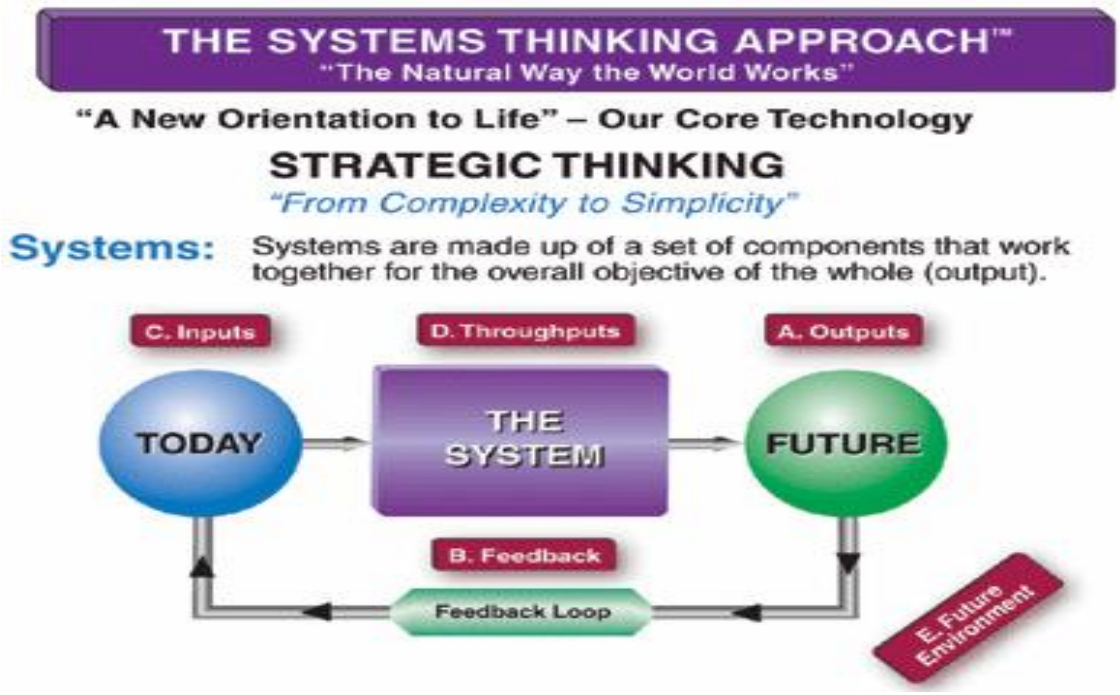

Figure 16 - System thinking approach

(Source: - A.K.R.N.A.[31])

[31] http://www.akrna.com/why-our-mission-advocates-systems-thinking/ - accessed 20.06.2014

However, systemic thinking from sustainability perspective has not been yet applied to the maritime surveillance domain and this is the first initiative of this type. The challenge is to use a tool based on sustainable principles and theories outside of the socio-environmental domain in the complex field of maritime surveillance perceived as a socio-technical system. The rationale of using the FSSD in this case is based on the relatively simple analytical principles used to describe and explain steps in time, space and functionality. On the negative side, the assumption that the FSSD model, usually used for ecosystems analysis will work as well for the complex techno-social system of maritime surveillance can be considered a risk and is certainly open to criticism and improvement.

The system level perspective starts from the concept of EU IMS as defined within the context of the IMP and CISE project (detailed in the previous chapters) and as illustrated in Figure 17 below.

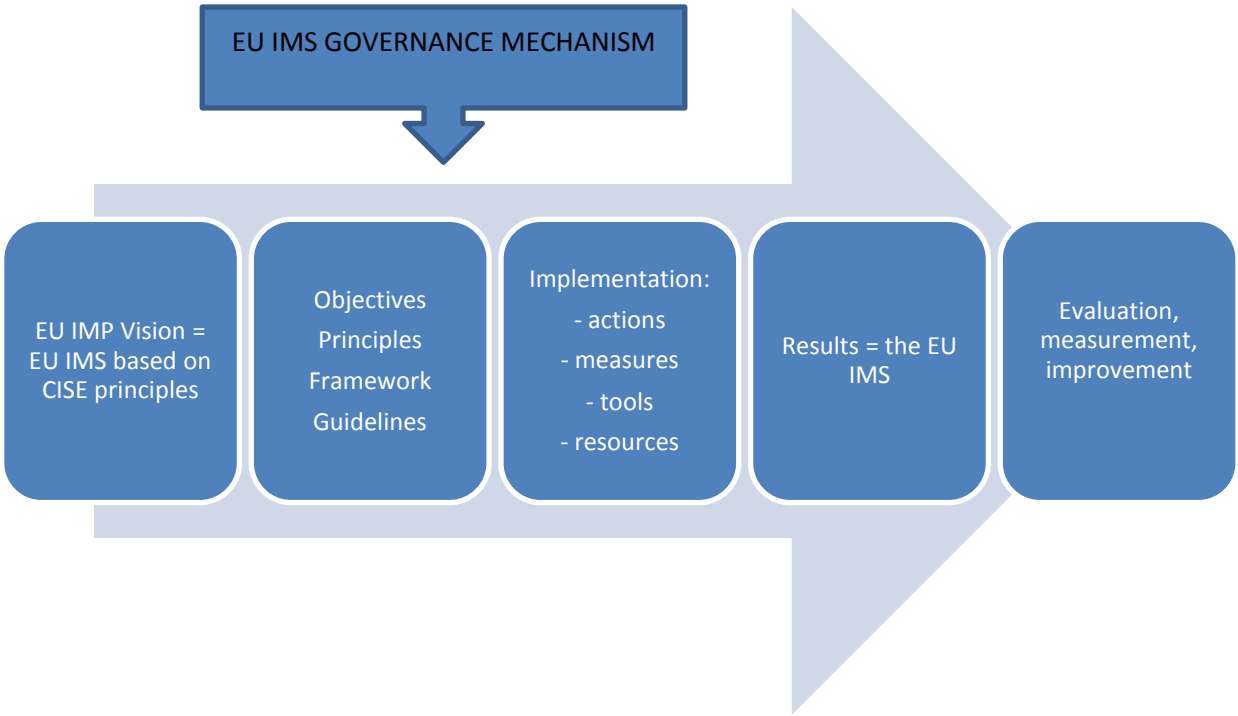

Figure 17 - EU IMS system approach

(Source: self-authored during research)

The FSSD supporters have identified that the essential characteristics of a socio-environmental system are the self-organization, diversity and interdependence (Cook, 2004) and these determine system's capability to adapt to changes and to meet its needs within complex and dynamic environments (Robert et al, 2005). In addition, living systems are stable due to their capacity for learning and collaborative nature (Holland, 2002). The research applies these concepts to the regional (EU) and global socio-technical system of integrated maritime surveillance to examine the organization, diversity and the relationship between existing structures and to explore new potential approach beyond the traditional sector-based hierarchical governance structures. Analyzing the IMS from the perspective of a living system can contribute to better understanding of the adaptations needed when facing the on-going changes and challenges. The analysis starts with an overview of the existing sectorial maritime information systems at EU level, as follows:

SafeSeaNet (SSN) – regulated by Directive 2002/59/EC, SSN is the EU vessel traffic monitoring and information system hosted and managed by the EC, in cooperation with Member States, through the European Maritime Safety Agency (EMSA). The system is based on the reception of the position and identification message transmitted by the shipboard Automatic Identification System (AIS) through a network of over 700 AIS shore-stations spread along the EU coastline. AIS is a ship-borne transponder system designed in the first instance for maritime safety and in particular collision avoidance. It consists of a transponder unit including GPS, VHF transmitter / receiver and display / terminal. The unit broadcasts a message at regular intervals containing its identification, position, speed, course plus a number of detailed items about the ship and its cargo such as ship length, draft, cargo type, ports of providence and destination. The ship identification is hardwired into the device and some static data about the ship are also fixed; geographic position is taken automatically from the GPS receiver; but all other data has to be manually entered (and are thereby not so reliable). The broadcast covers VHF range, which is

basically line of sight and can be capture wither by mobile (ships) or fix (shore-station) receivers. Under IMO's SOLAS convention the carriage of AIS is mandatory for (a) ships of 300 gross tonnage and over on international voyages, (b) passenger ships (any size / voyage), (c) tankers (any size) on international voyages, and (d) cargo ships of 500 gross tonnage and over (any voyage). Technical developments over the last five years have enabled the reception of the AIS position message by satellite (S-AIS), therefore the VHF range limitation is no longer applicable and the use of S-AIS supports worldwide tracking of ships. The S-AIS information is also included in the SSN service provided by EMSA. In addition to the AIS positions, the SSN system also includes information coming from various mandatory reporting requirements within EU coastal waters, such as port notifications (vessels entering or leaving EU ports), Hazardous Material (HAZMAT) reports, West European Tanker Reporting System (WETREP) and Pollution Report (POLREP). Using the information contained in these reports, the SSN has also developed an extensive ship database, including the risk profile of the ship.

Picture 18 provides the coverage area of the SSN shore-based AIS network.

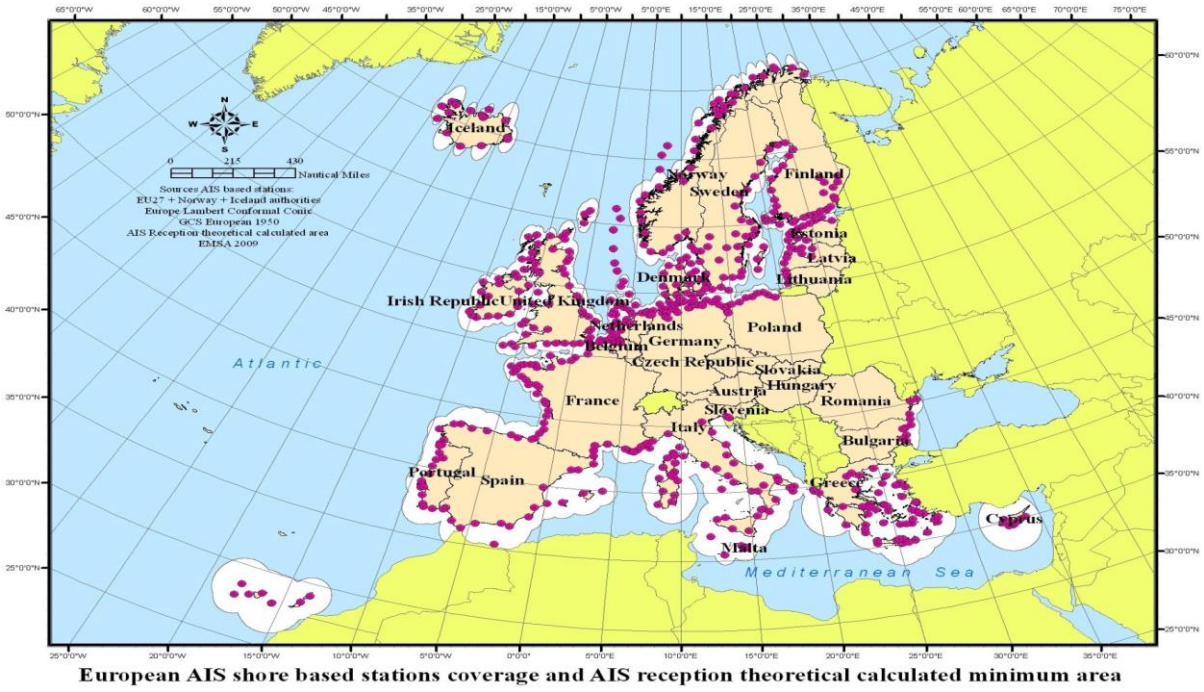

Figure 18 - SSN shore-based AIS coverage (Source: - EMSA)

Long Range Identification and Tracking (LRIT) - is a messaging system for security and SAR purposes that is also regulated by IMO through SOLAS Chapter V (V/19-1). It is mandatory for the following vessels on international voyages: (a) passenger ships, (b) cargo ships of 300 gross tonnages and over, and (c) mobile offshore drilling units. The message includes the ship's identity, location and date and time of the position. The main components of the LRIT system are: (a) ship borne transmitting equipment, (b) satellite communication links, (c) LRIT Data Centres, and (d) the International LRIT Data Exchange (IDE). According to the Council resolution of 2 October 2007, Member States agreed on the setting-up of the European Union Long Range Identification and Tracking Data Centre (EU LRIT DC), to be managed by the EC, in cooperation with Member States, through the European Maritime Safety Agency (EMSA). The EU LRIT DC tracks all ships under EU flags (around 9000), all over the world and all ships, irrelevant of their flag, within a maximum range of 1,000 Nm from the EU coastlines. Figure 19 provides a snapshot of the EU LRIT DC worldwide ship tracking capabilities:

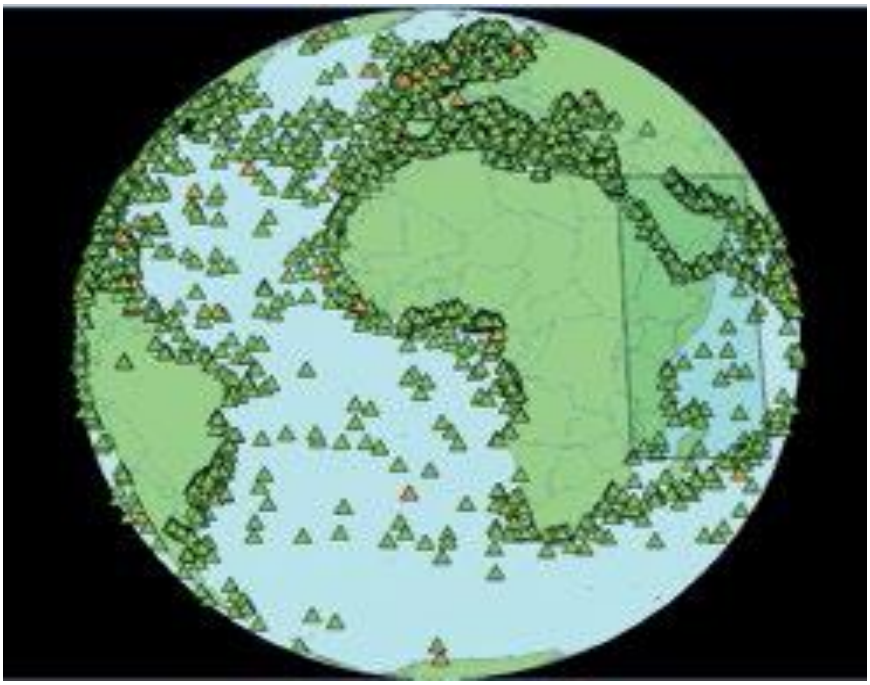

Figure 19 - EU LRIT DC world-wide tracking picture

(Source: - EMSA)

CleanSeaNet (CSN) – is a ship and pollution detection system using Satellite Radar Aperture (SAR) images for identifying and tracing oil pollution on the sea and associated polluters. When a potential oil spill is detected in national waters, an alert message is transmitted to the relevant country. Analyzed images are available to national contact points within 30 minutes of the satellite passing overhead, allowing swift reaction for law enforcement in case of pollution. When a vessel is also detected in a satellite image, the identity of the vessel can often be determined through correlating the satellite data with vessel traffic reports from SSN. This increases the likelihood that a MS will be able to determine which vessel is polluting and take action (*e.g.* verifying the spill, inspecting the vessel on entry into port). In addition to the immediate operational support, the system is also acting as a strong deterrence tool due to its permanent watchdog functionality. This is reflected in the continuous decrease of the number of pollutions detected within EU waters. All MSs use the system with Coastal State responsibility. Figure 20 provides a snapshot of oil spill detections.

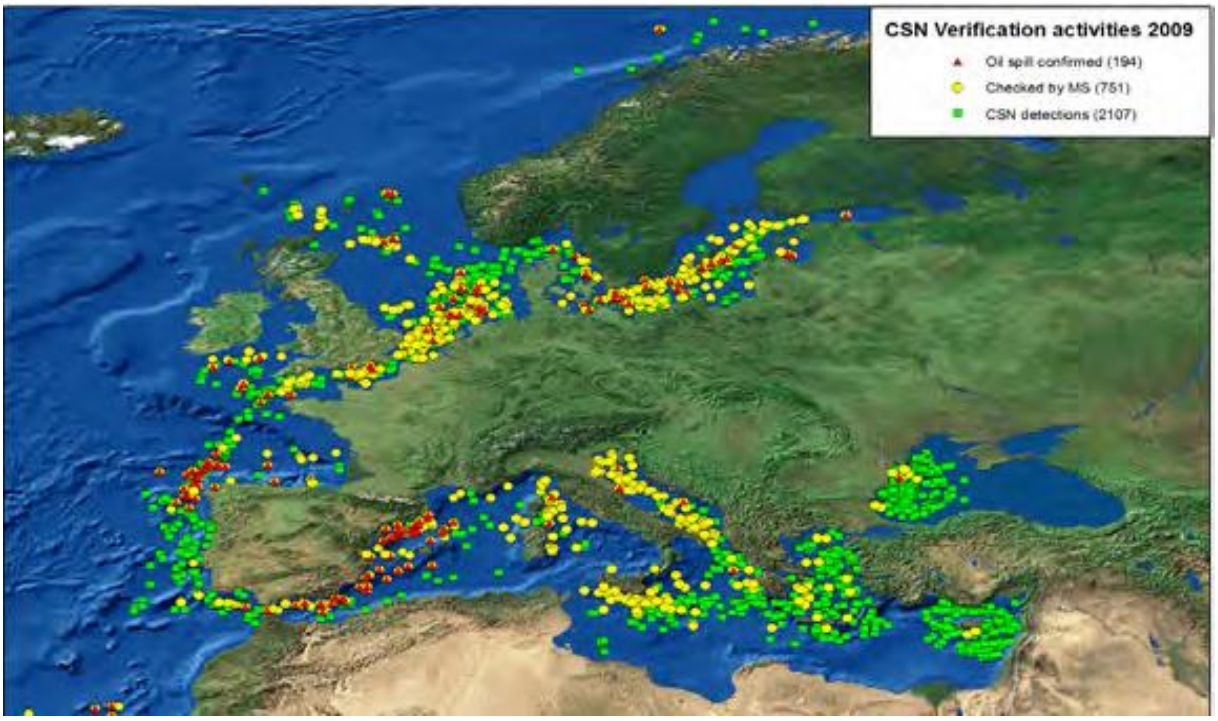

Figure 20 - CSN oil spills coverage
(Source: - EMSA)

Integrated Maritime Data Environment (IMDatE) – is the EMSA ICT platform providing data exchange, correlation and integration between the individual systems. The platform uses interoperability tools and standardized interfaces to achieve flexible service oriented architecture which is able to connect to different individual systems, manage different types of data and data-formats, provide time and/or area related data correlation and a wide range of maritime picture customization in accordance with end-user needs. The IMDatE is the most advanced maritime information platform available to EU MSs and a standing proof that integration of systems, data and different user communities is possible in a controlled and coordinated manner. However, it is still considered as a sectorial integrated tool developed by EMSA and has not evolved to the status of EU Integrated Maritime Surveillance system. Figure 21 provides an overview of how IMDatE works in practice.

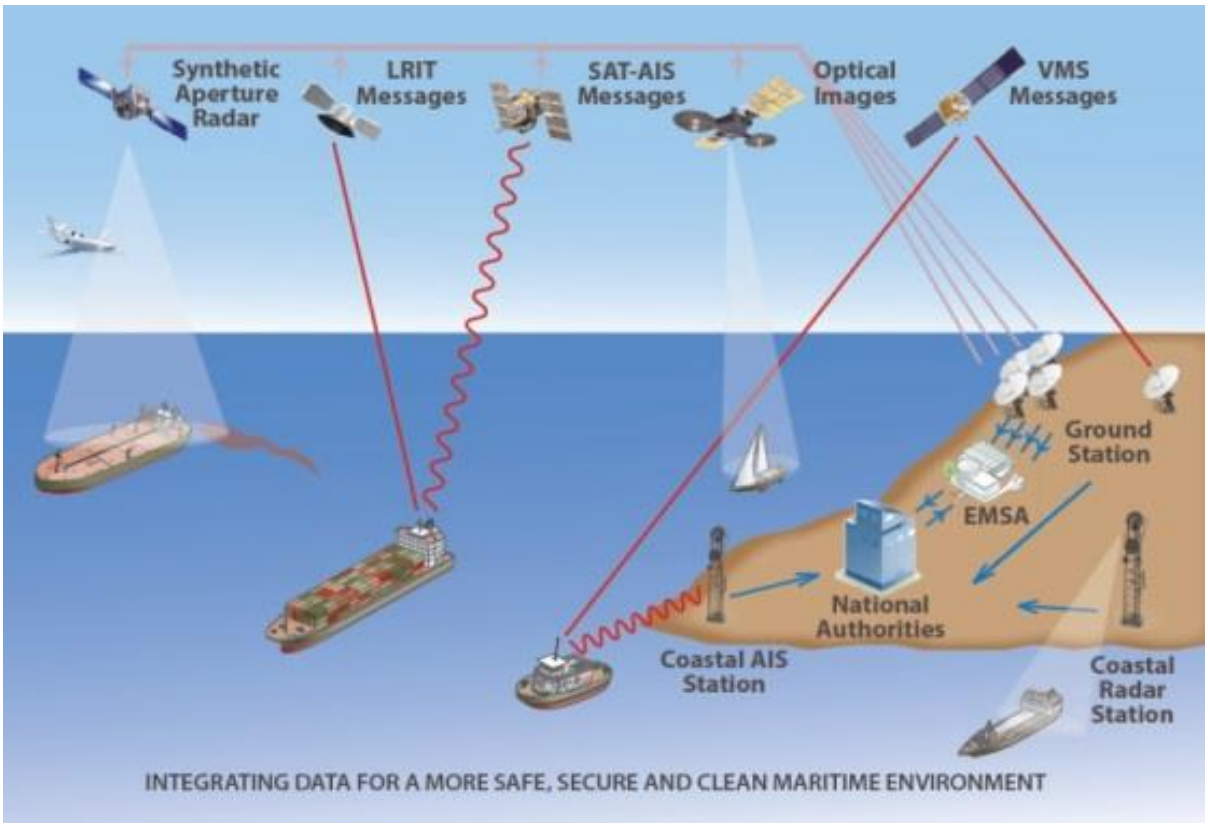

Figure 21 - IMDatE User graphical interface
(Source: - EMSA)

Vessel Monitoring System (VMS) – is a satellite based system for monitoring fishing vessels longer than 15 m. Very similar to the LRIT system, the fishing ship carries a transponder linked to a GPS receiver. The legislation mandates that the transponder send a short message every hour, containing vessel identification, time, geographic position, course and speed. The message is sent via satellite communication to the vessel's Flag State authorities known as Fisheries Management Centre (FMC). At EU level, all FMCs are inter-connected and exchange data under the coordination of the European Fishery Control Agency (EFCA). Traditionally, the information on fishing vessels was strongly safeguarded on the alleged ground of potential commercial disclosure and fishing competition between MSs. However, under the pressure of the IMP and CISE initiatives, the information is nowadays shared not only between FMCs but also with other maritime communities (*i.e.* for Search and Rescue purposes). Figure 22 provides a snapshot of the user graphical interface for VMS.

