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## Overview

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## Overview

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The European programme *Human Sea* was selected by the European Research Council in August 2013. It is an Advanced Grant 2013 No. 340770 of the 7th Framework Programme for Research and Development (7th PCRD or FP7). The research programme is planned over 5 years from 2014 till 2019.

### *"Making the sea more human"*

The project deems that one of the roles of the law is to civilise the use of techniques. Technological developments have allowed and will allow the extension of human activities at sea. To what extent does economic activity at sea lead to the transformation of Maritime Law and the Law of the Sea? The research programme supported two conferences organised within the framework of the Scientific Days of the University of Nantes: one, on 5 and 6 June 2014, called "*Piracy: From the sea to cyber space*."<sup>1</sup> It addressed piracy and linked work from law historians and general historians to current research being conducted by contemporary legal practitioners and geographers regarding maritime piracy off the Horn of Africa and the Gulf of Guinea. Frantz Mynard and Frédéric Davansant organised the event. The impact the risk of violence has on underwriters and legal jurisdiction was contemplated in the follow up to *Piracy* published by Pédone and Hart in 2012, and coordinated by Charles Norchi and Gwenaële Proutière-Maulion.<sup>2</sup> Piracy became part of common language to describe the precariousness of large areas, routes, and in the world of internet, cybercrimes. Internationalisation extends beyond the national framework of states and has

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1) Colloque "Piraterie : de la mer au cyberspace", 4 and 5 June 2014,  
[http://www.msh.univ-nantes.fr/63674436/0/fiche\\_\\_\\_actualite/](http://www.msh.univ-nantes.fr/63674436/0/fiche___actualite/)

2) Prof. C. H. NORCHI et G. PROUTIERE-MAULION (dir.), *Piracy in comparative perspectives: Problems, Strategies, Law*, Pédone – Hart, Paris/Londres, 2012, <http://www.pedone.info/piracy/piracy.html>



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complicated the control and enforcement of activities of businesses set up in one country but operating globally. The second conference, on 11 and 12 June 2015, called "*New maritime routes: Origins, evolutions and possibilities*", organised by Odile Delfour-Samama, Gwenaële Proutière-Maulion and Cédric Leboeuf, developed a multi-disciplinary approach to this multi-faceted phenomenon that is as old as maritime navigation but a real challenge of the 21st century. Maritime routes evolve, disappear and are created under the influence of external circumstances — in particular those that are political, economic and technical. Routes in use are the result of how economic, geopolitical and technical data has evolved. They are created, adapted and disappear as a result of external circumstances, in particular political and economic. Oceans remain most often deserted outside these maritime routes. Regardless of the origin or transformation of the routes, these new maritime routes of communication have shaken up the global economy and relations among maritime operators. Based on the confluence of the analyses in the various disciplines (historical, geographical, political and legal), the colloquium provided a comprehensive overview of the causes and effects of new routes as a result of the opening of the poles, the straits, as well as the conventional routes which are used by more than 50,000 ships of over 500 UMS. Discussions addressed risks and threats which are inherent to routes such as pollution of areas with low human presence and maritime piracy. The melting of the polar pack has opened up two new Arctic routes, one near Russia and the other in Canada. It has also created international tensions and threats to the marine environment. These developments need to be taken into account by political and operational stakeholders, even researchers, so that they may reflect on the anthropogenic pressure and ethical nature of the development of new human-based activities at sea.<sup>3</sup> Have oceans been invaded by the 55,000 large merchant vessels that sail its waters? It is precisely the definition of maritime routes that explains the flow of maritime traffic towards the Strait of Malacca, the Bosphorus and the Channel. There is a main longitudinal axis running west-east and east-west between 55° and 30° parallel north and narrower north-south meridians, as well as a few north-east/south-east diagonals.<sup>4</sup> The world's merchant fleet is not spread out on the entirety of the oceans' vastness. In fact, it is concentrated on very specific routes that link the world's most important economic regions and raw material extraction sites to consumer areas. It is thus necessary to secure ports, vessels and exchanges at the international level.

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3) DELFOUR-SAMAMA O., LEBOEUF C. and PROUTIÈRE-MAULION Gw. dir. (2016), *Nouvelles routes maritimes - Origines, évolutions et prospectives*. Editions A. PEDONE, Paris, 2016, p. 269.

<http://www.pedone.info/792/NRM.html>

4) FRÉMONT A. "L'espace maritime et marchand : pour une problématique", *Espace géographique*, 1996 Volume 25, Number 3, pp. 203-213. [http://www.persee.fr/doc/spgeo\\_0046-2497\\_1996\\_num\\_25\\_3\\_985](http://www.persee.fr/doc/spgeo_0046-2497_1996_num_25_3_985) - FRÉMONT A., "Les routes maritimes : nouvel enjeu des relations internationales?" *Revue internationale et stratégique*, 2008/1, n°69, pp. 17-30 - GRATALOUF Chr., *Géohistoire de la mondialisation - Le temps long du monde*, U Géographie, A. Colin, Paris, 2015.