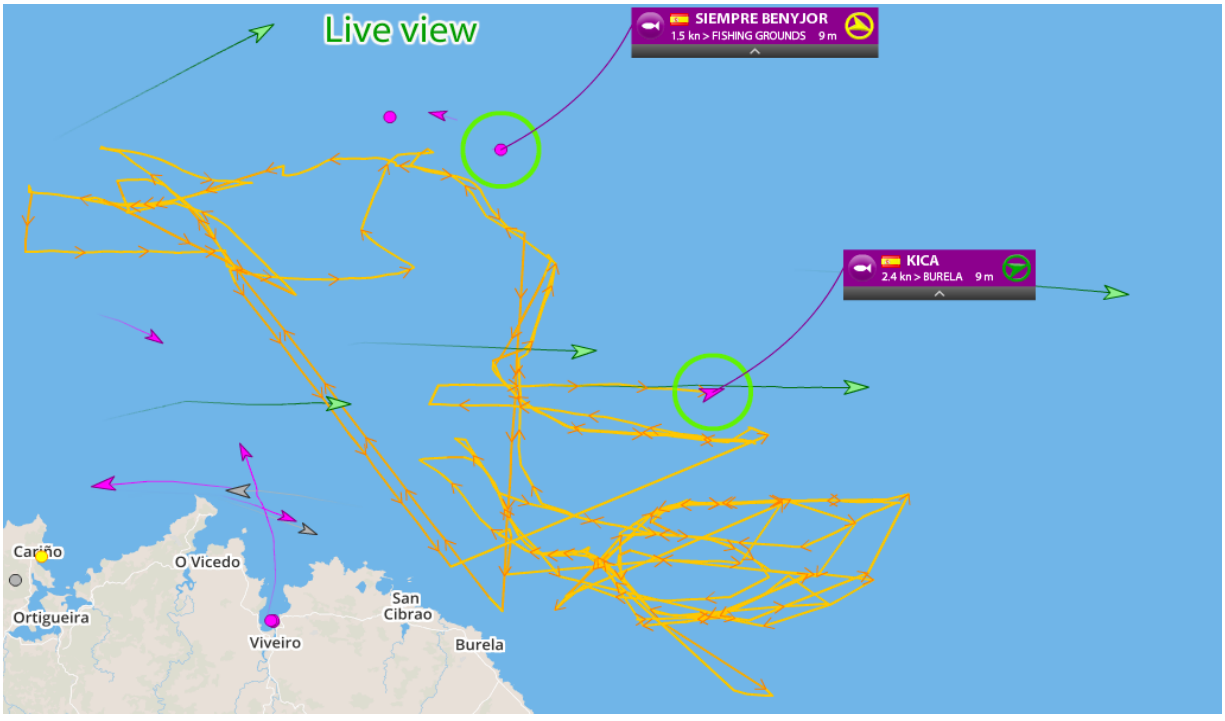

Figure 22 - VMS User graphical interface

(Source: -Fleetmon[32])

[32] http://blog.fleetmon.com/page/2/ - accessed 20.06.2014

EUROSUR - is an information-exchange system designed to improve management of the EU external borders. Each Member State has first to establish a National Coordination Centre (NCC) to coordinate national border-control activities and to collate and exchange information between its various border-control and law-enforcement bodies to create a coherent national picture. This network of NCCs forms the 'backbone' of Eurosur and includes specific information on non-cooperative targets coming from a range of ship detection sensors, such as mobile radar from the on-site assets, infrared and thermic cameras, reconnaissance aircraft information, satellite remote sensing and optical sensors. In addition EMSA is providing the layer of cooperative ships. Therefore the EUROSUR maritime system is the closest version of an integrated EU maritime picture, still missing the connection with the military layer. Figure 23 provides a snapshot of the EUROSUR user graphical interface.

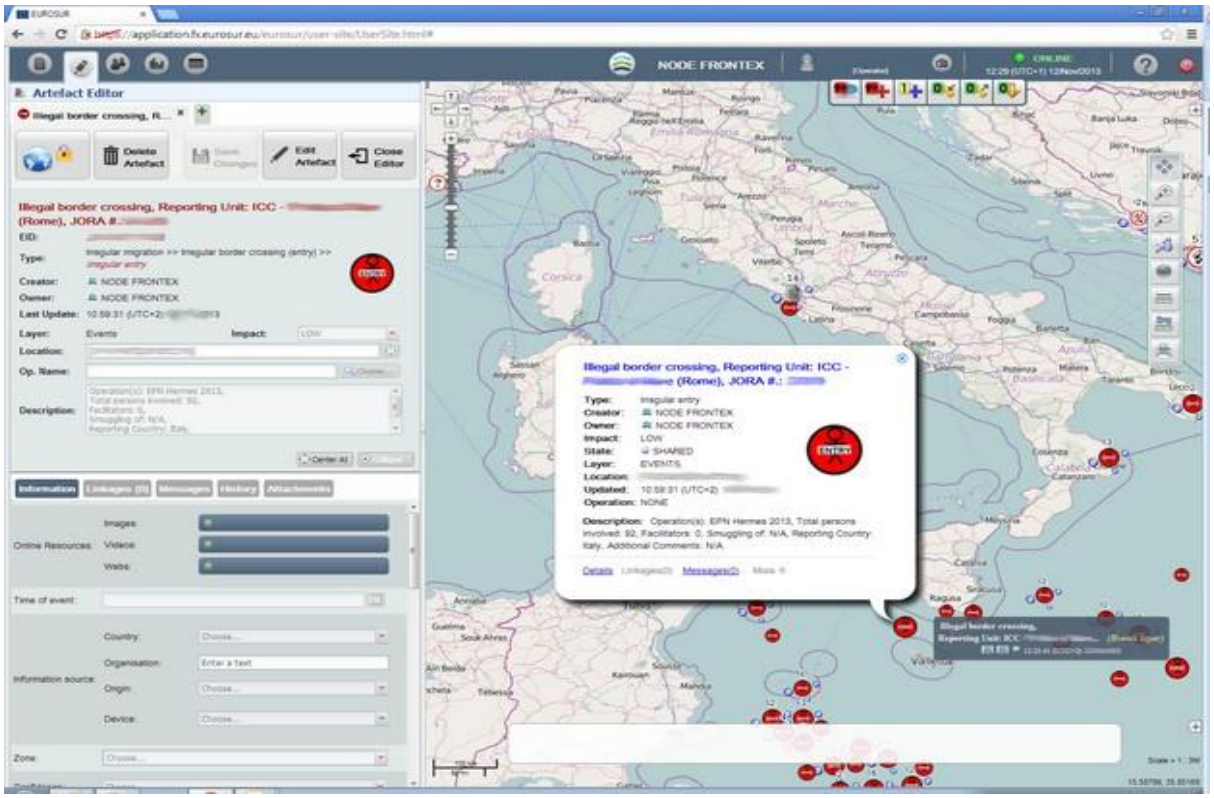

Figure 23 - EUROSUR user's graphical interface

(Source: - FRONTEX)

Maritime Surveillance (MARSUR) - is a technical solution that allows dialog between the maritime information systems of EU Navies. Designed to become the potential "military layer" of the wider Common Information Sharing Environment (CISE) project led by the European Commission, the project aims to improve the common "recognized maritime picture" by facilitating exchange of operational maritime information and services such as ship positions, tracks, identification data, chat or images, available from Naval sources, as illustrated below.

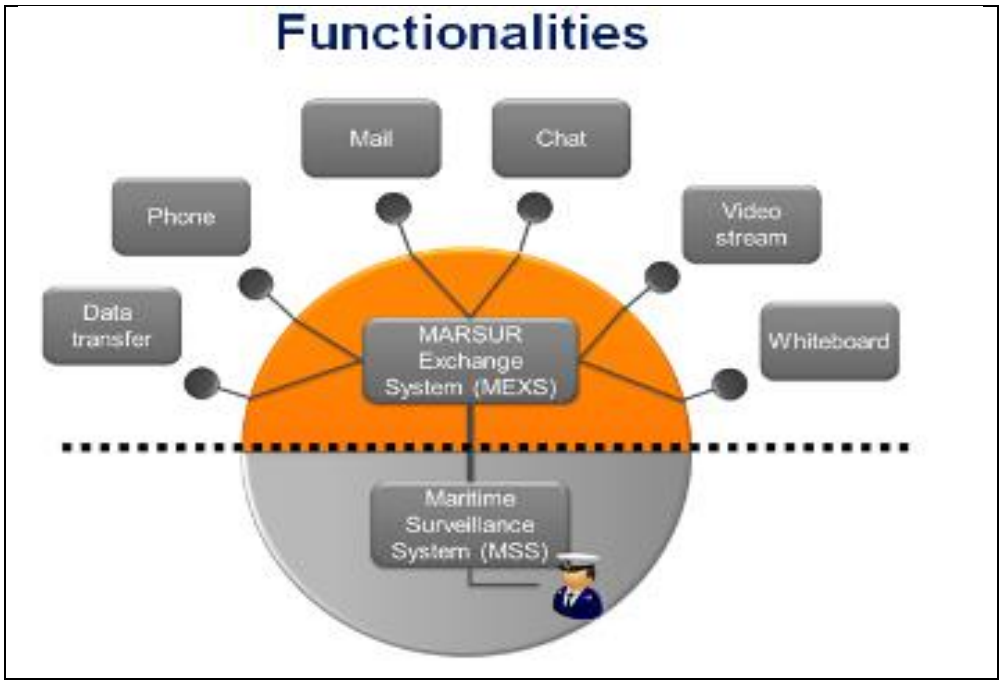

Figure 24 - MARSUR concept

(Source: -Spain Ministry of Defence[33])

BlueHub - is EU R&D platform developed by the EU Joint Research Centre in support of maritime surveillance and situational awareness projects, experimenting with new data sources previously untapped and also testing various data integration and statistical analyses methods. High level architecture is presented in Figure 25.

[33] http://www.tecnologiaeinnovacion.defensa.gob.es/es-es/Contenido/Paginas/detalleiniciativa.aspx?iniciativaID=36 – accessed 20.06.2014

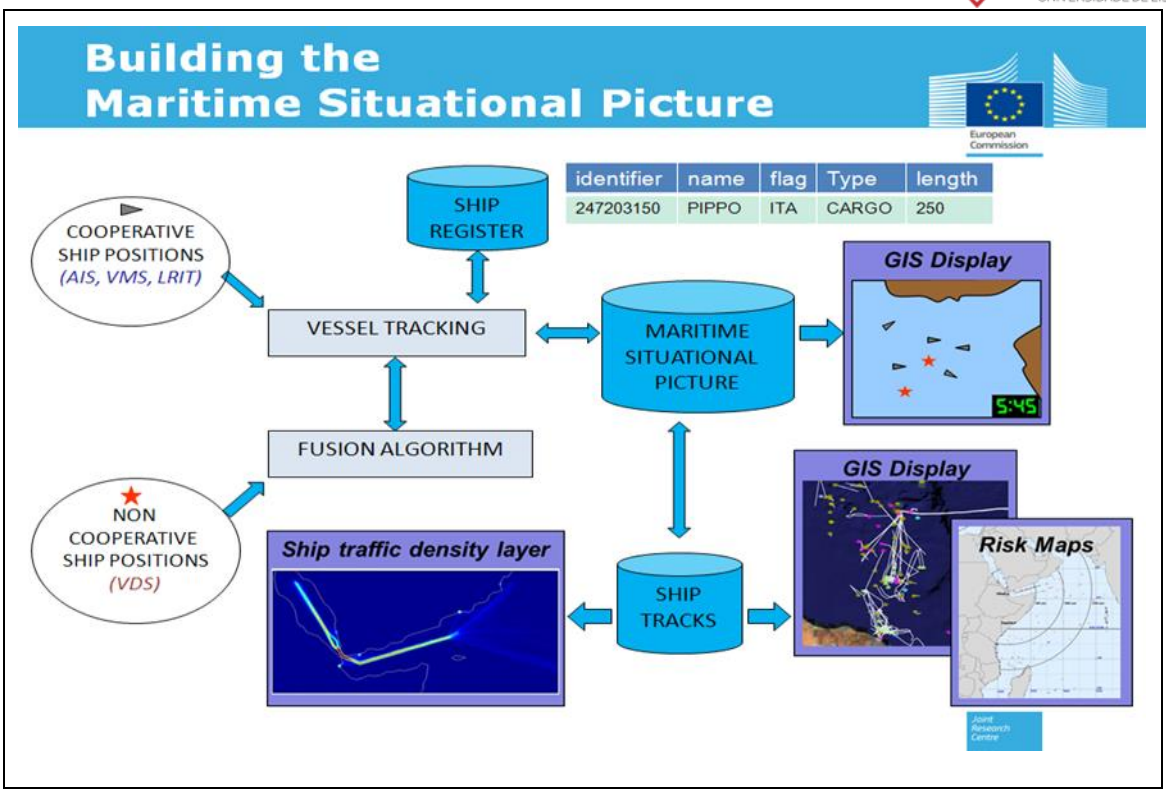

Figure 25 – BlueHub architecture

(Source: -JRC[34])

All these systems have been developed at EU level during the last 10-15 years as stand-alone independent systems supporting specific requirements and objectives agreed between the MSs. No single system has the complete overview of all vessels within a certain area; rather, the different existing systems cover different subsets of the maritime traffic according to their needs. This system-based structure is illustrated in the architectural framework diagram (Figure 26). Still, in order to find all relevant threats and infringements, the availability of a maritime picture that is as complete as possible is instrumental. An obvious way to improve the maritime picture is to combine the information gathered from the different surveillance systems in use by the different authorities: the combination of the different sub-sets of the maritime traffic gathered by each will result in a more complete picture. Since 2009, the CISE project has tried to improve the inter-operability and data sharing between the systems towards the development of an EU IMS.

[34] https://bluehub.jrc.ec.europa.eu/ - accessed 20.06.2014

As argued in chapter 4, CISE has remained mostly a theoretical exercise supported by a number of temporary pilot projects but not materializing with the set-up of a EU IMS system. Although CISE has created a certain level of awareness, the complexities and the limited views based on the specific background and professional environment of the involved actors and organizations seems to adversely affect the capacity of implementing the CISE concept.

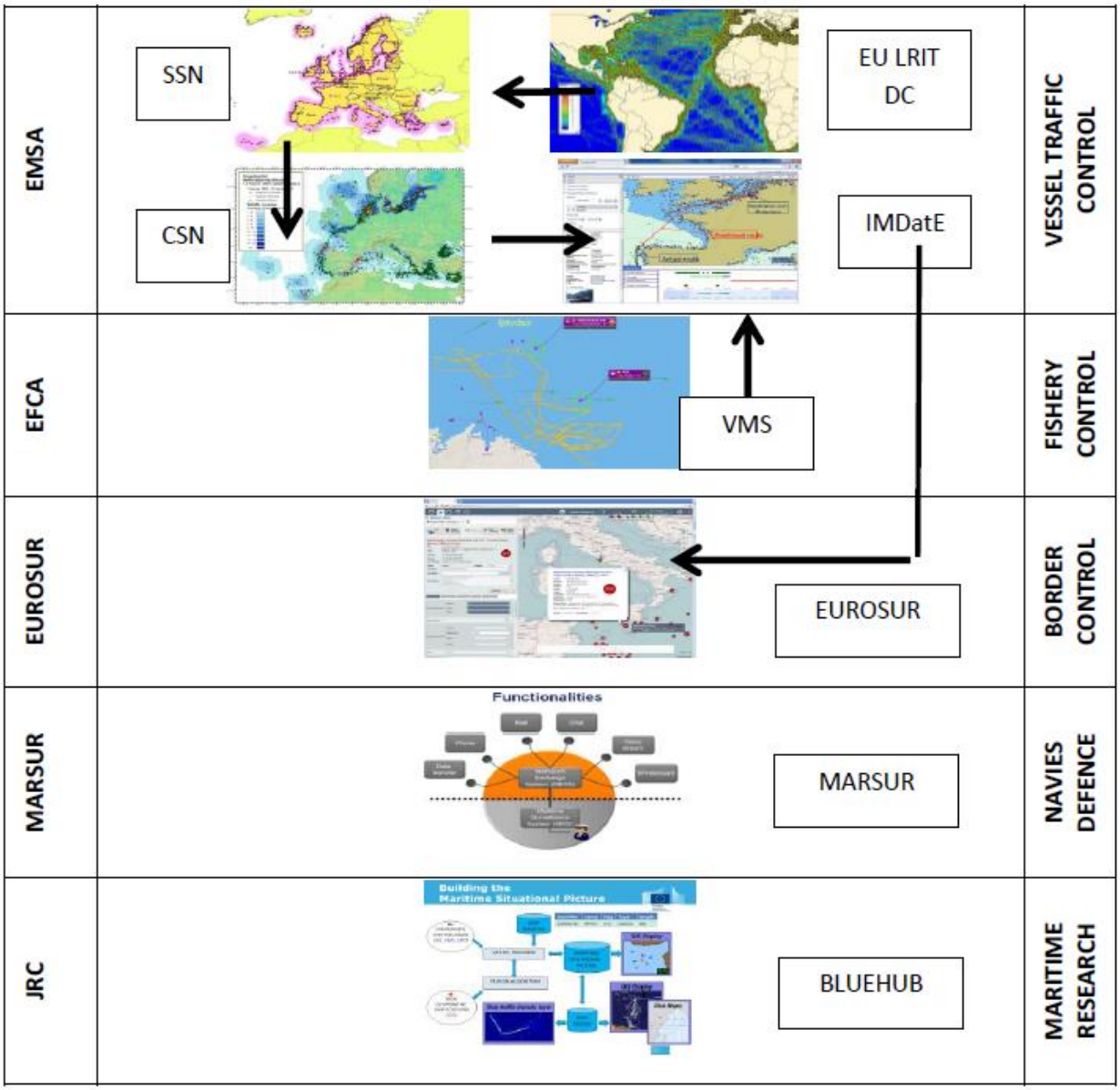

Figure 26 - EU Maritime Information Systems
(Source: - self-authored during research)

So far, the sustainability principles have not been achieved for the EU IMS. Parallel systems have been developed by various agencies, although the technologies are very similar or even identical (*i.e.* satellite based tracking) which results in duplication of systems and a waste of resources. Data collected is scarcely shared between maritime communities, which are driven by close and restricted data access policies, even if most of the data is also publicly available on internet from various commercial providers. The system-based fragmentation is visible at governance level as well. Each user communities have its own governing arrangement (six Directorates-General and six EU Agencies) and despite its coordination role, the EC has not managed to align the sectorial interests and power-fights. Diagram 27 illustrates the existing fragmented governance framework of the EU maritime surveillance domain.

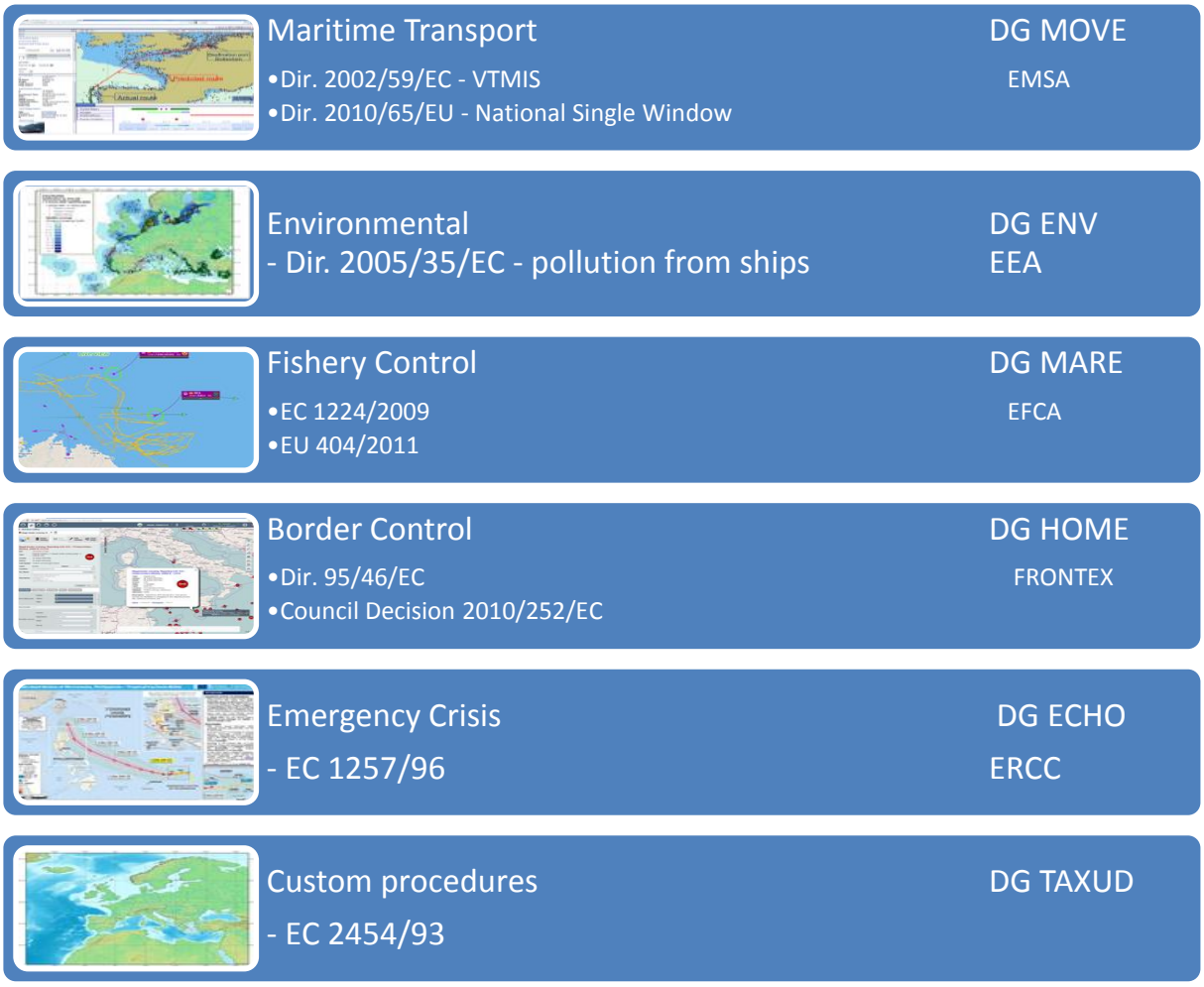

Figure 27 – EU sector based maritime governance model
(Source: - self-authored during research)

Although these systems are suitable for their intended purpose, from the sustainability perspective the conditions of setting up the EU Integrated Maritime Surveillance (IMS) system are not met. The IMP is trying to create the missing holistic view of EU maritime affairs but so far has not been very successful in finding the most effective implementation approach. The vision of the EU IMS system as promoted by the eloquent picture used for the marketing of the CISE project is provided below:

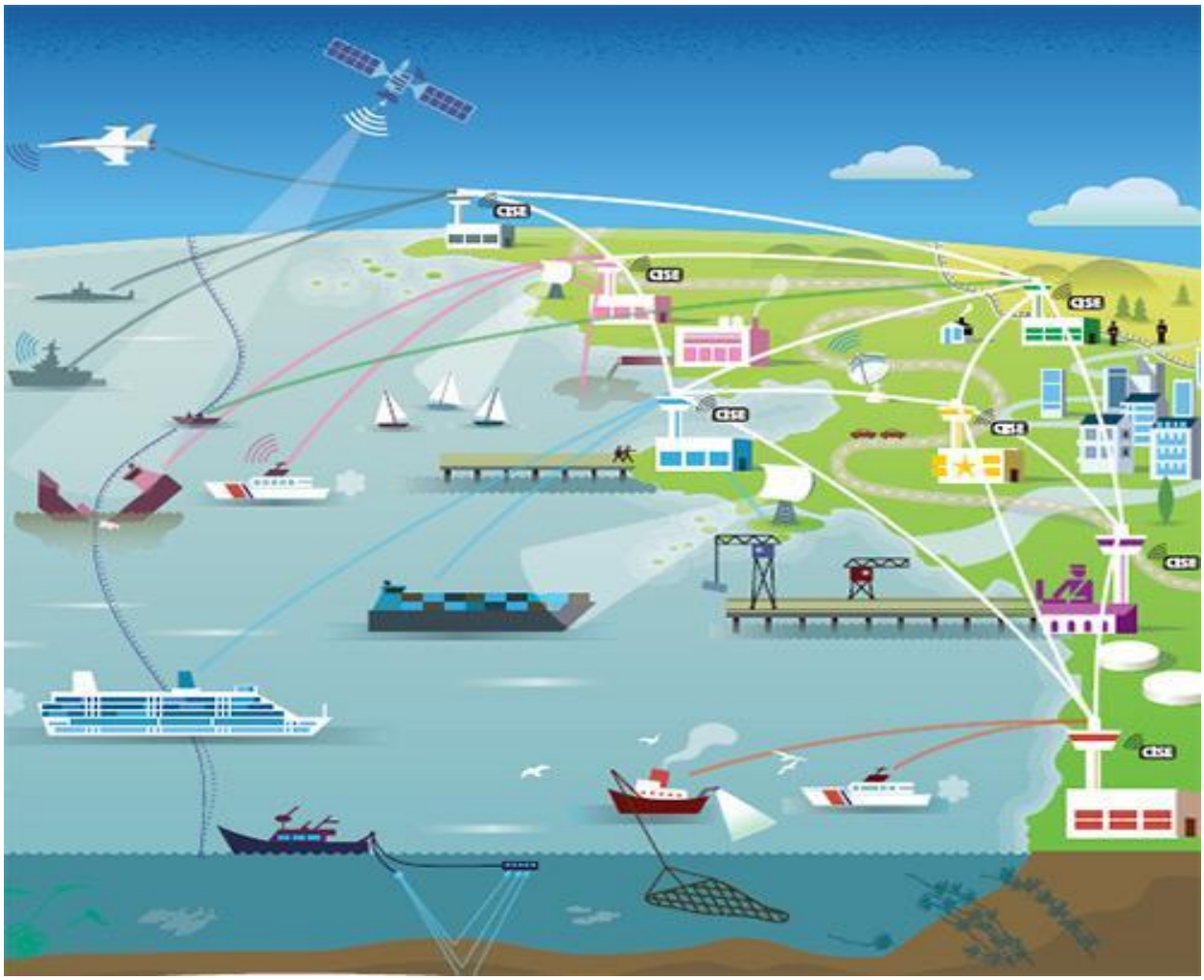

Figure 28 – EU IMS concept

(Source: - EC[35])

[35] - https://ec.europa.eu/jrc/en/news/jrc-supports-more-efficient-and-cost-effective-maritime-surveillance?search – accessed 24.06.2014

The status quo of the EU IMS reflects in fact the global status of maritime surveillance. The fragmented sectorial approach is a reality in all worldwide maritime regions. This is a consequence of the historical developments within the sector, largely based on the same considerations and reasoning as described for the EU case study.

However, Europe is not the only one embarking on the road to change towards a more sustainable integrated approach. The United States of America is also implementing an integrated maritime surveillance policy, as detailed in their policy document "A Cooperative Strategy for 21st Century Seapower" (US Navy, 2015)[36] and the associated Information Sharing Environment Business Model (ISE, 2015)[37]. Asian countries have joined forces to establish the Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships (ReCAAP, 2015)[38], a regional government-to-government arrangement to promote and enhance cooperation against criminal activities at sea, whilst the African countries are in the process of establishing a similar arrangement through the Maritime Trade Information Sharing Centre for the Gulf of Guinea (MTISC, 2015)[39].

There is a strong on-going current towards sustainability in the maritime surveillance domain and new paradigms are emerging pushing the change towards new ways of governance and operation at sea. As no single nation is able to fully cover all aspects of the Maritime Domain Awareness, cooperation for mutual benefits emerges as the most beneficial way forward.

[36] http://www.navy.mil/local/maritime/150227-CS21R-Final.pdf - accessed 27.06.2014
[37] http://www.ise.gov/ise-business-model - accessed 27.06.2014
[38] http://www.recaap.org/ - accessed 28.06.2014
[39] http://www.mtisc-gog.org/ - accessed 28.06.2014

5.3.2 FSSD 2nd Level – Success principles

The intended success of an integrated sustainable approach is stated in a number of EU policies. The "Blue Growth" initiative aims to elaborate the maritime dimension of the Europe 2020 strategy hence defined as "*smart, sustainable and inclusive economic and employment growth from the oceans, seas and coasts*". Complementing the Blue Growth, the EU Maritime Transport strategy until 2018 stipulates that *"the capacities of the EU's maritime transport system should be strengthened by putting in place an integrated information management system to enable the identification, monitoring, tracking and reporting of all vessels at sea and on inland waterways to and from European ports and in transit through or in close proximity to EU waters*." (EC, 2009/2095). The EU IMP and its CISE project also indicate that the EU IMS system should be able to provide any maritime community with the relevant information they might need for successful performance of their tasks and responsibilities. This includes the cooperation between civil and military authorities for building an enhanced maritime awareness picture able to cover all sectors and needs. The recommended principle behind data access policy should be "*the need to know and responsibility to share*". The specific success conditions required to achieve these objectives are analyzed herewith.

The maritime domain society must not be degraded through the **erosion of trust**, but contrary, IMS should strengthen the domain by entrusted cooperation of all involved communities. This should start with commonly agreed governance mechanism and meaning – in our case a common definition of the EU IMS system and its governance mechanisms. Equality, competence and democratic participation in the decision making process are critical conditions to achieve the common objectives.

A second critical sustainable principle is that the nature must not be degraded by systematic increase of human-made physical means. In the EU IMS use-case, this means to avoid duplication or multiplication of similar infrastructure and equipment, both at sea, on land and in space. These two critical principles should be embedded in the policies and activities of all organizations active within EU IMS domain. Any shortfall in applying the principles in the daily practice means a failure in meeting sustainability for the future.

Figure 29 provides a visual illustration of the potential scenarios for the future of EU IMS.

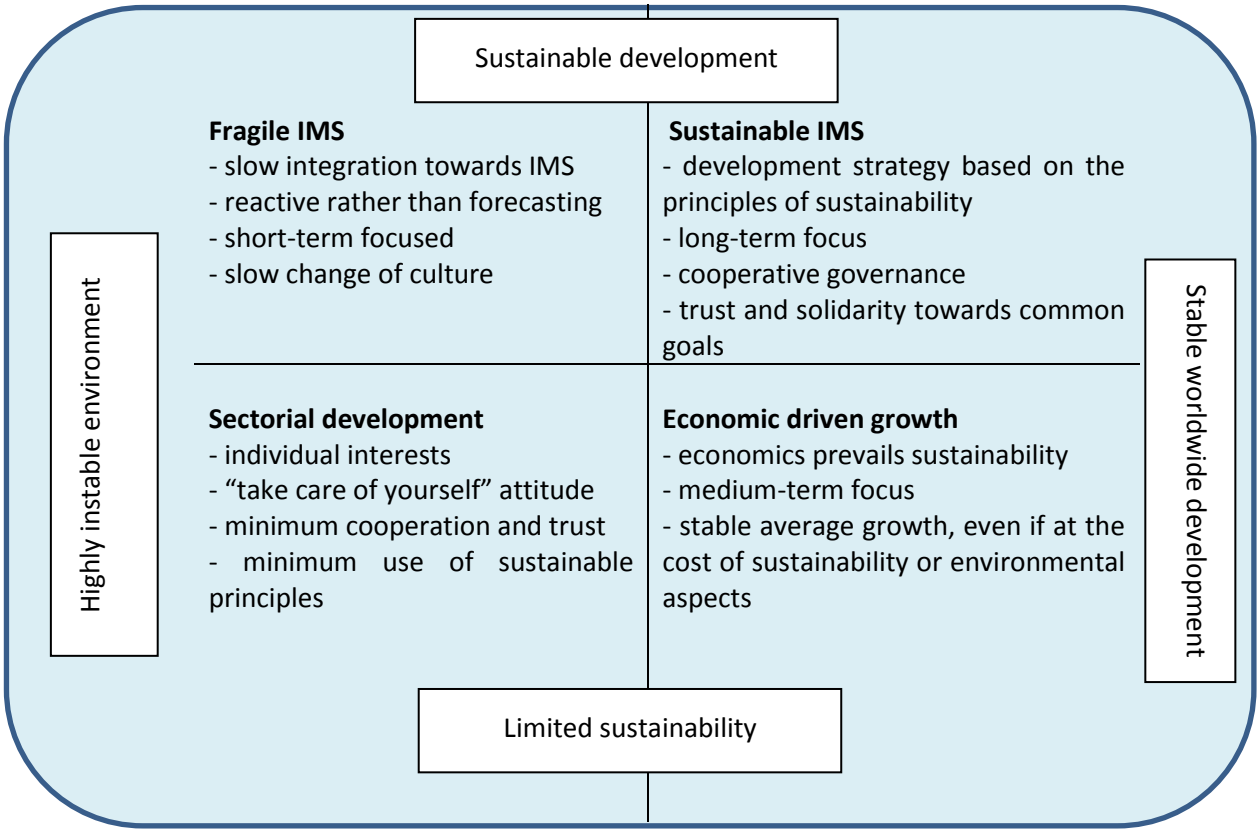

Figure 29 - EU IMS future scenarios
(Source: - self- authored during research)

Using the FSSD approach the following **success factors** for a sustainable IMS were determined:

Cooperative Governance for implementation: - The political governance and commitment for establishing a EU IMS system is quite clear and strong. The high level political agreement has been confirmed and communicated through a number of policies and associated communications, action plans and guidelines, such as: the EU IMP complemented by the full set of CISE related documents and the EU MSS and its Action Plan (EU Council, (2014)17002). Despite the strong political commitment, the implementation of the IMS related policies has constantly failed to meet the planned output during the last 10 years. There is a clear gap between the high level political decisions and the effective implementation of the policies in practice. The EU traditional governance model "pillar-based" on Directorates structure does not support the effective implementation of horizontal, integrated policies. The blocking issues revealed by the critical analysis in chapter 4 should be addressed through a new implementation governance mechanism designed to provide enhanced levels of effectiveness. Successful implementation of complex integrated policies like the IMP requires enhanced cooperation framework, ideally combining trust with formal and informal arrangements between all participating actors. **Trust** is a critical element for a cooperative and collaborative governance framework because everything works only by coordinated action and devolving responsibility. The IMP policy-making process has shown that a multi-DG governance body has been able to build the trust at policy-making level and successfully steer the process towards the expected deliverables. Using the experience, a similar implementation cooperative governance set-up may re-align the IMS implementation process towards more effective results.

The EC shall create an **adaptive structure** to support the shared vision of the IMS, **clear roles and responsibilities of participants**, and a **shared purpose** by all members. The institutional and legal structures should no longer be heterogeneous and undermining the cooperation and data exchange between different communities of users but rather homogeneous using cooperative and sustainability principles for achieving a comprehensive EU IMS. The present

voluntary approach under individual leadership of DG MARE was not able to create the necessary trust and cooperative environment between the actors. Defining a new structure in the context of an IMS Directive and setting-up a European Coast Guard leading structure may eventually provide the missing governance framework for effective implementation. The US Coast Guard (USCG)[40] provides a good example of a highly performing multi-mission, civil-military maritime organization. By law, the USCG is tasked with a wide range of maritime activities, including: ports, waterways, and coastal security; drug and smuggling control; aids to navigation; search and rescue; living marine resources; marine safety; defense readiness; migrant control; marine environmental protection; ice operations and other law enforcement activities. By comparison, at EU level these tasks are distributed between 6 agencies (EMSA, FRONTEX, EFCA, EUROPOL, EDA, EEA) without any formal coordination and cooperation framework. The concept of the EU Coast Guard is further analyzed in section 5.3.4 as a potential action for implementation.

Cooperative operational culture: - Communities, or social systems, are made up of networks of relationships that are interdependent (Harder et al, 2004). As identified by CISE, there are seven main maritime governmental user communities in Europe: the general law enforcement authorities, customs, marine environment control, maritime safety and security agencies, defense community, fisheries control and border control. Each community has developed its own way and means to collect the relevant set of information for conducting their tasks and missions. Sharing, integration, pooling of resources have barely being practiced in the past. The IMS and its CISE affiliated project are targeting a change of operational culture, from the segregated, sectorial segregation towards a cooperative information-sharing environment. However, a change of culture developed over 50 years of practice cannot be done overnight and requires dedicated and sustained efforts from all involved actors. When there is a gap between the current

[40] http://www.uscg.mil/top/missions/ - accessed 04.07.2014

culture and the objectives and goals of a change, the old culture will prevail. A prerequisite for alignment between culture and the sustainability initiatives that the IMP has committed to is a governance system that supports the effort towards intended goals. Generating commitment to change towards sustainability requires that members can clearly see the necessity to do so or otherwise the system will maintain its current status quo. The EU IMP/IMS-CISE implementation program has missed this. Out of the seven communities, the only one campaigning for the IMS-CISE initiative was the fishery control community through its parent directorate – DG MARE, mainly because they were assigned as managers of the project. To achieve an effective EU IMS, each community should embrace the concept and should develop and run its own communication and awareness campaign, showing the IMS added value for their own community and building the support and commitment from the inside, rather than waiting to be convinced from the outside, whilst maintaining their domain oriented culture. Whilst lately most of the sectorial user communities recognize the value of data exchange and integration, this concept needs to be translated in practice through new operational mechanisms and agreements.

The bottom-up IMDatE project initiated by EMSA has clearly demonstrated the benefits of cooperation and the added value of integrated maritime picture. End-users are willing to support a new, integrative operational concept, but the lack of a clear supporting legal framework is slowing down the progress as each user community is trying to find its own way to overcome existing blocking issues (legal restriction for data sharing, different technical standards).

Considering the EU implementation practice based on Directives, an IMS Directive may provide the missing legal and operational framework empowering each community to start cooperating and sharing with the others.

Data access: - Each EU maritime community collects its own data and access is restricted only to approved users of the community. Data exchange and sharing is quite limited, mainly within the members of the community, due to confidentiality, personal data and legal restrictions. Furthermore, if the sourcing of data is taking place on a contractual basis (for instance, where data is acquired from commercial suppliers as is the case for S-AIS and satellite pictures), such contracts may also contain specific restrictions (for instance, contractual provisions on intellectual property rights may limit the user's right to reproduce, exploit and share the data). Personal data protection law contains a number of significant use and purpose limitations to be complied with by those controlling and processing the data. In connection with the sharing of personal data, a number of specific safeguards will first need to be put in place in order to ensure that the basic principles of data protection law (such as the principle of proportionality) can be complied with. Because of the above mentioned constrains, any mechanism aiming at the cross-border exchange of data from various existing databases should be subject to a **clear legal framework** defining at least the nature of the data involved, the purposes, the methods of the exchange and the potential recipients of the data, as well as incorporating the necessary safeguards with regard to the confidentiality and security of (certain) data and the protection of personal data, where this may be relevant (EC, 2009). The IMDatE integrated services have also demonstrated the need of legal framework. Each of the main integrated service setup on permanent basis (EU NAVFOR anti-piracy service, EFCA fishery surveillance, FRONTEX IMS) is based on agreed Memoranda of Understanding signed between the involved agencies and endorsed by their Administrative Boards (MSs).

Despite the conclusion of the legal study (EC, 2009) and the evidence provided by IMDatE services, the EC approach towards data sharing is still based on voluntary participation within the existing legal framework which unfortunately is designed to restrict the information exchange rather than to promote it.

Systems inter-operability: - various EU maritime systems have been developed over the last 10 years, as described in the first level section. In order to be able to exchange and share data, these systems need to be inter-connected with system-to-system technical interfaces enabling the exchange of data in agreed formats. Therefore a certain degree of **standardization is needed**, both at system and data-format level. The advance status of ICT technologies and associated standardization provides the necessary tools to achieve the required level of inter-operability. Whilst there are no real blocking issues from a technical perspective, an agreement of which standards should be used is still pending. The various attempts of the CISE Technical Advisory Group (TAG) to set-up the EU technical framework for maritime data exchange have all failed so far mainly because the representativeness of the TAG members was more political rather than technical and therefore unable to make progress in this direction. This is another example of unsuitable governance approach, where tasks, participation and expertise of actors were not aligned along the intended purposes.

5.3.3 FSSD 3rd level – Strategy towards success

The EU strategy towards achieving the Integrated Maritime Surveillance system is quite well defined within the context of the Common Information Sharing Environment (CISE) initiative. CISE is a voluntary collaborative process seeking to further enhance and promote relevant information sharing between authorities involved in maritime surveillance. It is not replacing or duplicating but building on existing information exchange and sharing systems and platforms. CISE is an important building block of both the EU Integrated Maritime Policy and the new EU Maritime Security Strategy which aims to fulfill the principles and objectives of these cross sectorial, coherent and cost efficient policies. At national level, several Member States (France, UK, Sweden, and Netherlands) have already put in place mechanisms such as national coordination centers involving all relevant authorities, civilian and military, in order to improve

co-ordination. At EU levels, a number of projects (BlueMassMed, Marsuno, Cooperation, EMSA IMDatE) have demonstrated the added value of data sharing. Key improvement indicators of IMS include: **30% reduction of threats and risks, 40% reduction in duplication of data collection and around 400 million EUR overall financial benefits at EU level** (EC, 2014/451). These are very strong incentives to continue the efforts towards a fully operational and effective EU IMS platform. The strategy for future steps include the launch of an EU large scale CISE project between civilian and military authorities during 2015, development of a non-binding Maritime CISE handbook by the end of 2016 with best-practice recommendations on how to apply CISE and further development and dissemination of technical standards supporting maritime surveillance systems interoperability. In parallel, Member States are encouraged and financially supported to enhance their national systems towards CISE recommended standards and to further promote a change of culture within their maritime communities towards a cooperative and data sharing approach. Lastly, very relevant for the context of this research, the strategy also mentions the need of adapting the administrative (and governance) structures supporting CISE, eventually using service level agreements if or where needed. The role of the Commission will continue as facilitator and coordinator of the CISE process, building on existing systems and solutions, without creating a new system. The next review of the progress along these approaches is scheduled for 2018 and will constitute the basis for further action.

This research argues that this implementation strategy is not suitable to meet the urgent safety and security needs of the maritime transportation domain because:

a) Of the very long implementation timeframe when compared with the urgent needs of enhanced surveillance;
b) it is not structured around a clear and agreed IMS model; and
c) does not guarantee a sustainable outcome at the end of the cycle as the main planned deliverable for 2018 is a review report and not an operational EU IMS.

The EU IMS/CISE project was initiated in 2009 and the initial implementation deadline of 2014 is now postponed to 2018, when the next progress review is planned. That's already 10 years lifespan without achieving the intended goal of having an effective European Integrated Maritime Surveillance system in place. During this period, maritime security issues have escalated to some of the worst situations ever. The surge of Somali piracy attacks during 2010-2012 has almost chocked the Europe-Far East maritime trading routes. These days, the area of piracy concern is moving from Somali to the Gulf of Guinea, raising new challenges for the sustainability of the global maritime transportation activities. In the Mediterranean Sea, the last five years have seen the increase of illegal immigration at sea to levels never seen before – over 200,000 in 2014 (see fig. 30) and close to 150,000 during the first six months of 2015. More than 3000 migrants are estimated to have lost their lives at sea in 2014 and close to 2000 deaths were registered during the first six months of 2015 (UNHCR, 2015). This is the latest maritime challenge facing the EU and showing that MSs cannot face alone the regional maritime threats and that a cooperative and integrative approach is needed to face the common challenges of maritime illegal immigration, mass search and rescue operations, and comprehensive maritime surveillance.

The dynamic evolution of maritime safety and security issues requires similar dynamic policies and implementation mechanisms, able to provide the required level of support and sustainability. Unfortunately, the EU IMS approach is far beyond this model and more effort and good will is needed for efficient response mechanisms.

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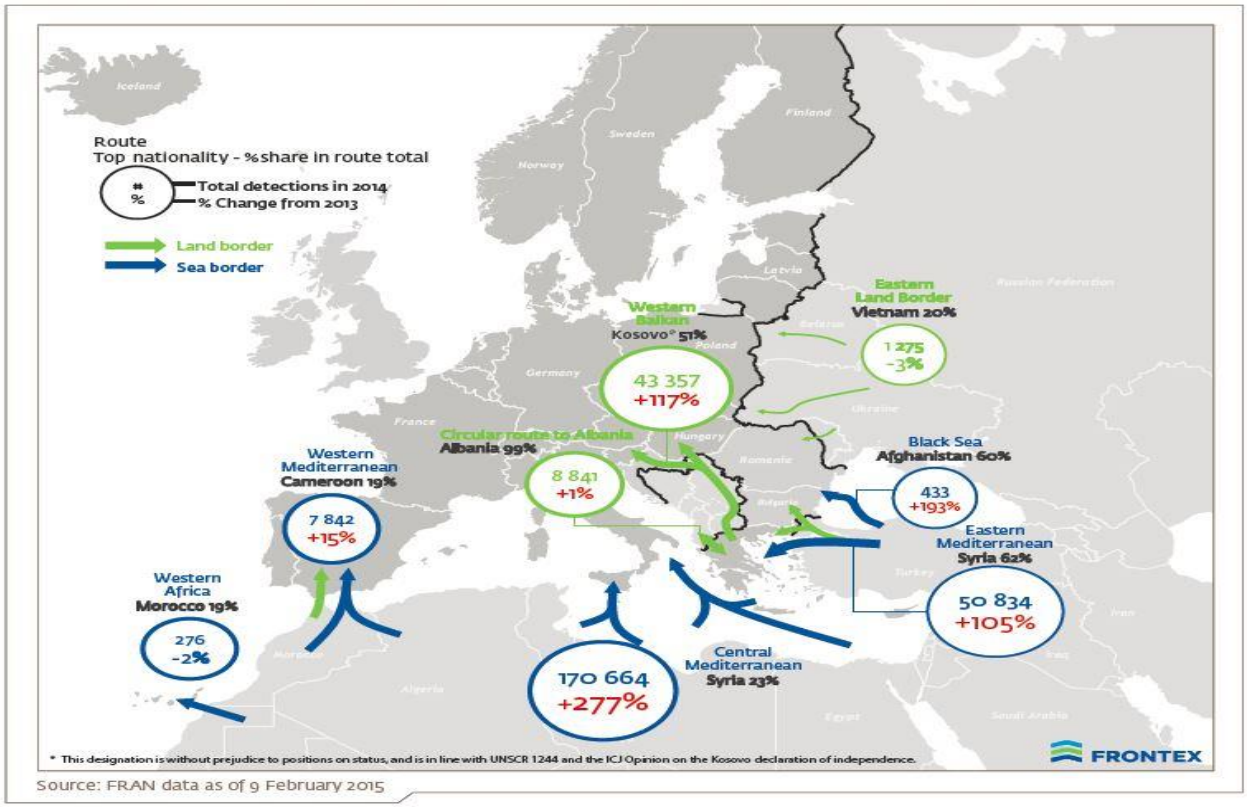

Figure 30 - EU illegal immigration – 2014 picture
(Source: - FRONTEX annual report 2015)

The **implementation strategy proposed by this research is** to change from the present voluntary approach towards **a combined mandatory-voluntary model** based on a dedicated EU IMS Directive setting-up the legal and operational framework for cooperation and eliminating legal data sharing barriers. The IMS Directive shall provide necessary clarity on what data need to be shared, the participating actors and their associated responsibilities, as well as the minimum level of integrated services and associated user communities.

Starting from this framework, the services can be thereafter extended and tailored to respond to other specific needs of the end-users. The use of Directives is the effective method for the development and implementation of EU legislation in general and so far was successfully used in the maritime domain as well, as proved by the existing EU cooperative maritime systems (SSN, EU LRIT DC, CSN). Each of these systems was developed based on clear legal frameworks as detailed in section 5.3.1.

Essentially, the IMP is a mode of policy-making and decision taking that seeks to overcome the discordance between competing demands on the marine environment from coastal, marine and maritime activities. It does not replace the sectorial maritime policies but rather built on them adding complementary information and a more efficient way of using common resources. As all sectorial policies and systems are based on EU legal requirements, would make sense to follow the same approach and develop a legal (mandatory) framework for the IMS as well. This will provide a clear vision of the goals to be achieved, the role and responsibility of each contributing sub-system and the means to monitor the implementation progress and collect feedback. Systems do not act randomly. They have rules that define how parts interact, what are their roles and the boundaries of decentralized power versus the responsibility to act towards the collective vision. The EU IMS needs such a framework and a Directive will provide all actors the legal foundation to start building a collaborative self-organized environment beyond the narrow scope of their sectorial interests. Many MSs also confirmed the need of a basic legal framework during the IMDatE meetings and discussions. In some countries, the legal framework is very strict about data exchange, even at governmental level (between ministries) and this has to be changed in order to support the development of the cooperative culture. Existing data sharing legal barriers can only be removed by changing the legislation, therefore the need to solve this problem in order to achieve fast and consistent progress.

5.3.4 FSSD 4th level – Actions for implementation

The EU CISE project has initiated a number of actions for setting up the EU IMS system. However, as argued in chapter 4, the results obtained so far have not fulfilled the expectations of the EU political ambitions. Despite a number of remarkable successes in the establishment of EU maritime cooperative systems (SafeSeaNet, CleanSeaNet, Eurosur) the last step of the holistic EU IMS is still pending. The already established systems are important steps as they provide objective evidence that cooperation and data exchange is possible, albeit at community level.