## Seafarers: An International Labour Market in Perspective.

The first publication of the European project Human Sea *Seafarers: An International Labour Market in Perspective* examines the developments that took place in the marine merchant sector. This sector was the first to be globalised in the second half of the 20th century because of the freedom given to vessel registration and the pacification of the oceans. This industry was mostly deregulated despite conventions adopted by the International Maritime Organisation, SOLAS and MARPOL. The sector was also experiencing significant growth in both international merchandise trade and the merchant navy.<sup>5</sup> 7.4 billion tons of merchandise were transported via maritime routes in 2006, in comparison to 550 million tons in 1950. Maritime transport has acted as a laboratory for globalisation since the 1970s through free vessel registration. Ships could only be attached to flag states via the implementation of port state controls and the development of minimum standards of international law established by the IMO through the conventions SOLAS, MARPOL and STCW. The port state control was founded on an equal treatment principle and guides signatories of international conventions on how to ensure ships stopping over in their ports, independently of the vessel's flag, comply with the stipulations set forth by said conventions. The International Labour Organisation was involved in the implementation of the port state control via the 1976 Convention 147 on minimum merchant shipping standards. The Paris Memorandum of Understanding (MoU) was created in 1982 and provided robust guidelines and a common database available to all signatories to control ships. The 1974 STCW Convention, subsequently revised in 1995 and 2010, sets standards of training, certification and watchkeeping for seafarers. The adoption of the Maritime Labour Convention in Geneva in 2006 and Convention 188 on Fishing in 2007 completes international law of this globalised sector. This means a globalised sector is no longer associated with deregulation. Now that flag states issue social certifications of vessels under the control of port states, it seems to have made the minimum international norms much more effective. It will eventually be complemented by international negotiations being conducted by social partners in regards to remuneration.

The book considers the changes in work on board merchant ships. This is the first internationalised sector, due to open registry shipping, search for a skilled and competitive labour force. The 2006 ILO Maritime Labour Convention takes a universal dimension and renews the framework of this sector, including a social certification. Control of ships by the port state contributes to the effectiveness of international standards, and their regionalisation. The European social law seeks to integrate the international dimension of this sector, to build a harmonised regional market and to treat shipping companies as any other company. The control of manning companies

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5) CHAUMETTE P. dir. (2016), *Seafarers: An International Labour Market in Perspective - Gens de Mer: un Marché International du Travail*, Gomylex Editorial, Bilbao, p. 428.

and the link of seafarers to a social protection system are two particularly complex projects, which might lead to unfair competition.

"From a wider international law perspective, the (Maritime Labour) Convention is of interest because it is one of the growing cadre of conventions that are responding to the search for 'effectiveness of international law' and reaches beyond the 'face' of state sovereignty to directly affect the behaviour of private actors. Even more unusually, the MLC 2006 contains provisions that seek to apply its requirements to non-ratifying States. In that sense it can be described as a convention that is 'universal' in its reach."<sup>6</sup> "Does this Convention and the way in which it was developed present a model workable process whereby international conventional law can be designed to be (more) effective and, in particular, in such a way as to affect the behaviour of non-state actors directly, while at the same time operating primarily at the level of state responsibility?"<sup>7</sup>

Research regarding seafarers was continued during a conference organised by Olga Fotinopoulou Basurko on 13 September 2016 in Bilbao within the framework of Maritime Work Watch, Sea Workers' Labour and Social Conditions International Research Network: *Studying Today's Challenges and Future Amendments to the Maritime Labour Convention*. It focused on research stemming from the fishing industry and actions of the International Transport Federation (ITF) and port workers.<sup>8</sup> A follow-up working session will be held in Nantes on 15 and 16 June 2017.

## Maritime Areas: Control and Prevention of Illegal Traffics at Sea.

The second publication of the European project Human Sea stems from the conference held in Nantes on 5 and 6 October 2015, titled *Maritime Areas: Control and Prevention of Illegal Traffics at Sea and Marine Spaces: Surveillance and Prevention of Illegal Trafficking at Sea*.<sup>9</sup> The Montego Bay Convention also stipulated the creation of Exclusive Economic Zones (EEZ) to regulate fishing and to protect fishery resources from excessive appropriation of marine spaces by coastal states. However, the Law of the Sea still focuses on vessels and does not include new sea-going vessels and the workers that man them.<sup>10</sup> Furthermore, high-sea jurisdiction is not clear because vessel registration has allowed some flag states to be complacent. The link between

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6) McCONNELL M.L., DEVLIN D. & DOUMBIA-HENRY Cl., *The Maritime Labour Convention, 2006 – A Legal Primer to an Emerging International Regime*, Martinus Nijhoff Publ., 2011, pp. 32-33.

7) McCONNELL M.L., DEVLIN D. & DOUMBIA-HENRY Cl., p. 569.

8) <http://www.maritimeworkwatch.eu/es/que-es-mww>

9) CHAUMETTE P. dir. (2016), *Maritime areas: control and prevention of illegal traffics at sea - Espaces marins : Surveillance et prévention des trafics illicites en mer*, Gomylex Editorial, Bilbao, 2016, 316p.

10) MIRIBEL S., "Qu'est-ce qu'un navire?", in *Mélanges en l'honneur de Christian SCAPEL*, C. BLOCH dir., PUAM, Aix-en-Provence, 2013, pp. 279-288.



a vessel and its flag state is more or less lax.<sup>11</sup> Internationally wrongful acts imputable to a ship do not make flag states liable in any way. At most, flag states are to respond "without delay" to requests made by states regarding ship registration. In the *Saiga* case, the International Tribunal for the Law of the Sea simply accepted Saint Vincent's claim without verifying the facts, even though the registration certificate had not been renewed when the ship had been seized by Guinea when caught illegally fishing.<sup>12</sup> The development of illegal activities at sea tests the competences of states and their cooperation at regional levels.