These systems have been established based on EU Directives documenting the purpose, data to be exchanged and the technical framework. CISE aims to extend the cooperative model from the community level (traffic control, pollution control, border control, etc.) to the horizontal, cross-communities and cross-borders Maritime Domain Awareness level. A voluntary approach was chosen for this purpose, which is a deviation from the previous legislative (Directives-based) approach. This paper argues that as the voluntary approach has not achieved the expected results and therefore a legal framework should be used for the set-up of EU IMS, in similar manner as with the existing networks. Based on the CISE studies and projects' results the EC should initiate the legislative process for defining and agreeing a Directive on the EU IMS system. This can be considered as a reasonable approach aligned to the previous practice and using the existing blocks for achieving the final goal of a fully integrated, comprehensive maritime surveillance system at EU Level. Whilst aligned to the EU modus operandi, the approach is also in line with the sustainability principles of re-using existing resources, avoid duplication of costs and promote cooperation between different communities having an interest in the maritime domain. Furthermore, it provides a fast track towards a standard set of maritime services, which eventually can be used thereafter for further development of more complex services, if needed. Specific actions for successful implementation of this approach should include:

- **EC decision to initiate the implementation of the EU IMS Directive** - considering the strong political commitment towards establishing the EU IMS (EU IMP, EU MSS), the results obtained so far from all CISE and IMDatE projects and activities, and the stringent need for better maritime surveillance in support of illegal immigration activities at sea, the EC should change the present voluntary approach towards a clear mandatory framework guiding the establishment and operation of the EU IMS.

- **Re-use of the existing EU maritime surveillance systems** to enhance the efficient use of resources. This will maximize the investment made so far at EU level and will also support the principle of equal participation of active capabilities. In addition, it will mitigate potential future duplication of systems and limit the impact of human-made infrastructure over the natural common environment. This is particularly relevant for the satellite-based systems, which today goes through a duplication process justified by free market competition. Instead of using financial resources to create new systems which provide same type of information, future EU IMS development shall adopt the sustainable development principles and build the future based on re-use and cooperation rather than on competition.
- **Design the EU IMS as a system to enhance the maritime awareness domain for all participating actors**. IMS should add value to the existing user communities by adding more information than what is now available within their sectorial systems and will also facilitate the development of a new user community interested in the holistic maritime picture (policy makers, emergency coordinators, search and rescue activities, law enforcement, maritime intelligence). The EU IMS shall also support the improvement of maritime social environment heavily degraded during the last years by the increasing number of security threats (piracy attacks). Demotivated maritime staff can create important impact on the sustainability of maritime transportation either by continuous reduction of the staff renewal rate (new staff joining the maritime transportation activities) or by low level of performance. As such, the EU IMS shall go beyond the governmental level and shall be opened to participation to other interested and entitled actors from the industry, NGOs and civil society.
- **EU IMS shall help to create thriving maritime communities** by mitigating negative impacts, such as pollution, traffic congestion, new business development and expansion of facilities (maritime mining, energy at sea, tourism, *etc*.). Enhanced and state-of-the-art communication and ICT systems are core components of an IMS system and therefore it

should follow similar development trends as other global networks (internet of the sea, social and professional networking). Funding mechanisms are critical to support technological progress and funding should follow a similar "integrated" approach rather than separate funding of each sector. Without adequate and accessible funding any project will remain at the level of intention and therefore the financial aspects should not be overlooked or underestimated.

- **EU IMS shall promote sustainability as the core governing principle**. The EU IMS should not be regarded just as a technical system providing enhanced maritime information. The EU IMS shall be also a culture-changing tool promoting the principles of sustainability and a new sustainable governance model where all actors and stakeholders work together for enhancing the environmental and socio-economic wellbeing. As the EU IMS is based on a network and relationship approach, a clear system for information and communication has to be developed in support of this cooperative model. Generating commitment to change towards sustainability requires that each participant can clearly see the necessity to do so or otherwise the system will maintain its current status quo. This can be achieved through dedicated EU IMS awareness and training program developed for each participating community to promote the common goals and create the necessary understanding and commitment.
- **EU IMS Governance Body** - Inter-DGs governance mechanism shall be put in place to drive the set-up and operation of the IMS, following the similar model used for developing and adoption of the EU IMP. Whilst the IMS vision as developed under IMP is quite well define, the critical mid-term analysis has shown that the outcomes are not aligned with the initial objectives, neither in terms of deliverables or timeline. Therefore the IMS Governance Body should be empowered and accountable to monitor and evaluate the progress and take active measures at all stages of implementation to ensure that policy objectives are met. A potential good implementation and governance arrangement would be the set-up of the EU Coast

Guard (EU CG) as the governing body for the EU IMS. An initiative along this path exists since 2009 in the form of the European Coast Guard Functions Forum (ECGFF)[41], a non-binding, independent and non-political forum initiated by the Heads of Coast Guards of the EU MSs aiming to improve cooperation on CG functions, including maritime monitoring and surveillance domain. A study on EU CG model contracted by DG MOVE (ICF International, 2014) indicates a number of viable opportunities for enhancing collaboration in regard to capacity building, joint operations and asset sharing, data sharing and harmonization of existing monitoring and surveillance systems, research and innovation. A new structure like EU Coast Guard can provide the missing legitimacy and institutional conversion towards a more effective implementation of the EU IMS concept. This approach is supported also by the outcome of the EU CG study which states that "*the use of the EU decentralized agency model is appropriate for EU cooperation in relation to specific CG functions (e.g.,…. maritime surveillance…) since it provides a clear legal framework"* (ICF, 2014).

5.3.5 FSSD 5th level – Supporting tools

There are three categories of tools, which can be used to support the implementation of a sustainable approach: capacity building (*e.g.* learning organization, training), system assessment (*e.g.* technology) and strategy tools (*e.g.* back casting). The CISE activities over the last years (2009-2014) have produced a good number of results and tools to support the establishment of a clear legal framework for the EU IMS: the assessment of the situation, identification of the communities involved in maritime activities, the data to be exchanged and the legal issues related to data sharing, the technical aspects to be addressed for enhanced inter-operability between the systems. Furthermore, the CISE pilot projects and EMSA integrated information services have demonstrated in practice that data sharing and correlation is possible thus providing the learning curve to assist users in understanding the operational added value of

[41] http://www.ecgff.eu/

integrated maritime surveillance services. These have to be recognized as important achievements of the IMS/CISE initiative and should be used as supporting tools for the future steps.

All necessary information for defining a EU IMS framework is available and based on this an IMS Directive can be completed and approved within a short timeframe, if the EC and Member States are committed to pursue this path. The traditional EU legal approach for implementing EU-wide policies via directives has proved its value and the legal framework should be used to provide the baseline of the EU IMS system. The past history of implementing EU rules and regulations has also proved that once a legal framework is established, the MSs and the involved institutions are more willing to expand their cooperation because they rely on the legitimacy of the existing framework. Contrary, the lack of a legal framework acts as a blocking issue for cooperation and as an excuse for many maritime communities to not take risks and initiatives outside of the alleged legality.

Furthermore, the representatives from MSs attending the IMDatE user group meetings have also indicated that some countries have internal regulations specifically restricting data sharing at national level, therefore an EU legal framework is needed to change the national restricted approach towards a cooperative data sharing environment, similar to other initiatives which proved successful (VTMIS and EUROSUR Directives). End-user support for a clear EU IMS legal framework constitutes a strong objective evidence of the proposed approach. Figure 31 summarize the outcome of FSSD analysis applied to the EU IMS. This is complemented by a draft EU Directive for Integrated Maritime Surveillance attached in Annex 1 and both represent the tangible results of the research on the regional IMS use-case.

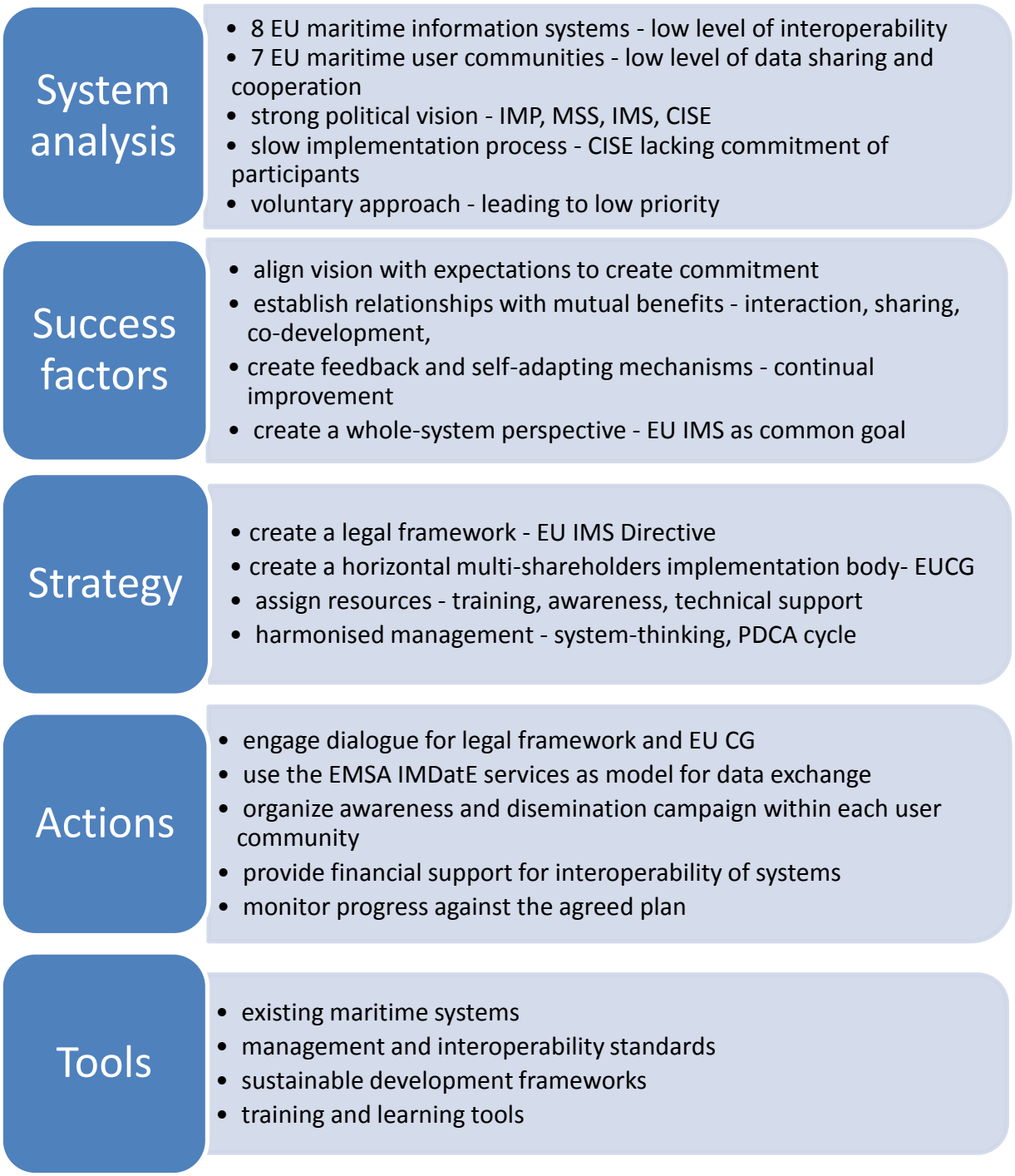

Figure 31 - EU IMS FSSD framework

(Source: - self-authored during research)

5.4 CONCLUSIONS ON REGIONAL MDA

The Common Information Sharing Environment project aiming to promote the EU Integrated Maritime Surveillance (IMS) platform under the wider umbrella of the EU Integrated Maritime Policy (IMP) is a representative use-case to analyze how regional cooperation can improve the Maritime Domain Awareness (MDA) for all participating actors. The representativeness is supported by: the large number of involved countries (28 MSs), the wide maritime area covered by the EU region (Central and North-East Atlantic, North and Baltic Sea, Mediterranean Sea, Black Sea) and the size of maritime traffic around EU (30% of the world traffic).

The analysis of EU IMS use-case revealed that despite the strong political commitment, the implementation process has failed to deliver the expected results in accordance with the initial planning. However, important steps have been made towards the final goal of having a European Integrated Maritime Surveillance arrangement. Building blocks were identified, user communities were brought together to discuss the cooperation framework, change of operational culture towards data sharing and synergies was initiated and technical solutions investigated through a number of pilot projects. Several large-scale cooperative maritime systems are operated at EU level (SafeSeaNet, CleanSeaNet, EU LRIT DC, EU AIS, IMDatE, EUROSUR, EU VMS, MARSUR) and they have all evolved from sector-oriented systems towards inter-operable platforms able to exchange data with any other external system. The EMSA IMDatE project used as an action-research tool has demonstrated that there are no operational or technical blocking issues obstructing the set-up of a European wide IMS, neither at national or EU agencies level.

However, in the absence of a clear implementation strategy and an adequate supporting governance framework, so far the EU IMS remains a theoretical exercise providing guidelines on the principles of CISE and few (costly) pilot demonstrations of potential regional arrangements

within EU (Baltic area, North Sea and Mediterranean Sea). The latest EC CISE communication document is the standing proof of the very vague and weak vision for the future of EU IMS as it is concluding that the EC "*does not see a need to put in place a cross-sector legislative initiative*" (EC, 2014/451) and further work will continue on the principles of avoiding duplication and using cost-effective solutions based on the previous experience.

This research argues that it is necessary to find better ways of implementation so as to be able to respond more quickly and more effectively to the demanding maritime challenges of today. Using the Framework for Strategic Sustainable Development the research proposes a mandatory legal framework to clarify the structure, roles, responsibilities and deliverables of the EU Integrated Maritime Surveillance platform. The mandatory framework shall provide the minimum requirements for effective cooperation, which thereafter can be further extended based on the voluntary initiative of each user community. A draft EU IMS Directive is proposed in support of this approach. The argumentation is based on the previous examples of existing EU maritime information systems, all of them having the root in a legal EU Directive, and the logical argument that the integrated platform using blocks (systems) set-up on mandatory legal requirements shall be as well based on similar legal framework defining how components will work together, responsibility and accountability of each actor (system), the deliverable services and associated access rights.

CHAPTER 6: GLOBAL MARITIME DOMAIN AWARENESS

6.1 PIRACY IMPACT ON MARITIME TRANSPORTATION

The United Nations Convention on the Law of the Sea (UNCLOS) defines piracy as "*the acts of violence or detention committed for private ends by the crew of a private ship and directed on the high seas, against another ship, or persons, or property on board such ship*" (UN, 2010). UNCLOS also provides that all States have an obligation to cooperate to the fullest possible extent in the repression of piracy (art. 100) and have universal jurisdiction on the high seas to seize pirate ships, or a ship taken by piracy and under the control of pirates, and arrest the persons and seize the property on board (art. 105).

Somali pirates began hijacking commercial vessels transiting near the Horn of Africa back in 2005. The pirates seize the ship, cargo and the crew and demand a ransom from the shipping company (Brice, 2008). Between 2005 and 2011 the number of pirate attacks and hijackings had constantly increased, with the number of hijackings peaking in 2010 and the number of overall attacks peaking in 2011. A number of studies were performed by different organizations (United Nations, International Maritime Bureau, IMO, BIMCO, consultancy companies) on the economic impact of the piracy revealing huge harm to the world's maritime trade and the seafarers, including the deaths of over 54 individuals. In 2005, ransoms paid to pirates averaged around $150,000 per ship, by 2009, the average ransom rise to $3.4 million and in 2010, ransoms goes to average around $5.4 million (OBP, 2014). The total cost of ransom is estimated to be around double the value actually paid to pirates, duplicated by a number of factors, such as: the cost of negotiations, psychological trauma counseling, repair to ship damage caused while it is held captive, and the physical delivery of the ransom money, often done by helicopter or private plane. Additional large costs result from ships being held out of service, as well from the

increased insurance costs attached to the sensitive areas. Finally, the piracy generates a new range of costs associated to the maritime transport, such as re-routing of ships, costs for using armed forces and navies (43 navy ships are operating in the Horn of Africa at an average cost of $80,000/day) to protect the sensitive areas, cost of prosecution procedures, including setting-up of dedicated regional agreements. Figure 32 illustrates the distribution of piracy costs.

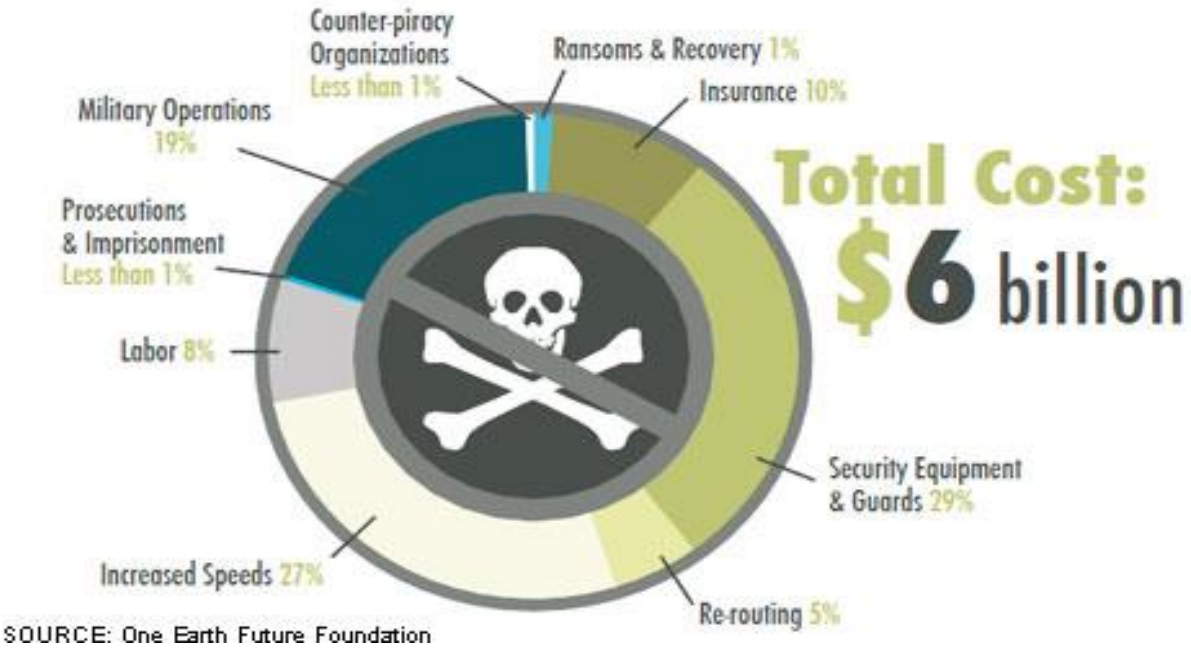

Figure 32 -Distribution of piracy costs

In addition, many neighboring countries claimed secondary costs resulting as indirect consequence of the piracy, such as trading routes being altered, insurance premiums increased, cargo shippers using alternative ports to pick up and deliver their goods and substantial decrease of the fishing activities. For example, the Kenyan Shippers Council has estimated that piracy increases the cost of imports by $23.8 million per month, and exports by $9.8 million per month. These costs are then redirected to Kenyan consumers resulting in a price increase of imported goods by 10%. Seychelles' Minister for the Environment and Natural Resources has stated that the "*maritime attacks pose a direct threat to our fishing and tourism industries, the two main pillars of our economy, reducing the Seychelles economy by around four per cent of GDP every year*" (Morgan, 2010).

Other countries, like Yemen, Taiwan and Nigeria have claimed similar negative impact. Secretary General of Gulf Petro-Chemical Association said that the "*piracy activities, if left undeterred, have the potential to interrupt, not only MENA (Middle East and North Africa) but also Asian-European trade routes as well. This is not only a Gulf issue, it's a global issue*." (Al-Sadoun, 2011).

A summary of the main impacts of maritime piracy include:

- Increasing number of seafarers killed in the act of piracy (8 - 2009, to 24- 2011);
- Around $ 5-7 billion annual average costs;
- Average ransom values between $ 4 – 5 million;
- Re-routing ships to avoid the area, especially loaded tankers of high value cargo;
- Introduction of armed security guards on board merchant ships;
- Extended military operations;
- Significant negative impact on stability and economic development of some countries in the area (Kenya, India, Yemen, Nigeria);

(OCEANS BEYOND PIRACY, 2014)

The piracy phenomenon has triggered a strong reaction within international maritime communities, bringing together private, commercial and governmental organizations in a common effort to find solutions to the problem. The efforts have paid back and the year 2012 saw substantial improvement in the global response against maritime piracy. Between naval operations, improved international coordination, continued observance of industry best practices, and increased use of private armed guards, the number of hijackings dropped 50% from 2011, and attempted attacks fell by just over 70%. The reduction trend continued since then and in 2014 there were only 3 attacks in the area, indicating the potential end of the crisis (Dryad Maritime, 2015).

It seems that the concerted, cooperative effort on the part of the community of stakeholders appears to have moved the global fight against maritime piracy out of the crisis management phase and into an era of reduced east African piracy numbers. However, it is worth mentioning that the root causes of Somali piracy have not been fully addressed yet and therefore the risk of re-ignition of piracy attacks is still a valid concern. The stabilization of Somalia and the strengthening of the other states around the Gulf of Aden and Red Sea is one of the main conditions to overcome piracy. "*The state's prime function is to provide the political good of security to prevent crime and any related dangers to domestic human security; and to enable citizens to resolve their difference with the state and with their fellow inhabitants without recourse to arms or other forms of physical coercion*" (Rotberg, 2003).

The surge of Somali maritime piracy has revealed a number of governance issues related to the safety and security aspects of the maritime transportation, the international law, and the sovereignty of State *versus* international security paradigm. The IMO has swiftly addressed the piracy issues by taking a leading role in coordinating efforts of all relevant stakeholders to alleviate the problem. These efforts materialized with the set-up of dedicated regional agreements for combating piracy, such as the Regional Cooperation Agreement on Combating Piracy and Armed Robbery against ships in Asia (RECAAP) established in November 2004 and the Djibouti Code of Conduct[42] concerning the repression of piracy and armed robbery against ships in the Western Indian Ocean and the Gulf of Aden, established in January 2009. The signatories commit themselves towards sharing and reporting relevant information through a system of national focal points and information centers; interdicting ships suspected of engaging in acts of piracy or armed robbery against ships; ensuring that persons committing or attempting to commit acts of piracy or armed robbery against ships are apprehended and prosecuted; and facilitating proper care, treatment, and repatriation for seafarers, fishermen, other shipboard

[42] http://www.imo.org/OurWork/Security/PIU/Pages/DCCMeeting.aspx - accessed 27.07.2014

personnel and passengers subject to acts of piracy or armed robbery against ships, particularly those who have been subjected to violence.

IMO has also adopted a number of internationally mandatory instruments and guidelines aiming to improve the maritime security, namely: the special measures to enhance maritime security as part of chapter XI-2 SOLAS Convention, including the International Ship and Port Facility Security Code (ISPS Code), the Best Management Practice (BMP) guidelines for possible means to protect ships from pirate attacks, Guidelines to assist in the investigation of the crimes of piracy and armed robbery against ships, Recommendations to governments, to ship-owners, to shipmasters and crews for preventing and suppressing piracy and armed robbery attacks against ships[43]. The international agreement on the use of privately contracted armed security personnel on board ships marks a significant change of the maritime security framework. Whilst the IMO has specifically mentioned that the adopted agreement is "*not intended to endorse or institutionalize*"[44] the use of armed guards, this has become a usual practice for most of the ships transiting piracy infected areas. This was a break-through decision as for the first time in the modern commercial shipping history, the peaceful and open maritime trade start using armed forces to be able to continue its role as the main transportation mean for the global commerce.

In addition to the security and economic impact of using armed forces on board, this new development had certain social and psychological consequences for the crews which had to be trained to cope both with piracy attacks and with the armed forces on board. As a consequence, whilst security has been improved by the use of armed forces on board, the seafaring job attractiveness and satisfaction has substantially decreased, raising another potential problem for the future sustainability and quality of the maritime transportation.

[43] http://www.imo.org/OurWork/Security/PiracyArmedRobbery/Pages/Default.aspx - accessed 27.07.2014
[44] http://www.imo.org/OurWork/Security/PiracyArmedRobbery/Pages/Private-Armed-Security.aspx - 27.07.2014

Maritime security concerns have also triggered the set-up of the first global maritime tracking system – the Long Range Identification and Tracking of ships (LRIT). The LRIT[45] system was conceived and approved by the IMO as part of SOLAS Convention, chapter V, and became operational in January 2009. It is a satellite based automatic reporting systems mandatory for all SOLAS vessels of more than 300 gross tonnages. Each vessel has to report its position every six hours to a Data Centre (DC) established by its Administration and this information can be exchanged between those Administrations interested to monitor certain ships or area, following a set of established rules and conditions. Today there are over 60 LRIT DCs all over the world which enable the worldwide tracking and monitoring of all commercial ships. The LRIT system is one of the main sources of information for tracking ships passing through piracy dangerous areas and good example of formal international cooperation in the maritime security domain, which eventually can be used as the first step towards a more comprehensive system.