In addition to combating arms trafficking, combating human trafficking is another example of illegal activities at sea. The abolitionist movement sought to bring an end to human trafficking. In 1784, Necker believed that only international efforts would bring an end to human trafficking. England abolished human trafficking in 1807 and slavery in 1833. It took advantage of the Napoleonic Wars to seize enemy slave ships along the coast of Africa and monitor neutral ships under the pretext that it was fighting contraband of war.<sup>13</sup> A military court was set up in Sierra Leone to try the offenders.<sup>14</sup> England forced Portugal to end its slave trade with Africa in 1810, and then South America. At the 1815 Vienna Congress, the world powers signed a declaration to end the slave trade without any other actions. From 1816 to 1841, the United Kingdom increased the number of bilateral conventions, stipulating reciprocal rights of access to merchant vessel by warships, the arrest of slave ships and their diversion to Sierra Leone. The right of access came to be during wartime but was extended to periods of peace to combat illegal trafficking. It limited the freedom of the seas and that of maritime trade. Portuguese slave trafficking was tolerated south of the equator between Brazil and Angola until 1830. Spain only officially abolished slave trafficking in 1845. In 1850, the Royal Navy bombed and sank slave ships in Brazilian ports. The Brazilian Parliament passed a prohibition law that was much more effective than that of 1831. On 20 December 1841, the main signatories of the 1815 Vienna Congress granted the British the right to combat the slave trade from the Atlantic Ocean to the Indian Ocean. In 1842, the United States of America committed to maintaining an 80-canon fleet to combat the slave trade. On 25 September 1926, the General Assembly of the United Nations rejected the proposition set forth by the British to assimilate the maritime

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11) KAMTO M., "La nationalité des navires en droit international", in *La Mer et son Droit – Mélanges offerts à L. LUCCHINI et à J.P. QUÉNEUDEC*, Pédone, Paris, 2003, pp. 343-373 - Sur le pavillon des organisations internationales, HINOJO ROJAS M., "La insuficiente regulación de la cuestión del pabellón en la Convención de las Naciones Unidas sobre el Derecho del Mar de 1982", in SOBRINO HEREDIA J.M., dir., *La contribución de la Convención de las Naciones Unidas sobre el Derecho del Mar a la buena gobernanza de los mares y océanos*, Editoriale Scientifica, Napoli, 2014, pp. 79-97.

12) TIDM, arrêt du 1<sup>er</sup> juillet 1999, n° 2, demande de prompt main levée. KAMTO M., préc. p. 359.

13) PÉTRÉ-GRENOUILLEAU O., *Les traites négrières – Essai d'une histoire globale*, Gallimard, Paris, 2004, p. 263 et s. - DAGET S., *La répression de la traite des Noirs au XIX<sup>ème</sup> siècle*, Paris, Karthala, 1997.

14) WARD W.E.F., *The Royal Navy and the Slavers: the Suppression of the Atlantic Slave Trade*, London, Allen & Unwin, 1969.



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transport of slaves to an act of piracy. Governments committed to take all the necessary measures to prevent and suppress the transport of slaves on vessels sailing under their flag. An international convention, similar to that signed on 17 June 1925 regarding the international arms trade, was signed.

Marine areas give rise to various illegal activities at sea: piracy and robbery, human trafficking and illegal immigration, drug trafficking, illegal fishing. The United Nations Convention on the Law of the Sea of 1982, Montego Bay, provides various legal regimes of state intervention at sea, resulting by the establishment of cooperation mechanisms. The evolution of the threat and risk monitoring techniques questions historically interstate practices and, today, calls upon new players and private services. The book contemplates the fight against piracy, against drug trafficking, against human trafficking, as well as against illegal fishing through the different legal regimes.

The United Nations Convention on the Law of the Sea (UNCLOS) adopted in Montego Bay in 1982 still allows the high sea to be associated to an idea of freedom. However, Article 87 lists the items proposed by the Institute of International Law in Lausanne in 1927 and the 1958 Geneva Convention on the high seas. It includes freedom of navigation, freedom to fly over high seas, freedom to lay submarine cables and pipelines, freedom to construct artificial islands and other installations permitted under international law and freedom of scientific research, subject to Parts VI and XIII.<sup>15</sup> The article is not restrictive. However, the 1972 London Convention and the 1982 Oslo Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircrafts had significantly restricted the freedom to dump waste even without Article 210 of UNCLOS. The Brussels Convention of 29 November 1969 came into effect following the Torrey Canyon oil spill off the eastern part of the Isles of Scilly on 18 March 1967. It consisted of an international convention regarding the intervention on the high seas in cases of oil pollution casualties, affirming the right of coastal states to take measures to prevent, mitigate or eliminate grave and imminent danger of pollution of the sea by oil.<sup>16</sup> It represented a significant departure from the exclusivity granted by the law of the flag state in the interest of the protection of the marine environment. The Protocol of 2 November 1973 extended the right of intervention on the High Seas in cases of pollution by substances other than oil. High-sea jurisdiction is not limited to a ship's registration and the law of the flag state under which it sails. States agree to maintain public order at sea in order to combat human trafficking and the transport of slaves at sea (Article 99 UNCLOS), piracy (Article 100 to 107) and illicit trafficking of narcotic drugs or psychotropic substances (Article 108) and unauthorized broadcasting (Article

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15) LUCCHINI L. & VOELCKEL M., *Droit de la mer*, t.1, *La mer et son droit – Les espaces maritimes*, Pédone, Paris, 1990, p. 267-281 – ROTHWELL D.R. & STEPHENS D., *The International Law of the Sea*, Hart, Oxford & Portland, 2010, pp. 154-158.

16) Du PONTAVICE E., *La pollution des mers par les hydrocarbures. A propos de l'affaire du Torrey Canyon*, LGDJ, Paris, 1968 - LUCCHINI L., "La pollution des mers par les hydrocarbures : les conventions de Bruxelles de novembre 1969", JDI 1970, p. 795.





109). Duty to render assistance to any person found at danger at sea, as stipulated in Article 98, corresponds to an active obligation of solidarity that goes beyond a moral, natural and ancient obligation. The UN Convention is conservative in regards to terrorism at sea — the subject of the Rome Convention of 10 March 1988, following the hijacking of the Italian liner *Achille Lauro* in the eastern part of the Mediterranean Sea, which is a multilateral convention for the suppression of unlawful acts against the safety of maritime navigation and protocol for the suppression of unlawful acts against the safety of fixed platforms located on the continental shelf.