6.2 MARITIME PIRACY – A CASE FOR COOPERATIVE GOVERNANCE

Modern maritime piracy has revealed a number of legal issues within the applicable international and national laws. Kraska and Wilson (2008) argue that the greatest challenge is not the capturing of the pirates but their detention and prosecution after being captured. The complexities stem from the numerous nationalities involved, for example; a hijacked ship may be registered in Panama, owned by a company in Germany, and operated by various nationalities. Also, most often a company in a different country owns the cargo being transported. Once the pirates hijacking the ship and/or cargo are captured the complexity that arises is, which of the nations associated with the ship and/or cargo prosecutes the pirates?

[45] http://www.imo.org/OurWork/Safety/Navigation/Pages/LRIT.aspx

Some countries (*i.e.* France, Kenya) are commended for successfully prosecuting pirates, however, most of the cases of captured pirates are treated in an *ad hoc* manner and there is no solution to detangle the diplomatic and logistical problems created by this complex situation. There were numerous catch and release cases where nations have had to return captured pirates to Somalia because jurisdiction on the case was unclear. Unfortunately, Somalia was in no capacity to process these pirates as the state lacks the governmental and social infrastructure to prosecute captured pirates. While the piracy attacks directly threatened maritime commerce in the Indian Ocean, they did not threaten any vital national interests or trigger any mutual defense treaties or arrangements. Since private individuals committed the crimes, it also meant that there was no nation that others could act against. Therefore, nations could not be compelled to participate based on existing agreements or treaties and any cooperation between nations would have to come in some form of a 'coalition of the willing' (Huggins and Madsen, 2014). There were few attempts to consider a more formal rule-of-law response, through an international tribunal or other form of extra-territorial court but most nations rejected this notion as both unwieldy and costly. From the international laws perspective, the Somali piracy has proved that the existing rule-of-law structures were neither adequate to compel nations to address the issue, nor to deter pirates from going to sea. In this context, the solution was to establish a less formal structure, based on voluntary cooperation and willingness to contribute within a multi-stakeholder arrangement bringing together governments, industry, NGOs and civil society. Initiated by United States of America, United Kingdom and supported by few other maritime nations, the new informal structure was set-up in 2008 and named the Contact Group on Somali Piracy (CGSP). The CGSP is one of the most innovative governance structures as it extends the principles of multilateralism beyond the formal structure of international organizations and agreements into an informal, free and open participation of multi-stakeholders interested to participate in the subject domain. Over time, the CGSP expanded to include over 60 countries,

20 international organizations, private industry and NGOs, representatives of sub-national entities and private security companies. The purpose and intent of the CGSP was '*to foster closer international cooperation to address the scourge of piracy off the coast of Somalia*' (Tardy, 2014), which means that the CG itself does not deliver outcomes, but encourages, supports and facilitates action by participants.

The CGSP was arguably the primary political enabler of at least three critical counter-piracy policies adopted:

(i) the remarkable voluntary operational coordination among naval counter-piracy forces operating in the region,

(ii) the measures taken by the shipping industry, including privately contracted armed security teams embarked on commercial ships transiting the Gulf of Aden, and

(iii) the creation of a legal framework for counter piracy – the Post Trial Transfer (PTT) system, a unique model of international judicial cooperation which allows that pirates convicted in regional states are transferred to prisons in Somalia to serve their sentence. Some of the prosecuting states for their part have made agreements with a number of countries participating in the international maritime law enforcement campaign, such as EU NAVFOR or NATO Operation Ocean Shield, to receive suspected pirates for prosecution. This chain from apprehension to prosecution to serving the sentence has proven to be highly effective and sustainable. A total of 1,200 individuals have been convicted of piracy in 21 states worldwide – a very clear sign that there is no such thing as impunity for pirates (Liisberg, 2014).

Despite the lack of any official standing, the CGSP has worked effectively to address the piracy challenges and has created a successful deterrence model potentially useful for other areas as well. Lessons learned during the process were used by the United Nations Office on Drugs and

Crime which has developed the UN Maritime Crime Programme[46] aiming to support regional states in building and joining up their capabilities and resources in countering maritime crime. The initial response of the international community to the rise of piracy off the coast of Somalia was to try to contain it by establishing a robust and credible military presence at sea, protecting vulnerable shipping, preventing piracy attacks and generally deterring pirates from attacking. Together, the nations affected by the activities of the pirates have both collectively or singularly deployed warship and their navies into the Somali waters to ensure safety for maritime transportation. This tactic adopted by the international community has not been very effective mainly because the world has been trying to protect their property- similarly to ideologies of traditional security. In traditional security, states provided security for their property against external adversaries. It can be interpreted that the international community perceives the pirates as adversaries attacking their states and must apply force to halt the problem. However, after the set-up of the CGSP the coordination of available resources had improved substantially and managed to create an effective security environment in the area.

The first dedicated international naval operation established in the area was the EU NAVFOR Atalanta[47], in December 2008. This was immediately followed in January 2009, by the Combined Task Force 151[48], a force of the Combined Maritime Forces with a specific anti-piracy mission mandate. Finally, the NATO's operation SHIELD[49] was established in August 2009. Each operation in itself has an international participation and the coordination between operations was ensured through regular 'Shared Awareness and De-confliction' (SHADE) meetings. It is worth mentioning that whilst each operation had a formal mandate and structure; the overall SHADE cooperation followed a similar informal approach as the political framework

[46] http://www.unodc.org/unodc/en/piracy/index.html?ref=menuside
[47] http://eunavfor.eu/ - accessed 29.07.2014
[48] http://combinedmaritimeforces.com/ctf-151-counter-piracy/ - accessed 29.07.2014
[49] http://www.mc.nato.int/ops/Pages/OOS.aspx - accessed 29.07.2014

established through the CGSP. The head of operations on a rotating basis chaired each SHADE meeting and there were no formal terms of reference, conclusions or decisions. The main focus was on information sharing in order to avoid conflicting operational tasking of the available resources. Furthermore, SHADE was also open to any participants involved in naval operations, even if outside of one of the formal operations. This allows gradual participation of countries willing to send assets in support, representatives of the industry and private security forces. SHADE has been a successful replication of the political informal governance model represented by the Contact Group on Somali Piracy at operational level.

Together, the two arrangements managed to provide immediate and effective answer to an international major threat and had made the Gulf of Aden one of the most important demonstrators of international cooperation on specific issue based on an informal multi-stakeholder collaboration.

The concept of international cooperation generated by the piracy crisis has developed beyond the Somali area in the form of the Global Maritime Partnership (GMP). GMP is a network of National navies, law enforcement agencies, shipping companies and NGOs, which tackle issues of sea-based terrorism and piracy by facilitating information flows and intelligence in a global partnership (Chalk, 2008). The main goals of GMP are to secure international waters, while allowing national navies to pursue their individual state security objectives (Berube, 2007). As such, the Global Maritime Partnership leverages the economic benefits of working together to secure state dependent international trade on the high seas through a forum where 'best practices' in the commercial industry and state security can be shared to enhance the overall safety of the seas. This provides members with 'the framework to think globally, while acting regionally' (Woodson, 2007).

Another similar arrangement is the Proliferation Security Initiative (PSI) addressing the proliferation of weapons of mass destruction. Although it does not deal with piracy per se, the PSI globalized informal structure and organizational approach is worth to mention when discerning integration procedures that can benefit the development of a globalized anti-piracy network. The PSI functions continuously as a kind of police force at sea and has been successfully employed over a dozen times (Etzioni, 2009) to facilitate concerted ship-boarding, shutting down facilities, seizing materials, and freezing assets. Like the other arrangements mentioned above, the PSI success stems from flexibility, integration and coordination, international legitimacy, and state sensitivity, without impinging upon state sovereignty in the process because it is a non-binding cooperative endeavor. Although global integration is usually met with criticism by state governments, the role global naval networks can play in combating international crisis in the 'global commons' should not be understated (Archibugi and Chiarugi, 2009); (Rahman, 2009). These global networks attempt to reconcile the conflict between Rationalists (protection of sovereign power and the centrality of state in security matters) and Internationalists (production of public goods and the centrality of people in security matters) based on the integration of organizational principles. In other words, they managed to establish a loose set of global parameters that guide the integration process beyond states to include non-state actors. This supports an effective global integration strategy that facilitates the achievement of global security goals without entering into a binding partnership where impingements on sovereignty may occur (Decker, 2010).

In the case of piracy, the capacity to establish global maritime security networks hinges on the ability of the global networks to appeal to state-centric ambitions in a situation whereby sovereign states more stringently appraise the value of adopting global policies in relation to the benefits that can be achieved through state action. The increasing influences of the information

technology and high-technology sensors and systems available for surveillance, many developed under private commercial ventures (GPS, satellite imagery and satellite based-ship tracking) also stimulate and support the globalization of maritime security based on similar models as the global social networks.

6.3 CONCLUSIONS ON SOMALI ANTI-PIRACY GOVERNANCE

The international community has achieved considerable success in its fight against Somali piracy due to close cooperation between and among states, regions, organizations, the maritime industry, the private sector and civil society. The number of piracy incidents has declined sharply (just 3 in 2014) back to the point of normality, although the root causes have not been fully addressed yet. Whilst the Somali piracy surge have pose substantial threat to the maritime transportation industry, it was also an opportunity to test and demonstrate a new type of international multi-stakeholder cooperation and governance model based on effective complementarity of formal and informal arrangements. The well-established but rather static framework of international organizations (UN, IMO, EU, NATO) complemented by the temporary, agile and open network of all interested actors (states, industry, humanitarian and social associations). The informal arrangement was able to find practical solutions to cut down on piracy, enabling the necessary time for the formal structures to set-up the required but time-consuming legal international framework and long term measures against the root causes of the piracy. The mutual support of this arrangement was able to answer the needs and interests of various stakeholders, thus also generating trust in the international capability to respond to a specific common threat.

It is claimed (Tardy, 2014) that the success of the model was partly due to the specificity of the crisis and the limitation to a closely defined geographical area where all involved stakeholders had a common interest to find quick and viable solution to the problem. It remains to be seen if similar arrangements will have same good results on other hot piracy areas. Whilst the statistics of the last three years indicates a drastic reduction of piracy on the East Coast of Africa, it also shows a constant increase on events on the West Coast, suggesting that rather than being eradicated, the piracy is changing geographical area to other parts of the world which lack similar cooperative deterrence and security models.

Somali piracy has demonstrated that a new maritime security governance model is available as a potential alternative to the traditional formal international organizations, which seems unsuitable to manage this type of issues. Political analysts talk about the "*informalisation*" (Whitfield, 2007) and the "*socialization*" (Tardy, 2014) of the political world and international governance. Cooperation is necessary because complex crises are characterized by multidimensionality and diversity of many actors involved both at local and international level. This complexity cannot be handled by a single state, as it requires a multi-layered response, which combines various components pertaining to the political, security, and humanitarian environment and which furthermore adapts to the different stages of the crisis. In other words, multifaceted and complex crises require global and interconnected responses and it is therefore necessary to adapt to this new environment (Tardy, 2013). In addition, cooperation has proved to optimize the available resources and prevent duplication, therefore further increase the reactivity to the crisis and the general effectiveness and impact. For the time being this new type of international cooperation is happening on ad-hoc basis being mainly driven by events and crisis as they happened. Within this structure of perceptions and interactions, state-level decision makers, determining whether or not integration benefits the state, hold the power to decide the future of global maritime security networks.

A number of attempts and projects are on-going for establishing a permanent network of international cooperation and information exchange in the maritime safety and security domain. The European Union Integrated Maritime Policy and Maritime Security Strategy both promote the establishment of a Common Information Sharing Environment as the basis for an Integrated Maritime Surveillance system. The United States of America has initiated the Global Maritime Partnership as an open, worldwide security network. United Nations is coordinating the Maritime Crime Programme whilst the IMO has established the LRIT system to exchange ship-tracking data at global level. These are clear examples that global oceans require global governance and States need to adapt their national policies to match and manage global issues, such as the maritime security. Further practice and research will demonstrate if *ad hoc* response approach can be extended to other international crisis or if some form of permanent and continuous informal cooperation can provide better support to address the complex challenges of international maritime domain. In concluding, is worth quoting the statement of Admiral Greenert from the latest USA maritime strategy of March 2015:

> "*The reality of today is that we have to think about the global network of navies. All it takes is a willingness to cooperate. There's a mission for everybody whether it's humanitarian assistance and disaster response, counterterrorism, counter transnational organized crime, or counter piracy*." (USCG, 2015)

6.4 GLOBAL MARITIME DOMAIN AWARENESS

Contrary to the aviation model, the maritime domain does not have yet a global maritime security and surveillance framework able to provide a worldwide picture of the on-going activities at sea. Whilst the IMO has managed to developed over the last decades a good international framework for maritime safety, the maritime security aspects were not addressed at global level until 10 years ago (2004) when under the pressure of increasing piracy attacks off Somalia coastline the IMO had agreed to include maritime security and surveillance within their working program. The main reason behind the separation of safety and security aspects was the underlying conception that safety at sea was a worldwide concern for all countries involved in maritime transportation activities, whilst the security was a matter of national sovereignty and therefore under exclusive regulation by the nation-state. The piracy has revealed that certain security issues can have global consequences and therefore cannot be managed by a single nation in isolation, requiring a similar cooperative approach as for the safety-case. Under IMO leadership important steps have been made during the last 10 years (2004-2014) towards a global maritime security framework: the adoption of the ISPS Code, the LRIT system, Best Management Practices against piracy. This section investigates further the potential steps towards a global model of sustainable integrated maritime surveillance, including the feasibility and practical measures and actions for realizing this vision. The approach is driven by sustainable development principles and promotes a change of maritime security paradigm towards a common bond shared by all stakeholders for achieving increased efficiency in the use of resources and infrastructures. It is worth outlining at this stage that sustainable development concept requires a new way of thinking and innovative solutions when reconsidering the old problems (Spangenberg, 2010) and the investigation approach to the IMS governance model is reflecting this theory as it proposes a new narrative that aims at generating a change in the way maritime security and surveillance issues are perceived. Rising to this challenge requires a

significant shift in mind-set from most of the stakeholders and the way to work this out requires very careful consideration and preparation in order to allow the new model to emerge. This section therefore envisages that the proposed model will reinvigorate the political discourse for global platforms, and in the particular case of maritime domain it will stir initiatives to effect change and replace traditional thinking by something new. The Somali piracy case has created a momentum of success, demonstrating that maritime global problems are susceptible to effective solutions if we can find the right actors, the right methods and pick our targets carefully.

Rosneau (2006) stated that global governance is the combination of all types of control mechanisms driven by different circumstance, goals and structures. However, a number of assumptions are generally associated with the concept of global governance (Pattberg, 2006) especially in the maritime domain, respectively: it is of special relevance to non-state actors (private shipping companies in our case); is concerned with new modes and mechanisms addressing global and public issues (like the case of safety and security environment of global maritime trade); and establish new levels of authority beyond the reach of the national state or international statutory organizations. Somali piracy case has proved that this type of governance can ensure fast and effective response against global threats, thus supporting the Internationalists' arguments of the primacy of human security against the concept of state-security.

At sea "*borders become colanders not canopies and they* (the nation-states) *find themselves obliged to respond with cooperative regional and global initiatives to deal with global issues*" (Pettman, 2005).

Within this context I have analyzed two important regional initiatives towards setting up Integrated Maritime Surveillance systems as the basement for improved safety and security environment at sea: a) the EU IMS use-case has demonstrated how a formal regional cooperation approach can work, whilst b) the Somali piracy case has provided a good example of informal multi-stakeholders international cooperation.

Can these models be used to develop a Global Maritime Domain Awareness system? In answering this question I have used the FSSD approach and the outcome is outlined hereunder.

6.4.1 FSSD 1st Level – System analysis

There is a number of maritime information systems that provides global maritime picture based on various sources of information. The first formal and mandatory system is the international **Long Range Identification and Tracking of ships (LRIT)** already introduced as part of EU IMS systems analysis. Developed by the International Maritime Organization and mandatory for all SOLAS contracting Governments, the LRIT system allows tracking of all ships over 300 gross tonnages engaged in international trading. The main elements of the system are: the LRIT equipment on board ship providing automatic transmission of the ship identity and position via ship's satellite communication network; the LRIT Data Centres, developed at national or regional level for tracking the ships under the flag of the establishing country(ies); the LRIT International Data Exchange (IDE), a communication automatic software allowing the exchange of data between the Data Centres; and the LRIT Data Distribution Plan (DDP) containing the rules and permissions for data exchange.

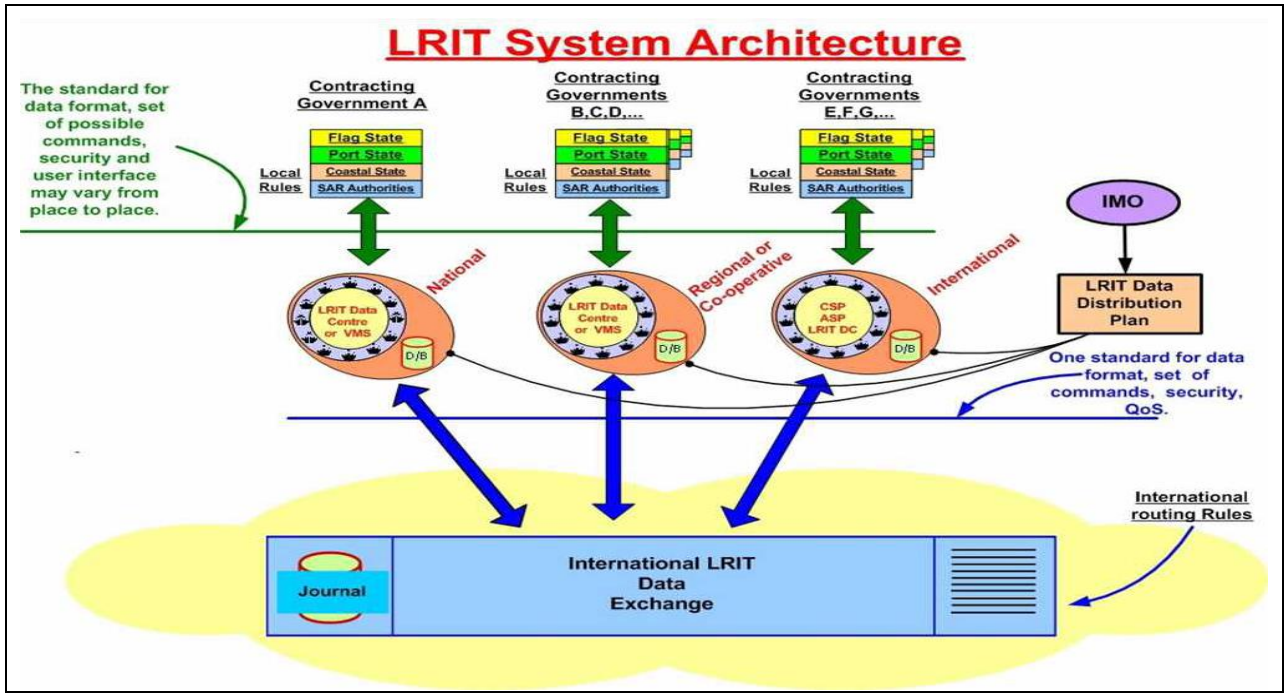

Figure 33 - International LRIT architecture

(Source: - IMO)

Operational since 2009, the LRIT system is a good example that cooperation and data exchange is possible at global level. It has established the first global governmental communication infrastructure, which is a critical requirement for any global data exchange. However, the LRIT has a number of shortfalls when analyzed from the perspective of sustainable development principles. Initiated as a global effort of all SOLAS Contracting Governments to support the improvement of maritime safety and security, its scope was diverted towards a commercial model where the Flag State establishing a Data Centre was trying to recover the costs by selling its maritime data (ship position of their ships) to other interested end-users. This is a major blocking issue in the use of the system, which undermines the initial cooperative philosophy. Despite the substantial effort invested by all countries to develop the system and the evident low use since becoming operational, an agreement towards a more economic-friendly approach could not be reached. Another shortcoming of the system is the limited information exchange, consisting just of the identification and position of the vessel. Any further information about the vessel of interest or its associated voyage has to be acquired from other sources.

In parallel with the development of the LRIT, another similar system has been developed over the last 5 years (2009-2014) using the **satellite detection of** the ship identification and position message broadcasted by the **ship's Automatic Identification System (AIS)** equipment. The AIS is also a mandatory requirement for all SOLAS ships, initially developed as an open broadcasting signal on Very High Frequency (VHF) channel (VHF maritime mobile band range is 156.0 – 162.025 MHz) to assist the navigation of ships and the anti-collision maneuvering. Technological development over the last years enables the capture of the AIS VHF signal by satellite receivers and therefore tracking of ships all over the world. Few satellite service organizations, both private and governmental, have developed their own AIS satellite network and provide worldwide ship-tracking services for any interested client (figure 34).

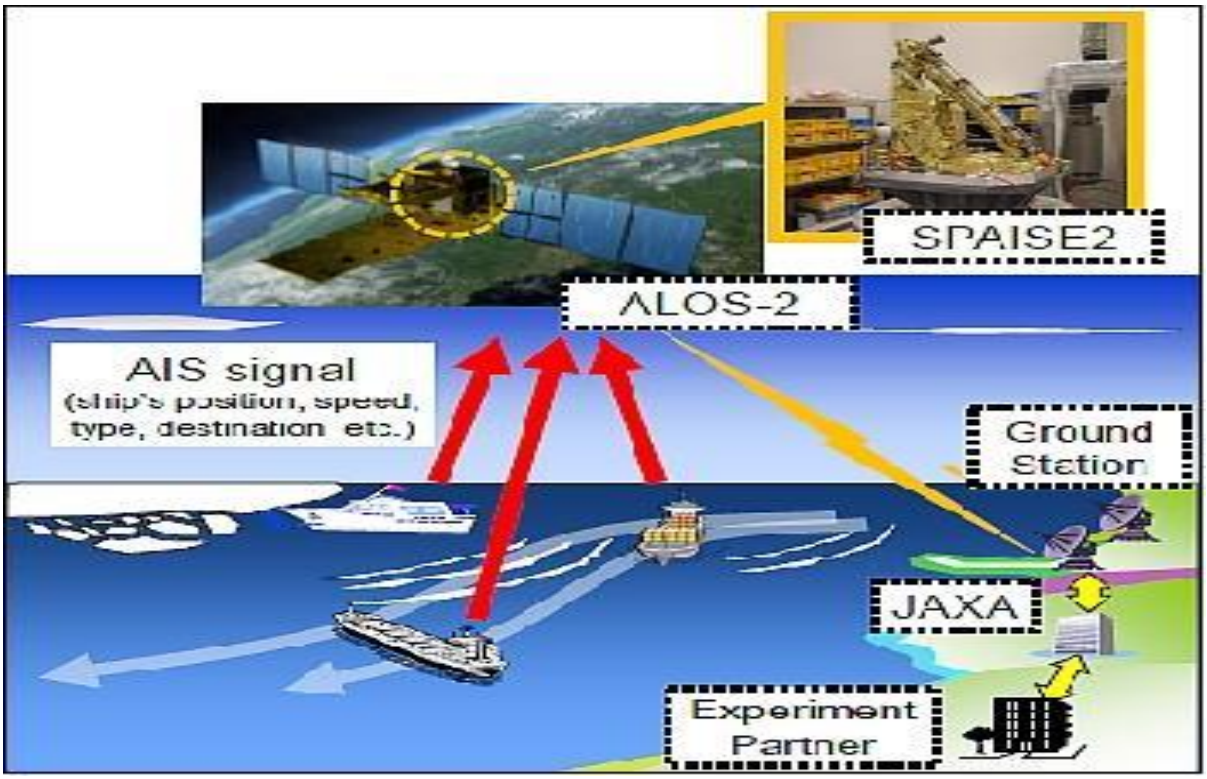

Figure 34 - Satellite-AIS architecture
(Source: - Eoportal[50])

[50] https://directory.eoportal.org/web/eoportal/satellite-missions/a/alos-2 - accessed 02.08.2014

The satellite technology also provides ship detection information using **satellite aperture radar images**, a powerful tool for detection of maritime targets at sea. The latest technical development trend in the maritime domain is the integration and correlation of all available maritime information into a comprehensive maritime picture. Both private and governmental organizations have developed and provide integrated maritime services developed in accordance with requirements of various user communities. Examples include both private services ("exactEarth"[51] or "Lloyd's List"[52]) and governmental organizations (like EMSA[53] and ESA[54]). It can be concluded that a certain level of global maritime picture is nowadays available to interested users, either from private commercial or governmental sources. Whilst this provides a fair global picture it is still based on single source and therefore constrained by sensor specific limitations. Figure 35 provides an example of the world traffic picture based on Satellite-AIS.

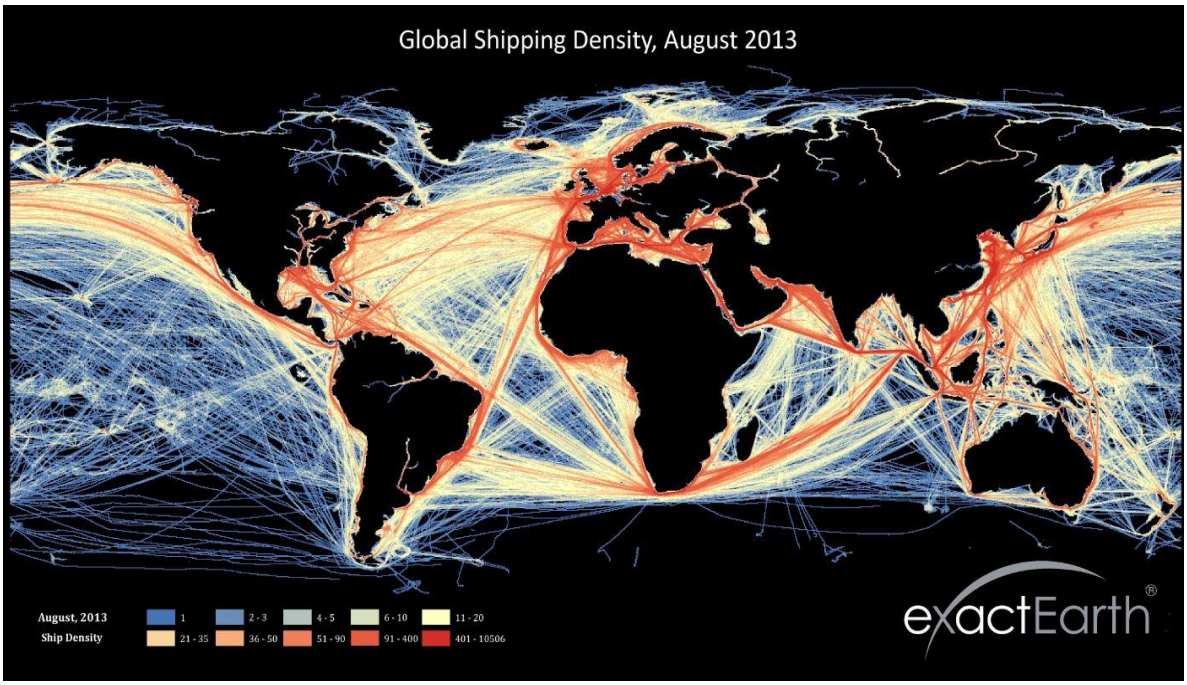

Figure 35 - "exactEarth" global maritime picture (Source: - exactEarth website[55])

[51] http://www.exactearth.com/products/exactais - accessed 04.08.2014
[52] http://www.lloydslistintelligence.com/llint/index.htm - accessed 04.08.2014
[53] http://www.emsa.europa.eu/operations/maritime-monitoring.html - accessed 07.08.2014
[54] http://www.esa.int/Our_Activities/Telecommunications_Integrated_Applications/SAT-AIS - accessed 07.08.2014
[55] http://www.exactearth.com/ - accessed 07.08.2014

However, the process of building and providing global maritime picture services does not follow the principles of sustainable development, but rather a similar path of duplication and waste of resources as it happened with the regional systems like the EU IMS. The parallel development of LRIT and Satellite-AIS stands in support of this statement. Both are using satellite-based technology and similar shipboard equipment, land-based processing data centers and communication networks for providing the same end-user service – worldwide tracking of SOLAS ships. The lack of cooperation and coordination between the two different initiatives, one politically driven by the IMO members to develop the LRIT as a global ship monitoring system and the second commercially and technically driven by private satellite service providers to develop satellite capability to capture the open-broadcast AIS signal, have resulted in 10 years of significant international effort and hundreds of millions of investment in two parallel similar global maritime systems. Furthermore, achieving a good level of satellite-AIS coverage and reporting frequency requires a large number of satellites and land-based processing stations working together within an integrated network. For example, the "exactEarth" company, one of the main Sat-AIS private service providers, operates eight satellites and 13 ground stations and plans to expand to eleven satellites and 24 stations in the near future. In parallel, another competitor, ORBCOMM[56], operates 9 satellites and plans to launch another 11 during 2015 as part of a $230 million satellite program. ESA has its own multi-million Sat-AIS program as part of the Advanced Research in Telecommunication Systems (ARTES)[57]. If from an economic perspective this situation can be argued as being a free market concurrence environment, then from the sustainability point of view it is an inefficient use of resources (financial and technical) and an over-exploitation of another "common good" of the humanity – the space.

[56] http://www.orbcomm.com/networks/satellite - accessed 07.08.2014
[57] http://www.esa.int/Our_Activities/Telecommunications_Integrated_Applications/SAT-AIS - accessed 07.08.2014

The metaphor of 'the tragedy of the commons' (1968) refers to conflicts between the quality and state of the commons (collective goods and resources) and individuals striving for optimization of their own interest. In order to achieve more sustainable systems, we need to change the current approach mainly based on the freedom of individuals towards new governance systems which combine freedom of individual development and innovation with sustainability criteria related to collective goods and their future developments. In our case, more and more satellites are flying around the Earth and "our common" space, once perceived as an unbounded immaterial concept is now gradually becoming a crowded area with conflicting interests. The computer-generated picture (figure 36) released by the ESA shows a frightening environment beyond the blue sky.

Figure 36 - objects in orbit around the Earth

6.4.2 FSSD 2nd Level – Success principles

How can a Global Maritime Domain Awareness System (GMDAS) be developed with a more sustainable approach?

IMO defines the Maritime Domain Awareness (MDA) as the effective understanding of anything associated with the maritime domain that could impact the security, safety, economy, or environment. A GMDAS should enable the detection, identification, monitoring and tracking of all vessels and activities at sea, in any ocean area of the world, using all available means and methods in an effective and efficient manner, and supporting the worldwide exchange of data between interested maritime user communities based on the (CISE) principle of "*the need to know and responsibility to share*".

The following are the success principles when analyzing the GMDAS from the sustainable development principles (FSSD):

a) **Governance**: - first of all, the GMDAS concept needs to be defined and embraced at international level by the main maritime stakeholders. The IMO might be the right place to start as it has already developed three important global systems:
   - the international LRIT, presented in the previous section (6.4.1);
   - the Global Maritime Distress and Safety System (GMDSS), an internationally agreed set of procedures, types of equipment, and communication protocols used to support emergency situations at sea and the rescue of distressed persons and ships; and
   - the Global Integrated Shipping Information System (GISIS), a repository of information associated with IMO activities, SOLAS ships and maritime ports.

However, IMO systems and databases cover only SOLAS registered ships and are available to governmental users only. For the purpose of this research I am labeling this environment as the **Global Governmental Maritime Layer** (GGML).

In addition, private commercial organizations have developed their own global maritime capabilities and services, available to any type of users upon contractual agreement. Satellite AIS and maritime communication satellite-based ship tracking services are available from various international service providers (exactEarth[58], Fulcrum[59], INMARSAT[60] and others), complex maritime databases are used for commercial statistics and market analysis (IHS[61], Lloyd's List Intelligence[62], *etc.*) and integrated platforms have been developed by ICT companies and marketed as service-to-client (CLS[63], Kongsberg[64], etc.). This is what I call the **Global Private Maritime Layer** (GPML).

The third layer, although not so visible as the other two, was described under the maritime piracy use-case (section 6.2) and is known as the **Global Maritime Partnership** (GMP), the network of National navies and law enforcement agencies. The holistic GMDAS shall define the governance and cooperation framework between these three global layers, thus providing the solution for access to all available international maritime information, according to the needs of the authorized users. To be successful, the GMDAS needs to align the interests of different stakeholders and provides incentives for their active support and participation starting from the baseline need that everyone wants a safe and secure maritime transportation environment.

[58] http://www.exactearth.com – accessed 04.08.2014
[59] http://www.fulcrum-maritime.com/lrit-systemsV2.nsf/NavCategory?OpenAgent&Category=Vessel%20Tracking – accessed 11.08.2014
[60] http://www.inmarsat.com/maritime/ - accessed 11.08.2014
[61] http://www.aislive.com/ - accessed 11.08.2014
[62] http://www.lloydslistintelligence.com/llint/index.htm;jsessionid=DDB72309245B11A355223050CC476FEA - accessed 12.08.2014
[63] http://www.clsat.com/html/solutions/maritime/welcome_en.html - accessed 12.08.2014
[64] http://www.kongsberg.com/en/kds/kncit/ - accessed 12.08.2014

b) GMDAS culture: - in 2013 the IMO launched its own concept and campaign for a Sustainable Maritime Transportation System (SMTS). The IMO SMTS document[65] contains a number of important statements relevant within the context of this research. It says that the SMTS requires "*well-organized Administrations that co-operate internationally*" (SMTS, page 9) and "*a distinct role for Governments, for industry, for international organizations and for all actors*" (page 10). This means that IMO and contracting parties undertake to develop and promote the culture of global information sharing. Unfortunately this has not been initiated yet and the last years of LRIT operation has revealed that many governments are not willing to easily share their maritime information. As a matter of fact the rules governing the use of the international LRIT system are rather restrictive by nature instead of promoting and supporting an effective data-exchange environment. In a similar manner as in the case of EU IMS, we can notice similar discrepancy at global level between the political discourse and the implementation actions. To make a change, there is a need to build a cooperative culture at international level and political declarations need to be followed by concrete supporting and awareness actions to support the acceptance of the new concepts. Whilst the SMTS document also recognizes the critical role of a reliable global maritime security environment, the associated goal is very weak and vague - "*protection measures must respond to the threats posed to sea trade*…." (page 17) – and the intended actions consist mainly of promoting and supporting regional cooperation on maritime security issues. Much more formal and informal efforts need to be done to move towards a more collaborative approach on matters of common interest and use in the maritime domain. The IMO shall promote a more cooperative international approach, which whilst being

65 http://www.imo.org/About/Events/WorldMaritimeDay/WMD2013/Documents/CONCEPT%20OF%20%20SUSTAINABLE%20MARITIME%20TRANSPORT%20SYSTEM.pdf - accessed 16.08.2014

government-led shall be coordinated, transparent and commercially-friendly in relation with the private market. For example, IMO was aware of the industry on-going SAT-AIS developments but did not address the issue and has not created any regulatory link between the two similar satellites tracking systems (LRIT *vs.* SAT-AIS), thus allowing duplication instead of collaboration. The Global Maritime Distress and Safety System (GMDSS) system is an excellent example of how resources can be shared globally for the common interest of saving life at sea. A similar arrangement can be eventually initiated for the purpose of the Global Maritime Domain Awareness System. Lessons learned at regional level (EU, Malacca Strait) should also be used to formulate and promote the GMDAS concept.

c) **Data access and systems inter-operability**: - so far, the standardization in the maritime transportation domain was mainly focused on construction of ship and its associated equipment. With respect to the maritime surveillance aspects, various ship detection and tracking systems have been developed over the last 30 years, using different technologies and data formats. In order to be able to exchange and share data, these systems need to be inter-connected with system-to-system technical interfaces. Therefore a certain degree of standardization is needed, both at system and data-format level. The IMO is presently trying to tackle these issues through the e-Navigation project defined as the harmonized collection, integration, exchange, presentation and analysis of marine information on board 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. An Implementation Plan (IP) has been approved by IMO's Maritime Safety Committee (MSC) in November 2014, which provides a road map of tasks addressing five priorities:

- improved, harmonized and user-friendly bridge design;
- means for standardized and automated reporting;
- improved reliability, resilience and integrity of bridge equipment and navigation information;
- integration and presentation of available information in graphical displays received via communication equipment; and
- improved communication of vessel traffic services (VTS) Service Portfolio.

Hopefully, the e-Navigation will provide the missing technical support for improved data exchange between all actors within the maritime transportation chain.

6.4.3 FSSD 3rd level – Strategy towards success

The strategy towards a successful GMDAS should start from an agreed definition of the concept. I have already mentioned the IMO definition of Maritime Domain Awareness (MDA) as the effective understanding of anything associated with the maritime domain that could impact the security, safety, economy, or environment. The addition of the "global" and "system" terms to this definition means that the goal of a GMDAS is to develop a global capability of interlinking various maritime systems within a worldwide network able to exchange information related to MDA aspects. The set-up of the international LRIT system about five years ago (2009) is a very good example that such a goal is feasible. The potential strategy towards a successful GMDAS could be to use the existing LRIT system as a starting point and gradually to expand its capabilities towards a comprehensive GMDAS. The timing element is also supporting this approach as few other related revision projects are on-going and can be joined within an integrated revision of IMO global maritime tools. In parallel, the IMO is undertaking the review

of the GMDSS and associated maritime safety information systems, whilst the IMO 94th MSC meeting of November 2014 has recognized the need to review and update the LRIT system in view of the experiences learned so far. The main IMO global maritime information systems are going through different levels of revision, unfortunately on a system-based, fragmented approach, instead of a more holistic integrated vision. A comprehensive, inter-systems and inter-agencies approach is needed to coordinate the local and regional IMS initiatives in a global context for finally achieving the GMDAS. The following strategic principles should be observed:

- Maximize maritime information integration to support decision-making, including integration with land, air and space based sensors and systems;
- Ensure appropriate availability of relevant information where and when needed;
- Enhanced international partnerships, cooperation, and information sharing and safeguarding, whilst maintaining the primacy of national sovereignty;
- "Responsibility to share" – states with advanced capability to collect and share maritime safety and security information shall support less developed states needing information;
- "Accountability to preserve" – for those actors which receive information from others;
- Easy access to the relevant maritime related information;
- GMDAS shall support the development of national and regional cooperation and capacity building;

Information sharing is the second pillar of a successful implementation strategy and IMO should actively promote the change of culture in the maritime information domain towards the "need and responsibility to share" mentality, where each community is exposing the available data as a contribution to the global maritime data awareness picture. In this respect, the data exchange model adopted for the international LRIT system may be considered a failure against the "need and responsibility to share" principle as it imposes tight restriction rules for the data exchange

between the LRIT Data Centres. This mentality should be changed and aligned to sustainable development principles and the EU CISE model. More and more, other regional arrangements are embracing the "need to share" principle as demonstrated by NATO Maritime Strategy[66], the Africa's Integrated Maritime Strategy[67] (AIMS), ASEAN Regional Forum[68] (ARF) and other non-aligned countries (Brazil, China, India, etc).

It is worth quoting the strategic goal of the AIMS as it reflects the principles which should be embraced at global level as well: "….*through collaborative, concerted, cooperative, coordinated, coherent and trust-building multi-layered efforts to build blocks of maritime sector activities in concert with improving elements of maritime governance*".

6.4.4 FSSD 4th level – Actions for implementation

A number of actions should be taken for a successful implementation of the GMDAS based on above-mentioned strategy:

Efficient utilization of resources through the integration of global maritime systems: - as global regulator in the maritime domain, the IMO should coordinate and harmonize the on-going revisions of its systems through an integrated process approach, rather than individual, system-based revision as it is now the case. The GMDSS, LRIT, GISIS, SAT-AIS and e-Nav revisions shall be integrated to achieve synergies, enhanced functionalities and cooperation. These systems should be inter-linked to enable data exchange, re-use and automatic cross-validation between databases. Decision should be taken as well on the use of the SAT-AIS to be a ship-tracking tool in complementarity with the LRIT system. Ideally, the LRIT specifications should be upgraded to include the use of SAT-AIS towards establishing a global satellite-based ship tracking system.

[66] http://www.nato.int/nato_static/assets/pdf/pdf_2011_03/20110318_alliance_maritime-strategy_CM_2011_23.pdf - accessed 21.08.2014
[67] http://pages.au.int/sites/default/files/2050%20AIM%20Strategy%20(Eng)_0.pdf - accessed 21.08.2014
[68] http://aseanregionalforum.asean.org/ - accessed 21.08.2014

Other available databases, such as GISIS and regional Port State Control arrangements should be also connected with the global ship tracking system to provide available ship information once a ship is identified as of interest. Weather and routing information shall be connected as well to the GMDAS to ensure updated information in support of navigation and sea-based operations.

Transparency and accountability within a Cooperative Data Exchange Policy: - closely related to the systems interconnectivity, the policy of data exchange and sharing shall be revised. Existing data policies are very restricting and system oriented, therefore a brand new cooperative data policy shall be promoted and discussed. This should include not only governmental data but also the information collected by and available within industry and private organizations (SAT-AIS, classification societies, Lloyds List Intelligence, *etc.*). The final aim should be to achieve a globally shared maritime domain awareness capability that links all relevant sources of information. This has to be supported by transparent data format standards and development of a cooperative culture at governmental level.

Promoting the principles of sustainability through the process of international law-making: - IMO was a late start promoter of sustainable principles. The IMO concept of a sustainable maritime transportation system was launched in 2013 and is still in the phase of transposing the concept in concrete plans and actions. However, a number of actions are already recommended within the context of the concept, such as: implementation of the e-Navigation services, cooperation and harmonization of maritime systems and standards, implementation of adequate security measures through the entire transportation chain (ashore, port-ship interfaces, on board) and better partnership for cooperation and coordination of capacity-building activities across the world. In addition, monitoring the implementation and effectiveness of IMO regulations and promoting better communication between all actors should be intensive activities of the IMO.

Adoption of a formal Action Plan towards GMDA might be a good tool for a safe and steady voyage towards sustainability in the MDA.

New technology and Innovation – is now available to support the development of a more sustainable and environmentally friendly maritime transportation. This should be used in all maritime activities – shipbuilding, on-board equipment, communication, propulsion and energy, cargo handling and storage. Maritime surveillance is totally dependent on technology and new sensors and surveillance means are available (thermal and ultrasonic sensors, drones and unmanned air and water vehicles) which are not yet used within the surveillance activities.

6.4.5 FSSD 5th level – Supporting tools

Available supporting tools include:

a) the existing IMO conventions which provide the regulatory framework for developing a global cooperative maritime surveillance capability;
b) the existing global systems (GMDSS, LRIT, AIS / SAT-AIS, GISIS, radio and satellite communication systems) as supporting technical tools;
c) the e-Navigation framework as operational link with the industry;
d) existing regional cooperation agreements and associated systems and technologies (EU, ASEAN, Africa, USA, South America);
e) existing military initiatives and systems for global maritime cooperation (NATO, GMP).

Relevant information for the content and data exchange within the GMDAS can be defined based on an integrated analysis of the end-users needs and feedback collected during the last 10 years (2004-2014) within each of the enlisted systems. Various studies and analyses performed during last decade outlined the main categories of maritime data required for a worldwide MDA picture, such as:

- **Vessels -** information on the flag, type, classification society, tonnage, ship's particulars, construction and outfitting, history (build, employment, and regulatory), documentation, capacities, risk profile (Port and Flag State Control inspections), incidents history;
- **Voyage** - port of origin, positional information, next port of call, last port of call, track history, mandatory reporting;
- **Cargo** - information derived from cargo manifests and bills of lading, hazard class, customs mandatory information;
- **People and Organizations** - information regarding vessel owners and charterers, crew and passengers, freight forwarders, husbanding agents, insurers, lien holders, port terminal operators, stevedores, *etc.*;
- **Infrastructure -** information on Ports, Waterways, and Facilities, vessel traffic services and vessel separation schemes, shipping routes, disposal sites, offshore sites (*e.g.*, oil fields, wind farms), underwater restrictions (cables, works);
- **Environment** – weather forecast, including wind, sea, swell, tides and currents, hydrographic and bathymetric data, regulated fisheries, marine sanctuaries, marine protected areas and species, pollution, emission control areas;

In addition of the data above, IMS services can be also listed under a defined GMDAS portfolio of services. The Maritime Service Portfolios (MSPs) developed under the IMO e-Navigation project is a good example of how standardized services can be established and made available at global level. Launched in 2006, the IMO e-Navigation initiative represents the vision of the organization for the 21st century global maritime information services and is defined as: *"…the harmonised collection, integration, exchange, presentation and analysis of maritime information on-board 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" (MSC 85/26/Add.1)[69]. Diagram 37 illustrates the concept of the IMO e-Navigation.

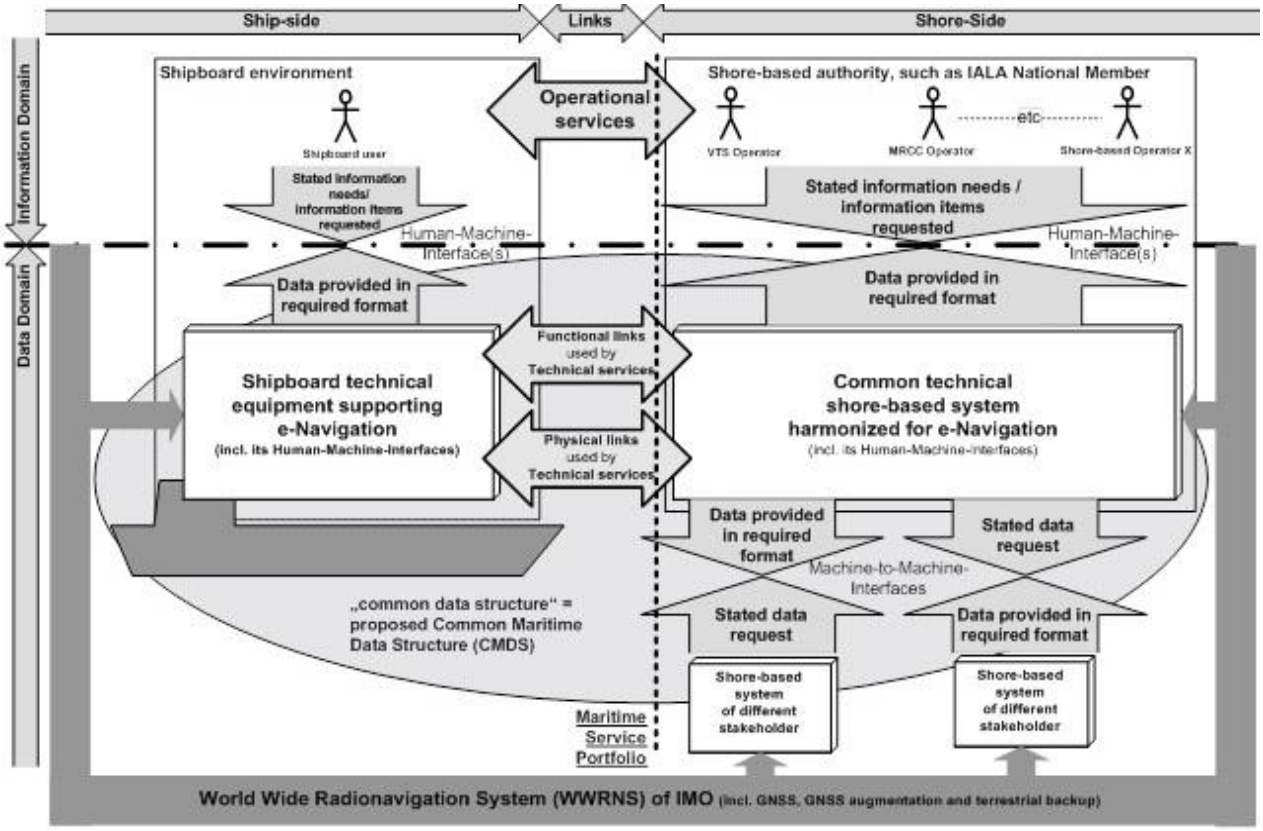

Figure 37 - IMO e-Nav architecture (Source: - IMO)

So far, important steps have been made in defining the architecture of the system, the use of common standard (IHO S-100[70]) and common data structure, the MSP[71], the Strategy Implementation Plan (SIP) for 2015-2019 and associated guidelines. The e-Nav is very much focused on potential improvements in the safety of navigation and therefore the proposed MSP consists mainly of maritime traffic related services. However, the e-Nav concept includes maritime security domain as well and the MSP can be and is expected to be extended during the bed-testing phase to cover maritime surveillance and domain awareness.