If the principle of the law of flag state is the expression at high sea of the sovereignty of states, there can be exceptions to this principle in the event of sufficiently serious infractions and threats.<sup>17</sup> Professor Djamchid Momtaz believes the legal framework relating to the prevention and suppression of unlawful acts on the high seas is inefficient because of the tension between global and zonal governance. Global governance strives to fill the gap between an integrated global economy and the continued fragmented world order. In terms of prevention, states are reluctant to allow their ships to be inspected on the high seas and even more reluctant to allow other states to intervene in their territorial waters. In terms of suppression, existing suppression powers and the reluctance of states to exercise their powers weakens global governance.<sup>18</sup> Therefore, only national frameworks and interstate cooperation are in place.

### **Human Sea – Marisk: Economic challenges and new maritime risk management: What is blue growth?**

There are lawful activities being carried out at sea that require security and safety measures. The Human Sea Programme organised another international conference on 3 and 4 October 2016 in conjunction with the 5th International MARISK conference. The objective of the conference was to consider the risks associated to sea-based renewable energies, oil and gas rigs and large vessels. The MARISK conferences were organized by the ENSM (the National Maritime and Naval College of France), which now encompasses the following institutions: École Nationale de la Marine Marchande, École nationale de la Sécurité et de l'Administration de la Mer (ENSAM), before École des Affaires Maritimes and the Port of Nantes / Saint-Nazaire. Our colleague, Professor Jean-Pierre Beurier, an expert in the law of the sea and environmental law, was the chair of the scientific committee. It took place in 2005,

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17) BEURIER J.P., *Droits Maritimes*, Dalloz Action, Paris, 2006, 1<sup>ère</sup> éd., n° 115.21, 3<sup>ème</sup> éd., 2014, n° 115.21 à 115.27.

18) MOMTAZ D., "Tension entre gouvernance globale et gouvernance zonale dans la prévention et la répression des actes illicites en mer", in SOBRINO HEREDIA J.M., dir., *La contribución de la Convención de las Naciones Unidas sobre el Derecho del Mar a la buena gobernanza de los mares y océanos*, Editoriale Scientifica, Napoli, 2014, pp. 441-453.



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after the ISPS (International Ship and Port Facility Security) Code went into effect as part of the SOLAS Convention, and subsequently in 2007, 2009 and 2012. Following further research, the final conference of the European program Human Sea shall take place in Nantes in October 2018 and it will provide an overview of the evolution of the law of the sea and of maritime law by examining tensions among technological and economic developments and the measures needed to ensure the protection of the marine environment.

Humankind will need to overcome the following challenges in order to achieve Blue Growth: the exploitation of new sea-based energies, increasingly distant and increasingly deep drilling sites, as well as larger and larger vessels. New economic opportunities are ready to be seized but are not exempt of new risks affecting security, safety and the marine environment. These new challenges are at the core of the Human Sea-Marisk discussions. This event brings together international experts to discuss the latest scientific and technological developments in the port and maritime sector. The maritime, ship and port industry must impose restrictions to protect the environment but it must also be protected against malicious and violent attacks. Security issues are not new but those related to safety are. Players can include public, private and international organisations; states and their administrations; regional organisations; port authorities; economic players; port and port facility management firms; insurance companies; classification societies; security experts and advisers. The participation of these players is usually complementary and non-competitive, but this conciliation should nonetheless be thought through and organised.

## Maritime and port security: public interest or private business?

**Chris TRELAWNY**, Special Advisor of the Secretary-General, Subdivision for Maritime Security and Facilitation, examines what the International Maritime Organization (IMO, UK) does with respect to civil maritime security in ports. The paper also looks at the work of IMO in the wider context of the United Nations, IMO's aims, and some ways ahead. The views expressed in the paper are those of the author. They are intended to promote discussion and should not be taken as a reflection of the views of any organisation.

IMO is the specialised agency of the United Nations responsible for the safety, security and efficiency of international merchant shipping and the prevention of marine pollution by ships. As such, IMO is responsible for the implementation of some 50 international conventions<sup>19</sup> and hundreds of codes, resolutions and guidance circulars that collectively ensure that standards in all aspects of shipping continue to rise. It is a technical rather than a political body, with 171 member states working by consensus.

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19) For all IMO Conventions see <http://www.imo.org/en/About/Conventions/Pages/Home.aspx>



The outputs of the organisation reflect the collective will of those member states. Within the context of maritime security and facilitation, IMO has responsibility for two key conventions: the International Convention on the Safety of Life at Sea, 1974, as amended (SOLAS), including the associated International Ship and Port Facility Security Code (ISPS Code); and the Convention on the Facilitation of International Maritime Traffic, 1965, as amended (FAL).

In the context of security, IMO focuses on what the civil maritime industry, i.e. both the shipping and port sectors, can do to protect itself and to assist Governments to protect global maritime trade. The main focus is on preventive security through risk management, deterrence and threat transfer, rather than countering terrorism *per se*. However, IMO is also the competent body for the Convention for the Suppression of Unlawful Acts Conventions against the Safety of Maritime Navigation, 1988 (SUA 1988) and the Protocol for the Suppression of Unlawful Acts Conventions against the Safety of Fixed Platforms located on the Continental Shelf, 1988 (SUA Protocol 1988) which criminalise terrorist acts against ships and fixed platforms and, more recently, SUA 2005 that, among other things, allows for boarding on the high seas pursuant to suspected terrorist offences. SUA 2005 complements UN Security Council resolution 1540 (2004) and the Proliferation Security Initiative. Through its work on the facilitation of international maritime traffic IMO also has an interest in mixed migration by sea, prevention of drug smuggling, cybersecurity and prevention of stowaways.

In order for IMO's strategy to succeed, it will need the full support of the port sector. A port sector supported by government, able to streamline procedures and remove excessive barriers to trade, to embrace new technologies, to root out the cancer of corruption and to treat safety, security and reputation as both desirable and marketable, will be a major driver towards stability and sustainable development.

States and shipping stakeholders participate at all stages of IMO regulation development.<sup>20</sup> Maritime underwriters were concerned with assessing covered risks based on weak criteria so they founded classification societies, the first being Lloyd's Register of London. The practice was born in Edward Lloyd's Coffee House where classification certificates were issued following the assessment of ships prior to setting sail. Ship materials and components were eventually codified into classification regulations. Ship assessments gave rise to the issuance of classification certificates. Lloyd's of London is a British insurance market founded in 1688 where members, underwriters and private individuals — the latter traditionally know as "Names" — would come together to pool and spread risk. It is a marketplace governed by the

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20) LEFEBVRE-CHALAIN H., *La stratégie normative de l'Organisation Maritime Internationale (OMI)*, PUAM, Aix-en-Provence, 2012, p. 189 et s. – BEKIASHEV K.A. & SEREBRIAKOV V.V., *International Marine Organizations - Essays on Structure and Activities*, Martinus Nijhoff – Springer, 1981 – NORDQUIST M.H. & MOORE J.N., *Current Maritime Issue and the International Maritime Organization*, Martinus Nijhoff - Brill, The Hague, 1999.

Lloyd's Act of 1871. Lloyd's Register was established in 1860. Classification societies developed commercial relationships with shipyards as well as ship owners and charterers. These societies then began issuing certificates for flag states. They developed expertise in the area of technical and documentation controls. Their work evolved at the same pace as technologies and their expertise was to the following industries: manufacturing, gas and oil, offshore and, most recently, renewable energies, while adapting to the demands of globalisation. The International Association of Classification Societies (IACS) was founded in 1968 and counts among its members some of the most important classification societies in the world. It has focused on improving the quality of services rendered to vessels detained in ports. The IACS has offered to allow non-member societies to take part in the development of standards and regulations so that they actively implement the latter following their publication. International professional shipping and sport associations participate in the work conducted by the IMO.<sup>21</sup>

Following the 9/11 terrorist attacks in New York City and Washington D.C, port and maritime security became significantly more important and required the implementation of actions that went beyond the resolutions adopted by the UN General Assembly. The IMO proposed a technically sound approach in an international forum which included all shipping stakeholders. The Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation SUA was adopted in Rome on March 10, 1988. Although it went into effect in 1992, it seemed insufficient. The International Ship and Port Facility Security (ISPS) Code was adopted in London in December 2002 and takes into account the land-sea interface, borders and ports, as well as the technical challenges through the implementation of a technical cooperation program. States determine the level of security and inform operators which measures they are to implement. Port companies are responsible for establishing personnel prevention plans and assigning and training personnel so that they can ensure the coordination, follow up and implementation of these measures. The implementation of the code is supported by the issuance of certificates by administrations and security organisations who conduct periodic controls. The complementary relationship between public and private stakeholders is key.

Maritime and port security is firstly the states' responsibility due to their sovereign mission of guarantee of public order. The implementation of security allows involves combating criminality in general and requires the collaboration of various state services such as port state inspectors and police. Security is also of public interest because of the major role that shipping has in the economy of a country. In 2012, for instance,

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21) LEFEBVRE-CHALAIN H., préc., p. 209 et s. p. 249 et s. p. 444 et s. – RINGBOM H., *Competing Norms In The Law Of Marine Environmental Protection*, Kluwer Law International, 1997 – ROSAEG E., "The Role of the International Maritime Organization in Defining and Altering the Jurisdiction of Flag, Coastal, and Port States", in *Jurisdiction over Ships – Post-UNCLOS Developments in the Law of the Sea*, RINGBOM H. (Ed), Brill – Nijhoff, 2015.



Djibouti created its national coastguards, with the cooperation with the US Coast Guards. On a local scale, ports also have an important responsibility in the implementation of safety. The ISPS Code puts in place, for instance, security plans that maritime companies must write, implement and try out. Private initiatives can also be proved essential in the implementation of security. In Antwerp, for instance, public-private forums are held every year thanks to a private initiative (think-tank and members of civil society). Security procedures and measures must not slow down economic activity. Thus, for instance, it would be unthinkable to fence the port of Antwerp for security reasons since 409 km of public roads cross the 130 km<sup>2</sup> of infrastructure. Following an audit of the European Commission of 2007, the authorities of the port of Antwerp have begun a close cooperation with safety services. Belgian local security committees gather authorities from the port, the maritime police, the local police, safety teams and users. Also, public and private players work together within an information network that collects remarks on unusual events. They participate in joint formations and exercises.

**Mowlid H. ADEN**, Director for the Ports of Djibouti and the Free Zones Authority, Managing Director of Port Secure Djibouti FZCO, presents *From French enclave to strategic crossways: The prominence of Djibouti in the Horn of Africa*. Since 2008, the infrastructures of Djibouti have welcomed and provided services to over 300 military vessels yearly. With the expansion of the only permanent US military base on the continent, the reconfiguration of France's military presence and the establishment of Italian, Japanese and other military facilities, Djibouti has become an international maritime and navy hub where new methods of cooperation and relationships are being developed. The recent opening of the Regional Maritime Centre funded by the IMO is another example of Djibouti's importance in the region and the world.

The Republic of Djibouti is expanding its ports and maritime infrastructures and continues to play a vital role. Over the next five years, it is expected that Djibouti will have more than 5 new facilities including LNG terminal and more specialised terminals to cater for the ever-developing and industrialising Ethiopia and the COMESA market.