[69] http://www.iho.int/mtg_docs/com_wg/CPRNW/S100_NWG/2014/MSC%2085_26_add1.pdf – accessed 22.08.2014

[70] http://www.iho.int/iho_pubs/IHO_Download.htm#S-100

[71] http://www.e-navigation.net/index.php?page=the-structure-of-the-maritime-service-portfolios

Within this context, a diagram of potential GMDAS service as part of the IMO e-Nav MSP is provided in Figure 38.

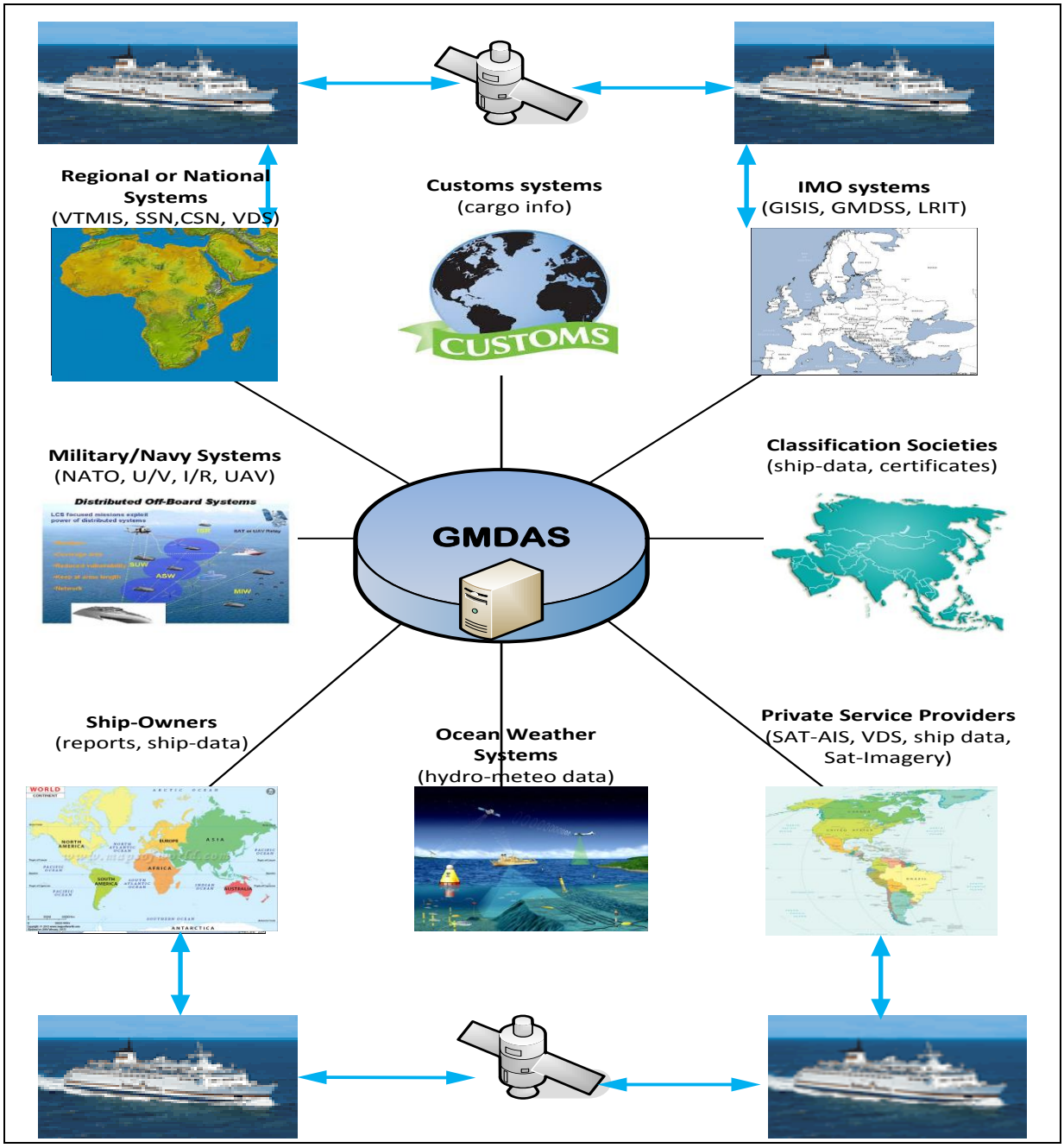

Figure 38 - GMDA diagram
(Source: - self-authored during research)

The outcome of FSSD analysis applied to the Global Maritime Domain Awareness System is summarised within Figure 39 below.

Figure 39 - FSSD model for GMDAS

(Source – self-authored during research)

6.5 CONCLUSIONS ON GLOBAL MDA

Agreement and adoption of the Global Maritime Domain Awareness (GMDA) concept would be the very first step to demonstrate how the concept of "Think globally, act regionally and locally" (Dubos, 1972) can work in practice. IMO previous initiatives for global maritime systems (GISIS, GMDSS, LRIT) are good examples of how international systems have been set-up through local developments and inter-country cooperation and connectivity. GMDA can only be achieved by joining together all local pieces of the maritime domain "puzzle" and by changing the operational culture of the sectorial maritime communities towards the "responsible to share" mentality. Information sharing is the key to better maritime domain awareness. To achieve this, there is a need for coherence and coordination of all actors and this can be eventually achieved under the leadership of the IMO if the Organization is willing and ready to change its static and reactive governance model towards a dynamic, flexible and multi-stakeholders pro-active approach. Business as usual is not good enough for sustainable development and the number of examples is increasing each day. The evolution of piracy and illegal migration at sea from sporadic acts to a flourishing, albeit illicit, business shows the weaknesses of the existing governance framework. There is clearly a need for a new type of governance benchmark and the principles of sustainable development can offer the solution. If the reference values are changed from the individualistic accumulation competition, towards common contribution towards humanity and Earth sustainable development, organizations might change as well towards a more responsible and cooperative behaviour based on trust, low levels of corruption, democratic stability, and relative economic equality.

CHAPTER 7: FINAL CONCLUSIONS

7.1 GLOBAL MARITIME GOVERNANCE

> "*The successes of the MDG agenda prove that global action works. It is the only path to ensure that the new development agenda leaves no one behind. At the core of this agenda is sustainable development, which must become a living reality for every person on the planet."* (Ki-Moon, 2015)

Initiated at the beginning of the new millennium, the United Nations Millennium Development Goals (MDGs) program was the most ambitious global initiative to fight poverty and promote a better world. Since then, even if uneven and on occasion beyond our wishful thinking, enormous progress has been made towards achieving the MDGs:

- Global poverty continues to decline - the proportion of people leaving in extreme poverty (with less than $1.25 a day) was reduced by half;
- More children are attending primary school – from 83% to 91% in developing regions;
- Child deaths have dropped dramatically – global under-five mortality has declined more than half against 1990 (from 90 to 43 deaths per 1000 live births);
- Access to safe drinking water has been greatly expanded – the proportion of population without sustainable access to safe drinking water was reduced by half;
- Targeted investments in fighting malaria, AIDS and tuberculosis have saved millions – number of malaria and other major diseases was reduced by half and access to HIV/AIDS treatment is now available to all those who need it; (UN, 2015)

Whilst these are important achievements, much remains to be done towards the final objective of building a better world for all and year 2015 is an important milestone of this process. The UN Member States will meet in September to define the Sustainable Development Goals (SDGs) for the next 15 years (until 2030). Continuing the work and results achieved so far under MDGs program, the renewed SDGs' commitment includes important transformative changes relevant within the context of this research. The post-2015 SDGs calls for global partnership to build peace through effective, open and accountable public institutions using a science-based and action-oriented approach for integrating the interdependent dimensions of sustainable development: economic, social, environmental and governance (UN SG, 2015). Governance is now recognized as the fourth pillar of sustainable development and a critical one to promote cooperation, solidarity, mutual accountability and inclusive participation of all stakeholders. In support of this approach and as demonstrated by the exponential development of global dialogue and socialization internet-based platforms, people call for "*data and information revolution*", asking for availability, quality, accessibility and broad dissemination of information relevant for the common well-being, sustainable and safe development of future activities (UN SG, 2015).

This research has followed and applied these principles in the maritime transportation domain, trying to outline action-oriented measures towards a new, integrated data-sharing global environment for Maritime Domain Awareness. International trade is largely dependent on maritime transportation and an efficient and sustainable global trade and transportation system cannot be achieved without an adequate safety and security environment. As the maritime transportation is a world-wide activity involving the use of oceans "common good", the associated Maritime Domain Awareness and information system should be regarded as global common as well, build through international transparent and accountable cooperation.

All needed elements are available: various maritime surveillance systems, high data processing and integration capabilities; defined user communities with clear roles and responsibilities, necessary knowledge and know-how to use the information for decision-making process. However, one critical element is missing, or better said, has not followed the fast changing maritime globalization process: Good Governance for cooperative integrated MDA.

Still driven by traditional nation-state and sector-oriented arrangements, Maritime Domain Awareness has not yet adopted the integrated trans disciplinary approach required by its global dimension. Transdisciplinarity combines interdisciplinarity (combination of various sciences) with participatory contribution of all involved communities, including non-scientific knowledge and input (experience, feedback, opinions from NGOs and general public). Despite many political declarations of intent for moving towards integrated maritime surveillance, data sharing and cooperation, concrete actions are so far limited to temporary regional ad-hoc cooperation models in response of a specific threat or problem (*i.e.* Somali piracy, Mediterranean illegal immigration). Maritime surveillance information is still collected, processed and used in a segregated manner with little interoperability and data exchange between the sectorial user communities. Using the principles of sustainable development, this research has identified potential way forward towards establishing permanent integrated MDA arrangements at EU and global levels.

The outcome is summarized in table 3 containing the general guidelines for sustainable integrated MDA governance approach:

Integrated MDA Governance Guidelines	Social Reasoning	Economic Reasoning	Environmental Reasoning	Governance Reasoning
Adopt global system and sustainable development thinking for MDA	Remove barriers between sectors and nation-state centric approach	Replace duplication by integration, achieve synergies	Limit impact on resources and environment	Elevate MDA as component of global common peace and security
Align MDA vision with stakeholders' needs	Ensure responsible participation, understanding and commitment	Ensure support and resources from each participant	Efficient use of available resources	Ownership and accountability for participation
Transparent engagement of all stakeholders	Support all communities, create trust	Share resources and benefits, increase efficiency	Awareness of dependencies and crossing impacts	Create identity, clarify role and responsibilities
Create supporting legal framework	Remove data sharing barriers	Provide legal justification for resource allocation	Ensure enforcement and compliance	Create legitimacy & implementation mechanisms
Allocate resources	Support social needs and personal development	Ensure efficiency and effectiveness	Support ecological actions and developments	Ensure equality and ownership
Create integrated MDA culture	Support learning and understanding of new concepts	Support improved performance by creating know-how	Create awareness of environmental aspects	Create identity, knowledge and adaptability
Create technical framework	Provide clarity and understanding	Support efficiency through standardization	Integration of standards and requirements	Acceptance and harmonized implementation
Create dialogue, communication and feedback	Participation, contribution, learning and understanding	Support efficiency, timeliness, productivity, improvement	Ensure awareness, reactivity, report Remove boundaries	Create common knowledge, trust, interaction, progress

Table 3 – Guidelines for integrated Maritime Domain Awareness governance model (Source: - self-authored during research)

These guidelines, associated with other sustainable development tools (like FSSD), are intended to support the creation of mental models of vision and comprehensive strategy for integrated Maritime Domain Awareness approach at any level. Changing towards a sustainable way forward is possible if political will, good governance and the necessary resources are mobilized to strengthen the common goals and if decision is taken for working together. All stakeholders will benefit from a cooperative approach by having access to enriched layers of information especially when risks or threats are trans-boundary and exceeds the individual capability for efficient management.

7.2 RECOMMENDATIONS FOR FURTHER RESEARCH

The outcome of the research project reveals synergies between sustainable development principles and the Maritime Domain Awareness. However, the research was conducted using mainly one sustainable development tool (the Framework for Strategic Sustainable Development) and two relevant use-cases (the EU Integrated Maritime Surveillance and the Somali anti-piracy cooperative governance). In this respect, there is room for further investigation by using other sustainable development tools and methodologies within MDA area. The research on global governance is well developed and continuously growing, however, the applicability of global governance models in the specific area of MDA and maritime surveillance is rather limited. This is an opportunity for research on other regional MDA models to better understand the specificities of the main maritime regions as these may raise additional challenges not existing in the two main use-cases of this research.

Additional research is also recommended on the role of international organizations in the maritime domain. During the investigation process I have encountered significant work on the global governance theories and their association with international organizations. The role of United Nations in promoting sustainable development from theory to practice through the Millennium Development Goals (2000 – 2015) and nowadays the Sustainable Development Goals (2015-2030) programs is an outstanding example of international leadership towards sustainability. It would be interesting to analyze why the IMO has not followed the same pro-active development and so far has failed to create a similar global security environment as in the aviation field, for example, where the International Civil Aviation Organization (ICAO) has managed to achieve worldwide information sharing between national air traffic control centers. There is no reason why IMO cannot apply similar concept approach for maritime transportation.

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Annex 1 – DRAFT EU IMSS DIRECTIVE

The European Integrated Maritime Surveillance System (EU IMSS)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Articles 43(2), 100(2), 192(1), and 194(2) thereof,

Having regard to the proposal from the European Commission,

Having regard to the opinion of the European Economic and Social Committee,

Having regard to the opinion of the Committee of the Regions,

Acting in accordance with the ordinary legislative procedure,

Whereas:

(1) The rapidly increasing demand for maritime space for different purposes, such as installations for the production of energy from renewable sources, oil and gas exploration and exploitation, maritime shipping and fishing activities, ecosystem and biodiversity conservation, the extraction of raw materials, tourism, aquaculture installations and underwater cultural heritage, require an integrated maritime surveillance approach.

(2) Enhancing information exchange between maritime surveillance authorities is one of the key strategic objectives of the Union under the Integrated Maritime Policy (IMP), and an important building block of the Maritime Security Strategy. Strengthening the security of our seas and oceans is also an essential part of the blue growth agenda to create growth and jobs.

(3) The IMP identifies the gradual achievement of an integrated network of vessel tracking and e-navigation systems for European coastal waters and the high seas, including satellite monitoring, as a cross-cutting policy tool enabling public authorities and stakeholders to improve the situational awareness and reaction capability for the purpose of detecting, preventing and combating any activity at sea that could impact the security, safety, economy, or environment.

(4) This Directive forms part of the European model of integrated policies and aims to support the successful implementation of the Common Information Sharing Environment (CISE) for the surveillance of the maritime domain of the Union as detailed in the communication entitled "*Better situational awareness by enhanced cooperation across maritime surveillance authorities: next steps within the Common Information Sharing Environment for the EU maritime domain*".

(5) In order to further support the sustainable coexistence of EU maritime information systems and, where applicable, the appropriate apportionment of relevant uses in the maritime space, a framework should be put in place that consists at least of the establishment and implementation by EU agencies and Member States of an Integrated Maritime Surveillance System. The EU Integrated Maritime Surveillance System (EU IMSS) will contribute to more effective and sustainable use of maritime information resources, by creating a framework for consistent, transparent and evidence-based decision-making.

(6) Since the objectives of the proposed action, namely the set-up of the EU IMSS cannot be sufficiently achieved by the Member States alone and can therefore, by reason of the scale or effects of the proposed action, be better achieved at Community level, the Community

may adopt measures, in accordance with the principle of subsidiarity as set out in Article 5 of the Treaty. In accordance with the principle of proportionality, as set out in that Article, this Directive does not go beyond what is necessary in order to achieve those objectives and should not hinder Member States from establishing, operating and integrating their own national maritime information systems and from developing their own national maritime policies and national integrated platforms, but should rather aim to contribute to those policies through the integration and cooperation process.

(7) The establishment of a framework for the IMSS is necessary in order to strengthen the exchange of information and the operational cooperation between national authorities of Member States and between the existing EU maritime-related Agencies: the European Maritime Safety Agency (EMSA); the European Fishery Control Agency (EFCA); the European Agency for the Management of Operational Cooperation at the External Borders of the Member States (FRONTEX); the European Defence Agency (EDA). The involved Agencies and the Member States should make the best possible use of existing systems and capabilities in terms of human and technical resources, both at Union and national level.

(8) In order to ensure consistency and legal clarity, the geographical scope for EU IMSS should be defined in conformity with existing legislative instruments of the Union and international maritime law, in particular UNCLOS. The competences of Member States relating to maritime boundaries and jurisdiction are not altered by this Directive. In order to respect proportionality and subsidiarity, as well as to minimise additional administrative burdens, the transposition and implementation of this Directive should to the greatest extent possible build upon existing national, regional and local rules and mechanisms.

(9) This framework Directive does not interfere with Member States' competence for maritime traffic monitoring, as laid down in Dir. 2002/59/EC. The main purpose of EU IMSS is to promote sustainable development and encourage multi-purpose uses of maritime space, systems, information and resources.

(10) Timely transposition of this Directive is essential since the Union is confronted with various and urgent maritime challenges, such as the illegal emigration in Mediterranean Sea, piracy attacks against EU-flagged vessels and the increasing maritime activities in EU waters, and which this Directive aims to support and complement.

(11) Any exchange of personal data in the IMSS should constitute an exception. It should be conducted on the basis of existing national and Union law and should respect the specific data protection requirements. Directive 95/46/EC of the European Parliament and the Council (1), Regulation (EC) No 45/2001 of the European Parliament and the Council (2) and Council Framework Decision 2008/977/JHA (3) are applicable in cases where specific instruments, such as Reg. (EC) No 2007/2004, do not provide a full data protection regime.

(12) The implementation of this Directive does not affect the division of competence between the Union and the Member States under the United Nations Convention on the Law of the Sea, the International Convention for the Safety of Life at Sea, the International Convention on Maritime Search and Rescue, the United Nations Convention against Transnational Organized Crime and its Protocol against the Smuggling of Migrants by Land, Sea and Air, the Convention Relating to the Status of Refugees, the Convention for the Protection of Human Rights and Fundamental Freedoms and other relevant international instruments.

HAVE ADOPTED THIS DIRECTIVE:

CHAPTER I

GENERAL PROVISIONS

Article 1

Subject matter

1. This Directive establishes a framework for the EU Integrated Maritime Surveillance System (EU IMSS) aimed at promoting the cooperation and data exchange in the maritime domain with a view to enhancing the safety, security and efficiency of maritime surveillance, improving the response of authorities to incidents, accidents or potentially dangerous situations at sea, including search and rescue operations, and contributing to a better Maritime Domain Awareness (MDA) situation at EU level.
2. Within the Integrated Maritime Policy of the Union, this framework provides for the establishment and implementation by Member States and EU Agencies of the EU IMSS based on the principles of the Common Information Sharing Environment as detailed in the EC Communication COM/2014/0451.

Article 2

Scope

1. This Directive shall apply to maritime surveillance activities of the EU sea borders, including the detection, identification, monitoring, tracking, prevention and intervention of and upon all activities at sea that could impact the security, safety, economy, or environment.
2. This Directive shall apply to all seven maritime user communities of the MSs as identified within CISE Communication COM(2010)584 and to all EU Agencies having responsibilities within maritime surveillance domain, respectively: the European Maritime Safety Agency (EMSA); the European Fishery Control Agency (EFCA); the

European Agency for the Management of Operational Cooperation at the External Borders of the Member States (FRONTEX); the European Defence Agency (EDA).

3. This Directive shall not affect the sovereign rights and jurisdiction of Member States over marine waters which derive from relevant international law, particularly UNCLOS and shall not interfere with Member States' competence to design and determine, within their marine waters, the extent and coverage of their national maritime surveillance systems.

Article 3

Definitions

For the purposes of this Directive, the following definitions apply:

(1) 'Integrated Maritime Policy' (IMP) means the Union policy whose aim is to foster coordinated and coherent decision- making to maximise the sustainable development, economic growth and social cohesion of Member States, and notably the coastal, insular and outermost regions in the Union, as well as maritime sectors, through coherent maritime-related policies and relevant international cooperation;

(2) EU Maritime Domain Awareness (EU MDA) is the effective understanding of anything associated with the maritime domain that could impact the security, safety, economy, or environment of the EU sea borders;

(3) EU IMSS is the information exchange network established under the framework of this Directive for the purpose of achieving the EU MDA;

(4) EU Vessel Traffic Monitoring and Information System (EU VTMIS) is the system established by the Directive 2002/59/EC ;

(5) EU Vessel Monitoring System (EU VMS) is the system established by the Regulation EU 404/2011, Chapter V ;

(6) EUROSUR is the system established by the Regulation EU 1052/2013 ;

(7) Vessel Detection System (VDS) is the capability of detecting targets at sea using satellite based aperture radar images;

(8) Cooperative targets: - are the ships and assets at sea which continuously provides their identification by the use of electronic means and equipment;

(9) Non-cooperative targets: - are the ships and assets at sea which do not provide their identification in an automatic and continuous manner and therefore requires interception and/or interrogation;

(10) Near-real time: - means that any information exchanged through the IMSS shall be processed within maximum 30 minutes from the request of the end-user;

CHAPTER II

Integrated Maritime Surveillance System (IMSS)

Article 4

Establishment of the IMSS

1. The EU IMSS consists of the following maritime information systems and components:

   a) EU VTMIS;
   b) EU VMS;
   c) EUROSUR;
   d) MARSUR;
   e) National IMSS;
   f) System-to-system interfaces;
   g) Web-based Graphical User Interfaces;
   h) Communication protocols;

2. All components of the EU IMSS shall be interlinked using system-to-system and web-based interfaces, as agreed on bilateral basis, depending on the type of information to be exchanged. These interfaces shall be complimented by agreed data format translators and communications protocols to ensure the interoperability of the components.

3. Each Member State and each EU Agency indicated in this Directive shall establish and implement the EU IMSS. In doing so, they shall take into account and re-use to the maximum possible extent the existing maritime information systems provided they are in conformity with the requirements of this Directive.

Article 5

EU IMSS operational framework

1. The EU IMSS operational framework is based on CISE principles. It consists of a number of maritime information layers provided by existing EU systems as described hereunder:
   a. EU Fishery information layer: – consists of the detection, identification and tracking of fishing vessels active within EU sea areas. The information is collected and provided by national Fishing Monitoring Centres and centralised by EFCA;
   b. EU VTMIS information layer: – consists of the detection, identification and tracking of all SOLAS vessels over 300 gross tonnages. The information is collected and provided by national VTMIS centres and centralised at EU level by EMSA;
   c. The combination of the Fishery and VTMIS information layers provide the EU Cooperative Maritime Picture (CMP);
   d. EU Maritime Border Control (MBC) information layer: – consists of the detection, identification and tracking of any non-cooperative vessel and/or activity within EU sea border areas. The information is collected and provided by the national coordination centres and centralised at EU level by FRONTEX;
   e. EU Navy information layer: – consists of maritime military information collected by national maritime information systems and exchanged at EU level via MARSUR network operated by EDA;
   f. The combination of the MBC and Navy information layers provide the EU Non-Cooperative Maritime Picture (N-CMP);

Article 6

Minimum requirements for IMSS

1. EU IMSS shall be operational 24 hours a day, 7 days a week, with availability Key Performance Indicator (KPI) of 95% per day and shall allow for the bilateral and multilateral information exchange in near-real time and the secure handling, storing, transmission and processing of maritime information, including EU classified information up to the level of EU RESTRICTED.

2. IMSS shall be based on the interoperability principles and a Service Oriented Architecture that enable flexible interconnection with other systems and provides the users with secure, validated, and appropriate access to each other's data, while protecting personally identifiable information, proprietary, and security information.

Article 7

IMSS objectives

1. The IMSS shall improve detection, collection, and identification capabilities that can be used to monitor the cooperative maritime traffic and to discover the uncooperative maritime ships or activities of interest that represent threats, challenges, and opportunities to the EU MDA in order to facilitate timely, accurate and informed decision-making.
2. Improve EU MDA by effectively integrating data, intelligence, law enforcement information, from all available public and private sources, by modernizing maritime information sharing, safeguarding architecture, infrastructure, and processes to meet future validated requirements; and encouraging stakeholder collaboration.