*Secure Waterfront in the Unsettled Horn of Africa and Middle East:* The Republic of Djibouti, a resource-deprived country of 14,300 square miles and less than 1 million people in the Horn of Africa, infrequently makes international headlines. But between its comparative stability and its strategic location 20 miles across from war-ravaged Yemen and not far from the pirate-infested western edge of the Indian Ocean where Somalia has been without a functioning government for more than 20 years, it has been since 2008 a springboard for American-led anti-piracy operations. All the world powers that aim to position themselves as the primary guarantor of mercantile security in the Gulf of Aden, the Horn of Africa, and the Indian Ocean have used the facilities in Djibouti. The establishment of the Chinese Navy base next to the Port of Djibouti extended facility expected next year makes it even more important and in the long run may benefit the interaction and working relationship of all superpowers that have bases in Djibouti as well as their allies.

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*Dealing with maritime and port security threats:* In Djibouti, the government is committed to protecting its coasts. In 2012 it created the Djibouti Coastguards and it is getting help from partners such as Japan and the US to train and equip them. It is also working to implement a coordination strategy between the various agencies responsible for the surveillance of maritime approaches, such as the Navy and the Coastguard. Djibouti has implemented the ISPS Code (2004) and, with the IMO's help, has ratified the Code of Conduct of Djibouti and has accepted to host the Regional Training Centre.

*Port and trade security initiatives on maritime supply-chain management in Djibouti:* Since the 9/11 terror attacks, security is now considered one of the necessary prerequisites for a high performance maritime supply chain that is able to warrant highly profitable performances. The hunt for global supply-chain productivity is presently leading towards the development of techniques, technology and an agreed set of standards, which allow the stakeholders to plan or at least minimise the impact of incidents that might occur.

However, security has a cost. Supply-chain security is leading to an increase in logistics costs and may even, in some instances, exert an adverse pressure on economic development for all countries involved and Djibouti, located in a volatile region, is not an exception. The short-term effect has been negative (increased cost for both the Government of Djibouti but also for the facilities' operators) but the medium- to long-term impact is expected to be beneficial. Presently, the facilities in Djibouti are compliant with all international legislation including leading international initiatives such as CTPAT and ISO standards.

Security plans, initiatives and standards are now being measured key supply chain activities. Nevertheless, it is at the same time one of the most challenging activities, chiefly in a regional and international context. If the security activity fails to perform, this will surely impact on the competitiveness of the country and its ports.<sup>22</sup>

**Adriana ÁVILA-ZÚÑIGA-NORDFJELD** and **Dimitrios DALAKLIS**, PhDc Maritime Administration: Law, Policy and Security, and Assistant Professor, Safety & Security, of the World Maritime University analyses security in Mexico: "Enhancing Maritime Security in Mexico: Privatisation, Militarisation, or a combination of both?"

The authors examine three different solutions that Mexico has implemented within its ports and offshore installations in order to improve the country's maritime security framework, as well as ensuring compliance with the International Ship and Port Facility

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22) "Maritime and port security: public interest or private business? What is the role of private organizations in the management of security? Should States be sovereign on these aspects?" 21<sup>st</sup> November 2016, <http://humansea.hypotheses.org/709>

Security Code (ISPS Code): privatisation, militarisation and finally, their combination. The findings of an on-going research effort include inconsistencies within the data of the necessary security incident records, or even their total absence. Inadequate competence and training among the Port Facility Security Officers (PFSO) also stands out. Another important issue was the use of different procedures among the ports under investigation for dealing with exactly the same security issues. The clear conclusion is that, after twelve years of the ISPS Code implementation, Mexico, which is leading the Interamerican Port's Commission of the Organisation of American States (OAS), does not comply with the requirements of the ISPS Code at an acceptable level. The lack of a national maritime security policy has resulted in a poor (maritime) security culture, despite the severe (security) challenges that this nation is facing. It is also true that the country under discussion is currently reorganising its maritime security apparatus, with some positive results. Some tools and recommendations for enhancing the Mexican maritime security operating framework are therefore provided, along with areas of potential future research.

Port security issues cannot disregard natural risks. Sea levels have been studied throughout history. Hundreds of tide gauges, spread out throughout the world, have continuously monitored sea levels since the 1950s. Some were already in place in the 19<sup>th</sup> century. The tide gauge located in Brest has been in operation since the 17<sup>th</sup> century. These devices measure changes in sea levels at specific locations. Waves and tides are not used in the calculation. They are fixed to a terrestrial baseplate and record movements. Results are corrected by using very precise GPS coordinates which measure differences in land topography. Tidal gauges only provide coastal measures. Only satellites equipped with altimeters can provide a comprehensive overview. Since 1993, these types of satellites have been measuring the absolute level of the seas which is far from being uniform. In fact, the surface of oceans is comprised of bumps and depressions and the difference, in centimetres, is significant. By combining the different means of measurement, the average mean of sea levels is about 1.7 mm between 1901 and 2011. The difference between 1993 and 2014, however, is 3.2 mm. Sea levels have always changed and sometimes rather quickly. They rose by 130 metres between the last ice age – around 21,000 years ago – and the beginning of the current interglacial period. This represents about one metre per century. The rise slowed down about 6,000 years ago. It stabilised to an average of 5 cm per century in the last two to three millennia. Such changes cannot be explained solely by natural variations. In fact, sea levels rose by about 20 cm in the 20<sup>th</sup> century. The most commonly cited estimate was provided by the Intergovernmental Panel on Climate Change (IPCC) in 2013 – an increase from 26 cm to 82 cm by the end of the 21<sup>st</sup> century across all regions. The IPCC was created by the United Nations in 1988.<sup>23</sup>

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<sup>23</sup> *Intergovernmental Panel on Climate Change (IPCC)* - A la demande du G7, le GIEC fut créé en 1988, sous l'égide du Programme des Nations Unies pour l'Environnement (PNUE) et de l'Organisation Météorologique Mondiale (OMM). Plus de 3500 scientifiques ont contribué à la production de son dernier