3. Enhance the protection of maritime infrastructure by sharing and safeguarding relevant information to protect critical nodes and controlling the access to those with validated permission and relevant roles and responsibilities.
4. Improve the MDA governance by providing the baseline framework for cooperation and information exchange by developing web-centric enterprise maritime services using data from multiple sources, promoting cooperation and synergies between all involved actors.

Article 8

Data use and sharing

1. Information contained in the EU CMP layer shall be made available to any EU governmental user having a legitimate professional interest in the maritime domain. The Agencies responsible for the CMP (EMSA and EFCA) will elaborate and maintain a joint User Management Policy detailing the user profiles and associated data access rights.

2. Information contained in the EU N-CMP layer shall be made available only to authorised EU governmental user. The two Agencies responsible for the N-CMP (FRONTEX and EDA) will elaborate and maintain a joint User Authorisation Policy detailing the type of information available and associated authorisation requirements and user profiles.

CHAPTER III

The management of EU Integrated Maritime Surveillance System

Article 9

EU Coast Guard Agency

1. The operational and technical management of the EU IMSS shall be provided by the EU Coast Guard Agency (ECGA).
2. The ECGA shall establish and maintain the IMSS network as required by this Directive and shall provide the necessary technical support to all participating parties to ensure the secure exchange of the required information.
3. Member States' authorities and the involved EU Agencies using the IMSS shall ensure that equivalent security rules and standards as those developed by the ECGA are used for handling the IMSS information.

Article 10

EU Maritime Domain Awareness Picture (EU MDAP)

1. The ECGA shall establish and maintain the MDAP in order to provide effective, accurate and timely information of activities within a 200 Nautical miles from the EU coastlines.
2. The EMDAP shall contain both the CMP and the N-CMP layers and shall be able to accommodate other information layers, such as information from off-shore developments or activities, own assets or operations, weather conditions, buoyage systems, pleasure crafts, other sources.

Article 11

Cooperation with third countries

1. The ECGA shall endeavour, where possible, to cooperate with third countries on their actions with regard to maritime surveillance in the relevant marine regions and in accordance with international law and conventions, such as by using existing international forums or regional institutional cooperation or by means of bilateral cooperation agreements.

2. Before any agreement referred to in paragraph 1 above is concluded, the ECGA shall notify the agreement to the Commission, which shall verify that its provisions comply with EU Regulations. Once the agreement is concluded, the ECGA shall notify it to the Commission which shall inform the European Parliament and the Council.
3. Information between EU IMSS and participating third countries shall be exchanged via communication networks able to fulfil similar criteria of availability, integrity and security.

Article 12

Industry and Public participation

1. The EUCG shall establish a framework for industry and/or public participation to the EU IMSS where relevant. Such participation may include the integration of maritime information from private sources (commercial providers, ship-owners) or public sources (pleasure boats, voluntary associations, citizens).
2. Subject to the EC and MSs' approval, specific information can be made available to the industry (i.e. LRIT and Sat-AIS information) and to the public (historical data, statistics).

Article 13

Handbook

1. The ECGA shall, in close cooperation with the EC and MSs, make available a practical IMSS handbook that will provide the necessary technical and operational guidelines and best practices for the use of EU IMSS. The Handbook will be promoted by the EC in the form of a recommendation.

Article 14

Monitoring and reporting

1. For the purposes of this Regulation, the ECGA and the Member States shall ensure that procedures are in place to monitor the technical and operational functioning of the IMSS against the objectives of achieving an adequate maritime domain awareness picture within EU waters.
2. The Commission shall provide an overall evaluation of EU IMSS to the European Parliament and the Council by 1 December 2020 and every four years thereafter. That evaluation shall include an assessment of the results achieved against the objectives set, of the continuing validity of the underlying rationale, of the application of this Regulation in the MSs and by the Agencies. That evaluation shall be accompanied by appropriate proposals to amend this Directive.

Article 15

Entry into force

This Directive shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union.*

Article 16

Addressees

This Directive is addressed to the Member States and the indicated EU Agencies.

Done at Brussels, xxxxxx

For the European Parliament *For the Council*

The President Xxxxx *The President xxxxx*

Annex 2 – IMDatE Agenda and Minutes of Meeting with EU MSs

3rd IMDatE Meeting **Lisbon, 8th November 2013**

Agenda

Time	Agenda Item	Speaker
08:30 – 09:00	***Registration & coffee***	--
09:00 – 09:30	**1. Welcome and opening of meeting**	EMSA
09:30 – 10:00	**2. Background and Approach for developing an Integrated Maritime Data Environment**	EC - DG MOVE
10:00 – 10:30	**3. Economical, technical and operational principles of the IMDatE project**	EMSA
10:30 – 11:00	***Coffee Break***	
11:00 -11:30	**Overview of the IMDatE project**	EMSA
11:30 – 12:00	**IMDatE functional prototype**	EMSA
12:00 – 12:30	**IMDatE: supporting future needs for traffic monitoring**	EMSA
12:30 – 14:00	***Lunch Break***	
14:00 – 15:30	**Round-table discussion on IMDatE**	All
15:30 – 16:00	***Coffee Break***	
16:00 – 16:45	**Possible establishment of an ad hoc IMDatE User Group?**	EMSA
16:45 – 17:15	**Summary and conclusions**	**EMSA**
17:15 – 17:30	**Any other business**	All

Chairman welcome and opening

EMSA opened the meeting by welcoming all delegates. The willingness of both MSs and EU bodies to share experiences was recognised and appreciated. Only through such exchange of information can the IMDatE services reach their full potential for adding operational value.

The two main drivers behind IMDatE were explained: 1) the growing awareness at policy level of the need to fuse data; 2) the various pieces of legislation which prompted links between different data streams.

The agenda of the meeting was outlined, and the meeting participants were informed that the report of the meeting would be presented at the High Level Steering Group, to take place on 16 January 2014 (TBC).

Update and overview of IMDatE project

The presentation on the update and overview of the IMDatE project reminded participants of the process leading up to the initiation of the project. Moving the EMSA IT systems in-house in 2010 prompted the realisation that there would be the need for harmonisation between the systems, not only to improve the services offered to outside users, but also to facilitate the management of the systems internally.

The progress over the period 2010-2013 was reviewed, from kick-off, through to pilot projects, and the 'go-live' in March 2013. It was explained that the final deliverables for the main development phase of the platform are expected by the end of 2013, when the existing contract ends, and the final version will be in place in early 2014. This version will be made available for operational use on a voluntary basis.

The meeting participants were reminded that some activities fall explicitly outside the scope of IMDatE; there is no intention to replicate existing specialized capabilities, such as ordering of satellite images, billing of the Long Range Identification and Tracking (LRIT) Data Centre, SafeSeaNet PortPlus exchange, etc.

An overview was provided of plans for 2014. Once the development phase is complete, Member State users of the existing systems (SafeSeaNet, LRIT, CleanSeaNet) will be able to choose whether they wish to continue receiving individual services separately, or one integrated service.

Introduction to Member States Pilot Service

In relation to the pilot service established for interested volunteer Members States (currently nine: France, Germany, Ireland, Italy, Portugal, Malta, the Netherlands, Spain and the United Kingdom), an overview was given of activities over the period since March 2013.

The presentation covered the following points:

1. Users and organisations
2. One single screen
3. Integrated ship tracking
4. Satellite AIS data stream
5. Member state specific tracking data
6. Sharing of data
7. System-to-system interfaces
8. Automated behaviour monitoring
9. Overlay of custom layers

The presentation illustrated the way in which Member States bring specific data types into the system for fulfilling their operational requirements, and emphasized that the system can handle all relevant access rights and distribution policies as requested.

IMDatE demonstration

A live demonstration was given of the IMDatE service, covering the services established for EU bodies and member state pilot project volunteers. This went through the functionalities of the system, showing meeting participants how the features can be used and displaying some of the additional data provided by the member state pilot project volunteers. All participants, including those who do not currently use the system, were able to obtain a clearer overview of how it works, and can be tailored according to user needs and to the data sources available.

Discussion

Following the live demonstration, there were a number of questions, revealing a high level of interest from participants.

Poland asked about medium-term plans for continuing with services to member states following the termination of the initial phase of the pilot project at the end of 2013, and whether IMDatE would be included in the revised Directive 2002/59/EC establishing a Community vessel traffic monitoring and information system (VTMIS Directive). A question was also posed regarding whether or not there is a specific format foreseen for the system-to-system interface.

The Commission responded with regard to the revision of VTMIS Directive, explaining that consultations have been taking place for the revision of the Directive, and the Impact Assessment is still on-going. Once the process is complete, the various policy options will be assessed.

EMSA explained that while revisions to the legislation are pending, use of IMDatE remains entirely voluntary. This also has implications in terms of ease of access to data. There may be restrictions depending on the data type in question, and at the moment the process for requesting access to some types of data can be quite time-consuming. Hopefully, with the revision of the relevant legislation, this process will become easier.

However, it was emphasized that EMSA only allows access to data under defined conditions, and that these are based on the rules given by the relevant National Competent Authorities (NCA). This follows a bottom up approach, where the notion of 'functions' rather than 'user communities' is used. The example was given of CleanSeaNet data, which, depending on the competent authority in the member state in question, may be provided to an environmental institute, the navy, the coast guard, or the maritime authority. The service is delivered to whoever is responsible for the function of pollution monitoring in the state, regardless of the organisation to which they belong. With regard to system-to-system interfaces, it was explained that IMDatE is able to provide information in different formats and protocols. Whenever a request is received, EMSA will try to provide the data in whichever format is preferred by the user.

The United Kingdom representative explained that the greatest challenge in involving other UK counterparts in using IMDatE has been technical. IMDatE is supported on Chrome and Firefox, but not on Internet Explorer, which is more widely used in an institutional setting. EMSA explained that the reason why IMDatE is available only on Chrome and Firefox is related to the limitations regarding the use of WebGL on Internet Explorer. Currently, the only way to resolve this is through using a plug-in.

Denmark asked whether IMDatE would be fully available via XML for the system-to-system interface. EMSA confirmed that it would be, and that IMDatE can provide information in accordance with a range of different formats, depending on what the user prefers. Sometimes it may take a while to set up services due to the time it takes to install security certificates, etc. The team in EMSA is available to respond to any technical question, and willing to help in any way possible.

Feedback on member state pilot services

Of the volunteer member states involved in the pilot project, Greece, Ireland, Italy, the Netherlands, and the United Kingdom, agreed to provide feedback by way of presentations. Malta, Spain and France also provided brief overviews of their experiences.

Greece

Greece provided an overview of the elements which condition maritime activities in Greece. The presentation addressed how Greece has been using the service for validating AIS data through other data sources, cross-checking SafeSeaNet and for extending the coverage of vessel tracking through the use of satellite AIS. Extensive use is made of the replay capability in relation to marine accidents and oil spills. In terms of evolution of the IMDatE platform, Greece expressed a wish to receive additional SSN information on expected port arrival and departure times, enhanced satellite AIS coverage, elimination of some of the system bugs, and the inclusion of watchdog functionality.

The Netherlands

The Netherlands presented the range of tasks currently being undertaken by the Coastguard, which span a wide range of maritime activities. The organisational structure of the Maritime Information Centre-NL was also introduced. The Netherlands presented three examples of how IMDatE has been used: to reconstruct events leading up to the collision of a guard vessel and a fishing vessel; to search for a missing buoy; and in a case of suspected drug trafficking.

The Netherlands outlined future expectations from the IMDatE system, which included a risk-based scoring of vessels; direct/automatic access to SafeSeaNet and CleanSeaNet.

The United Kingdom

UK users find the interface effective and user friendly, and the map (after the initial slow loading) is quick to navigate and manipulate. It is now the tool of choice in the event of a CleanSeaNet report, and two examples of counter pollution operations were provided.

The main benefits of IMDatE at the moment for UK users are: that vessels can be tracked across a variety of position reporting systems in one programme; that CleanSeaNet pictures can be overlaid; that satellite AIS increases the level of domain awareness in comparison to the use of only LRIT; and that there is now one login rather than many.

The main features which would improve the service for the UK were as follows: inclusion of a bearing element to the measuring tool; UK meteorological feeds; access via Internet Explorer; and the establishment of a UK national alarm plan for vessel traffic monitoring, which might be addressed by automatic algorithms. The problem of chart zoom layers obscuring data was also mentioned, and it was stated that it would be useful for the start map to be set to the UK.

Ireland

The Irish Coast Guard presented their operational experience with IMDatE, using the example of a medical evacuation. It was noted that IMDatE was extremely valuable in the context of Search and Rescue, but that there were some improvements to be made. It was observed that although the vessel could be tracked using IMDatE, the helicopter was not visible on IMDatE. Ireland queried whether it would be possible to add rescue assets to IMDatE.

In terms of the benefits, Ireland noted particularly the usefulness of: many applications provided via a single platform; and possibilities for long-range mission planning (increased safety of SAR assets, fuel savings due to better planning, more accurate timings for missions, improved quality service, improved decision support).

The problems noted in the use of IMDatE were the following: the login procedure can be cumbersome; the timeout feature is disruptive; the timestamp on some vessel positions was up to six hours old; using the tab key to sign in using Google Chrome is inconvenient.

In future, Ireland would appreciate support through IMDatE for: improved intelligence (on vessels of interest, and vessels carrying dangerous goods or high value cargoes); integration of VMS data

and fishing zone layers; integration of information from the Irish Sailing Association Safetrx App; and tracking abandoned vessels. Information on meteorological and hydrographical data and on sea currents and integrating information from government apps were also suggested as possibilities.

Italy

Italy provided three different examples of the operational use of IMDatE: during a SAR operation; investigating a CleanSeaNet alert; and monitoring the *Costa Concordia* parbuckling operation.

In addition to these specific examples, Italy also reported that in particular risk areas, IMDatE was extremely useful for monitoring Italian vessels which were not reporting LRIT (e.g. due to ship borne device technical problems). In this respect, the satellite AIS data stream was felt to be particularly valuable.

In terms of improvements in future, Italy had a number of suggestions: a 'watchdog' tool would be useful; it should be possible to create an 'event of interest' directly on the web interface; the Area Centric Query should have a choice between vessel positions, or the full vessel track visualisation; shape file formats (e.g. satellite images) could be added as an external layer. Italy also noted that Italian users would be interested in receiving a satellite AIS data stream using a system-to-system interface.

Malta

As the latest addition to the group of member state pilot project volunteers, Malta noted that there was not yet much feedback from operations, but that they were happy to share experiences to date. The IMDatE platform had been shared with three different entities: the transport authority, the fisheries authority, and the Coast Guard. In October, IMDatE was used twice to assist in SAR operations related to cases of illegal immigration. For merchant shipping, the system is very useful for monitoring vessels, particularly through the provision of satellite AIS when there has been a breakdown in LRIT equipment. For fisheries, it is anticipated that correlating VMS data with both terrestrial and satellite AIS will be useful.

Spain

Search and Rescue is the area where IMDatE represents the largest step forward in SASEMAR's operations, and it is also felt to be useful for marine pollution monitoring. An example was given of a recent SAR operation where 7 crewmen from a sinking fishing vessel were rescued. At present, SASEMAR does not find that IMDatE provides advantages over the integrated vessel traffic service (VTS) system currently being used. However, more time is needed to carry out further testing. SASEMAR looks forward to the inclusion of additional SAT-AIS data and of the Automated Behaviour Monitoring tools. The main new feature of interest is the Search and Rescue Surface Picture (SAR SURPIC) function, integrating all position sources, including fishing fleet VMS.

France

The general feedback from France is positive. IMDATE is currently used by two VTS centres (Jobourg and Gris-Nez). The main asset of the system is the aggregation of data from different

sources. One current drawback of the system is that the interface is sometimes slow. France expressed interest in receiving the IMDatE services delivered to France's national system – via system-to-system web services. In future, it was felt that the following developments would be useful: additional integration with SafeSeaNet (Sitreps, Polreps, and cargo information) and THETIS (Ship Risk Level); availability of met-ocean data; further customisation of the map; capability to display on demand a speed vector on a ship track.

Discussion

The Commission representative summarised the session by noting the general consensus among all pilot project participants of the benefits of data integration. The users of IMDatE have found it useful in a range of different situations for fulfilling different functions. There is a growing expectation that IMDatE will provide advanced features and functionalities, and that this expectation of stakeholders is fully in line with the view of the Commission on the future of IMDatE and forthcoming policy planning.

The meeting participants were reminded that developments to date have occurred within a relatively short timeframe. IMDatE was merely a concept in 2010, and, although still in the development stage, in 2013 the system is already operational and providing initial services. All this has been achieved within EMSA's existing financial package, and in the scope of the existing Work Programme of the Agency.

IMDatE operations for EU bodies

During the afternoon, presentations were given by the EU bodies currently using the IMDatE service: EFCA, EUNAVFOR and FRONTEX.

European Fisheries Control Agency (EFCA)

Following the meeting of EFCA's Administrative Board in October 2013, the emphasis placed on the importance of using integrated data services and in the collaboration with EMSA has been reinforced. A technical working group will be set up with participation from the member state fisheries authorities, EFCA, EMSA and the Commission.

An overview was given of the operational use made of the system:

1. Real time monitoring and coordination of inspection activities, basic behaviour monitoring;
2. Detection and mapping of possible illegal, unreported and unregulated (IUU) fishing activity and transit monitoring;
3. Post-event analyses: risk assessment, planning and targeting, cross checking, performance analyses.

The main benefits of IMDatE services are as follows: real time automated correlation and cross checking; easy access to fishing vessel specific information; scope for improved vessel behaviour monitoring; enforcement of reporting requirements and business continuity; cross checking on validity of identifiers (spoofing); direct visualisation of inspection/sighting activity.

In terms of challenges for the future, EFCA presented the following points for consideration: layer quality and availability; up to date vessel identifiers and fishery related information; automation of behaviour monitoring; inclusion of other fisheries related data in view of future regulatory challenges; data storage capacity; more extensive use of vessel detection system (VDS) vessel reporting; and affordable Sat AIS availability. Further functionalities and services which are likely to be required in the near future include: flexible alarm functionalities; ID inconsistency detection functionalities; user defined flexible symbols/colour coding; layer upload functionality; chart work functionalities; interconnection with other systems (electronic recording and reporting systems [ERS], environmental impact reports [EIR], etc.); and availability of secondary layer information.

EU NAVFOR

EUNAVFOR explained how IMDatE can be used to combine various maritime information streams with risk profile information related to vessels. The system can be used in time critical situations to identify vessels which need to be contacted, and to monitor the position of vessels held in captivity. Considerable use of integrated services is also made to look at 'patterns of life' time series.

FRONTEX

FRONTEX is the most recent EU body to request maritime monitoring services from EMSA. The FRONTEX presentation introduced EUROSUR, the European Border Surveillance system. An overview was given of how Frontex uses, and will use, data fusion services, including the information provided by EMSA. EMSA will be the main provider of services to FRONTEX for internal security in the maritime domain. In 2014, EMSA services to Frontex will consist of data including AIS (satellite and terrestrial), LRIT, anomaly detections, correlation of different data sources, and synthetic aperture radar and optical satellite data. This will contribute to building an integrated situational picture at the European border.

Summary Member State pilot services

The final presentation of the day provided an overview of the outcome of the member state pilot project experience to date, presented in three sections.

1. Outcome: the conclusions which can be drawn about the usefulness of each of the different features offered by IMDatE;
2. The overall user experience;
3. The new requirements which have been identified.

Credit was given to all member states for identifying and sharing in an open manner relevant maritime data with users of the Pilot Service. Special mention was made of those member states who, while not part of the pilot, agreed to share their national data: Latvia, Lithuania and Romania.

Conclusions

From the discussions around these issues, a number of conclusions have been drawn:

a. Phase I of the member state Pilot Service has been a test-bed to explore and develop a set of integrated maritime services responding to the needs of volunteer member states.

b. Addresses issues linked to data sharing as well as the collaboration and outreach with other sectors within the member state organisations.

c. The general feedback reported by the member states on this first period of usage of the system has been positive and there is willingness to continue.

d. Of particular relevance is the availability of multiple data streams and their integration towards the provision of an up-to-date and complete maritime domain awareness picture.

e. Users expect access to additional information and services, e.g.:

- Link to SafeSeaNet enrichment and THETIS Port State Control information;
- Automated Behaviour Monitoring algorithms;
- System-to-system interfaces to national systems.

f. Problems have been reported, mainly related to speed of Web User Portal and the reliability/consistency of the data.

g. Targeted training sessions are important in order to make full use of all Pilot Service functionalities and features.

Discussion

The meeting participants were informed that a draft report detailing the conclusions drawn from the pilot project would be sent to the nine participating member states.

Clarification was given on a couple of points: 1) satellite AIS information can sometimes be older than the equivalent LRIT information; it depends upon the number of satellites used to gather the information, and on the ground stations used. 2) Meteorological and oceanographic data is useful, but EMSA is not a repository of this information. If the member states use a particular meteorological information provider or would like to receive data from any particular provider, they should inform EMSA.

Roundtable discussion on IMDatE and future provision of integrated services

France expressed support for the IMDatE project, noting that it can be useful in a variety of contexts. Sweden stated that the project had brought much to the maritime community, to the benefit of all users responsible for a range of different functions, and asked about the medium and long-term strategy for continuing with IMDatE.

EMSA responded that IMDatE is currently running version 0.5. The first full version will only be completed at the end of the year, and operational in early 2014. It is intended that in the second quarter of 2014 there will be a User Meeting to collect feedback on version 1. At that point, further enhancements and improvements can be discussed.

Summary and conclusions

The information presented at the meeting, and the subsequent report, will be presented to the SafeSeaNet High Level Steering Group in mid-January. In February, a meeting will also be held with the European Space Agency on future developments within the Satellite-AIS programme.

The provision of integrated maritime services and further improvement of IMDatE platform will continue in 2014 to comply with the service requests received from EU NAVFOR, EFCA and FRONTEX under the governance of the bilateral agreements signed with EMSA.

The IMDatE platform will continue to be open also for the use of MSs based on the same voluntary approach as during 2013.

Thanks were given to the IMDatE team at EMSA and to the volunteer Member States, who tested the system and contributed to its development.

Annex 3 - Presentations and papers delivered during research project

Conference and workshop presentations:

1. *Satellite based services for dual use (civil and military)* – 12.02.2012, Rome, Italy
2. *Ship traffic information systems for the Arctic areas* – 26.03.2012, Stockholm, Sweden
3. *CleanSeaNet – a GMES monitoring service* – 03.05.2012, Bucharest, Romania
4. *The use of satellite services in maritime domain* – 09.07.2012, Vancouver, Canada
5. *Integrated Maritime Data Environment (IMDatE)* – 04.07.2012, Brussels, Belgium
6. Integrated Maritime Services – 05.04.2013, Rome, Italy
7. Integrated services in support of Coast Guard functions – 02.04.2013, Piraeus, Greece
8. IMDatE platform and Integrated Maritime Services – 16.06.2013, Brussels, Belgium
9. Fisheries surveillance – an integrated model – 08.07.2013, Mallorca, Spain
10. Integrated Maritime Services – 10.09.2013, Toulon, France
11. IMDatE update report – 06.12.2013, Brussels, Belgium
12. Integrated services for the Black Sea area – 21.01.2014, Bucharest, Romania
13. V-tracks: improving Maritime Awareness – 27.02.2014, London, UK
14. IMDatE update report – 21.06.2014, Brussels, Belgium
15. Maritime Piracy: change factor of security paradigm – 02.04.2015, Bucharest, Romania

Papers:

- *IMDatE – a tool for improved Maritime Domain Awareness* – SECESA Conference[72], Technical University of Lisbon, Portugal – 2012
- *Integrated Maritime Data Environment* – Ocean & Coastal Observation Sensors and Systems (OCOSS)[73] Conference, Toulon, France – 2013
- *The Success and Failures of the European Union Maritime Integrated Policy: Critical mid-term review 2007-2013* - Journal of Contemporary European Research, Volume 10, Issue 3 – 2014
- *Maritime Piracy – change factor of International Security paradigm* –Romanian Journal of Maritime Law – 2015
- *Global Maritime Domain Awareness: a Sustainable Development perspective* – World Maritime University Journal of Maritime Affairs –2016
- *EU Coast Guard*: *a governance framework based on the principles of sustainable development* – European Journal of Sustainable Development, EJSD V5N2 2016

[72] http://www.congrexprojects.com/12c12/programme-presentations - accessed 16.09.2014

[73] http://2013.ocoss.org/sites/2013.ocoss.org/files/files/conference-programme.pdf - accessed 07.04.2015