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In the 17<sup>th</sup> century, Saint-Jean-de-Luz had almost been overwashed by the waves that crashed down on the neighbourhood of Barre, built next to the ocean. In 1675, Jurats ruled to compensate Sir Esteban de Hargues because his home had been seriously damaged by the waves. These types of events became more and more frequent and, in 1707, the first sea dike was erected. It eventually collapsed and seven homes were swept away and another 180 were damaged. In the spring of 1782, a hurricane destroyed the Convent of the Ursulines, which had been built in 1630, and flooded two streets and destroyed 80 homes. The ocean was creeping in at an average of 1 metre per year. Even the protection works undertaken by Louis XVI did not stop an eight-day storm from flooding the entire neighbourhood in 1822 – more than a quarter of the city. The wall had a 107-metre hole and, once repaired, it did little to protect the neighbourhood from being flooded again in 1827. In 1854, Napoleon III, who frequently spent time on the Basque Coast and was aware of the distress the locals faced, authorised works to close off the bay. It consisted of building three large jetties. The first, Socoa, began in 1864 and was completed twelve years later. The second, Artha, took over 30 years to build and lastly, works on Saint-Barbe began in 1873 and it was completed 10 years later.<sup>24</sup>

Xynthia was a violent windstorm which crossed several European countries between 26 February and 1 March 2010. It affected Spain (the Canary Islands, Galicia, Asturias and the Basque Country), Portugal, and the Atlantic coast of France, Belgium, Luxembourg and Germany. Forty-three (43) people were declared dead in Madeira as a result of the torrential rains. Xynthia claimed fifty-three (53) lives in France, thirty-nine (39) of which in the county of Vendée. Xynthia was not an extraordinary storm: maximum wind speeds on the coast were registered at 160 km/h on the tip of the island of Ré, but they turned out to be the deadliest since the 1999 storms. It was during those storms that the tanker Erika sank off Belle-Île en Mer. The reason why Xynthia was so deadly was due to the following factors: strong waves, several metres high, and high coefficient tides (102) explain the exceptional rise of seawater along the coast. It caused the death of fifty-three (53) people – twenty-nine (29) in the county of La Faute sur Mer alone – in addition to significant property damage. Damages in France were estimated at two billion euros. The combination of violent winds and high tides resulted in a storm surge and coastal flooding. Charente Maritime, Vendée and Côtes d'Armor were the hardest hit regions. Geographers revealed that a map of

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rapport d'évaluation. Le GIEC ne conduit directement aucune recherche scientifique : sa mission consiste à évaluer le risque posé par le changement climatique et ses impacts, au travers d'une expertise de la littérature scientifique sur le sujet.

Le GIEC s'efforce de dégager clairement les éléments qui relèvent d'un consensus de la communauté scientifique et à identifier les limites d'interprétation des résultats.

[https://www.ipcc.ch/publications\\_and\\_data/publications\\_and\\_data.shtml](https://www.ipcc.ch/publications_and_data/publications_and_data.shtml)

24) LALANNE G., *Saint-Jean-de-Luz, les digues, les bains, les tempêtes, le quartier disparu*, Ed. Pimientos, Urrugne, 2009.





the flooded areas during the storm is almost identical to the area exposed to tides at the mouth of the Sèvre niortaise in 2 B.C.<sup>25</sup> The coast had been heavily developed to accommodate summer vacationers – past floods and the associated risks had been disregarded. The 2010 flood was history repeating itself.

**Dr. Guy Merlo MADOUNGOU NDJEUNDA**, researcher at the Institute of Social Sciences and Humanities Research in Libreville (Gabon), considers natural risks to be linked to climate change, warmer oceans, rising waters and coastal flooding. "*The impact of climate change on port facilities on the West Africa coast: The complex case of the maritime industrial port complex of Port-Gentil*".

Like other parts of the globe, the African West Coast is also confronted with the effects of climate change. Located on the borders of the Gulf of Guinea, Ile Mandji, which is a marine sand accumulation about 50 km length and which houses the oil city of Port-Gentil, is not immune to the vagaries of climate change. Characterised by its worryingly low altitude, located only 4 metres above sea level, the economic capital of Gabon has a topographic constraint exposed to flooding, saltwater intrusion in the Delta of the Ogooué, coastal erosion and flooding of coastal infrastructure. Projections based on the IPCC scenarios and an average assumption indicates a sea level rise in the order of 20 cm by 2050 and 50 cm by 2100. To adapt the industrial port complex of Port-Gentil to the potential effects of climate change, the Gabonese Government has conducted a vulnerability assessment of the coastal zone to climate change and the AAP program has set up the Steering Committee Management Côtes de l'Ile Mandji.

### Marine Renewable Energies

The Intergovernmental Panel on Climate Change (IPCC) opened a meeting in Copenhagen in October 2014 to review the Synthesis Report of its Fifth Assessment Report. 195 delegates distilled all three chapters of the Report and adopted a document on 31 October, which was a fundamental fulcrum during climate change negotiations. The Synthesis Report describes the observed climate changes and their causes. Human influence on climate change is indisputable. Anthropogenic emissions of greenhouse gases are the highest in history. If the same rate is maintained, it will lead to additional warming and increase the risk of severe, invasive and irreversible

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25) "Xynthia, une tragédie prévisible", MERCIER D. & ACERRA M. (dir.), Revue *Place publique*, Nantes, janvier 2011, numéro hors série, 64p., ISBN 9782848091693 – "Xynthia : leçons d'une catastrophe", 2011, *Cybergeo*, revue européenne de géographie <https://cybergeo.revues.org/23763> - PRZYLUSKI V. & HALLEGATTE S. (dir.), *Leçons de la tempête Xynthia*, Ed. Quae, Montpellier, 2012 – LARONZE-CLÉRAC C., MAZEAUD A. & MICHELOT A. (dir.), *Les risques naturels en zones côtières – Xynthia : enjeux politiques, questionnements environnementaux*, Pur, Rennes, 2015.

consequences. Changes in many extreme weather and climate events have been observed since about 1950. Some of these changes have been linked to human influences, including a decrease in cold temperature extremes, an increase in warm temperature extremes, an increase in extreme high sea levels and an increase in the number of heavy precipitation in a number of regions. The first ever universal agreement on climate change was adopted at the Conference of Parties to the United Nations Framework Convention on Climate Change (COP21), the Paris Agreement, in which 195 countries were able to reach a universal consensus to limit climate change in the upcoming decades.

As a result, it is necessary to develop renewable energies, notably sea-based energies. The United Kingdom has the potential in its territorial waters and Exclusive Economic Zone (EEZ) in the form of wind energy. It dominates the world market with 3 GW installed at sea. France was a pioneer in tidal wave energy and used the ebb and flow of the tides to produce electricity at the plant La Rance in Ille-et-Vilaine. The plant started up in 1966 and is still in operation. This type of technology requires the construction of dams and significant investments. Studies are no longer being conducted anywhere in the world, although there is a project in place in the UK. Only Canada and South Korea have these types of plants at their disposal. Offshore wind turbines are anchored to the ocean floor in shallow waters. This is currently the only type of technology being exploited at the industrial level. Vindeby Offshore Wind Farm was comprised of 11 wind turbines with a 0.45 MW capacity and was built in 1991 (Denmark). Europe is the world leader in offshore wind power and has accelerated growth rapidly since 2002. Offshore wind farms currently generate power ratings of 8MW and are using 10MW turbines. Offshore wind farms in the European Union generated a total of 9.2 GW in 2014 according to the EurObserv'Er 2015 barometer. It represents an increase of 2.2 GW (+32%) in one single year. The UK leads with 4.4 GW, followed by Denmark with 2.3 GW and Germany with 1.2 GW. Out of the 3,230 offshore wind turbines, 1,454 are British. Hornsea One Wind Park will have a capacity of 1.2 GW and will supply 1 billion homes by 2020. Floating wind turbines will be allowed in the future eliminating the 50 m constraint. This is of interest for the whole of the Mediterranean and Japan. The European Union decided in 2001 to increase the share of renewable energies of the gross electricity consumption from 14% in 1997 to 22% in 2010.<sup>26</sup> Offshore wind farms had doubled their output in 2015. This is equivalent to the output of eleven nuclear reactors.

**Franck SCHOEFS**, Professor at the Faculty of Sciences and Technology, MRE advisor to the president of the University of Nantes, Director of the research federation CNRS (National Centre for Scientific Research) at the University Institute of Sea and Littoral

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26) LANTZ F., "L'économie des énergies renouvelables en France et en Europe", in *Energies marines renouvelables – Enjeux juridiques et socio-économiques*, GUEGUEN-HALLOUET G. & LEVREL H., Ed. A. Pédone, Paris, 2013, pp. 25-32.



(France), analyses the current panorama in regard to sea-based renewable energy development in France: *A global risk assessment is required to raise awareness regarding France's commitment*. Our societies currently face major challenges that will become more and more prominent in our life during this century, including food and energy. The latter ones affects wider related issues such as available lands for agriculture and greenhouse gas emissions. The sea covers more than 70% of the earth's surface and will play a major role in addressing these challenges. We focus here on the topic of energy by analysing the interest and limits of Marine Renewable Energy. We introduce some key issues such as the global evaluation of risks, governance and safety in a multi-use context, the benefits of combination with other fields of the blue economy through Multi-Use Offshore Platforms, teaching, skills and career development, the reduction of cost and insurance challenges and the maintenance and decommissioning. The chapter focuses on the interest of multi-stakeholder, co-construction and on multi-disciplinary approaches throughout the whole life of a project with multiple steps. It also highlights the role of research organisations such as the CNRS Research Federation, "Sea and Littoral Research Institute".

The most economically viable sources of renewable energies are hydroelectric dams and solar panels. However, they demand large areas of cropland, or of land that could become cropland. Renewable marine energies provide an opportunity because they are operated on oceans which occupy 70% of the planet's surface. Oceans are shared for different purposes. Franck Schoefs summarised the points presented by his colleagues Sylvain Traversa and Pierre Leonidas on this subject during the conference held on 3 October 2015. Their work is addressed in further detail in Chapters 6 and 7. The issue of sea-based renewable energy facility insurability was addressed by François Renelier. Employment in regard to sea-based energy development was developed by Gérard Podevin. Once sea-based energy facilities are started up, maintenance work will need to be conducted as they are to operate for 25 years. The risks associated with decommissioning will also have to be considered.

**Sylvain TRAVERSA**, Head of the Sea-based Renewable Energy Office of the Maritime Prefecture of the Channel and the North Sea (Cherbourg, France) analyses *the development of sea-based renewable energies and their relation to maritime security in France*. France is trying to catch up with its neighbouring countries – Denmark, Germany and the United Kingdom – who are at least ten years ahead. The development of renewable marine energy is undeniable and booming in France. The first call for tenders for offshore wind farms, launched in 2011, will be materialised by the construction of the first offshore wind farms. The guarantor of maritime safety and of the safety of life at sea, the state, through its representative at sea, the maritime prefect, works with the different actors in the maritime sector and project developers to maintain an optimal level of maritime safety combining development of offshore industrial sites and framed maintenance of pre-existing activities. In the face of new challenges, marine renewable energies concentrate today a multitude of hopes. Real prefect of the sea, the maritime prefect aims to be a facilitator and accompanist of industrial successes while remaining vigilant on areas where he is expected to be so

by citizens and the industrial sector, namely the safety of life at sea, maritime safety and environmental protection. Whatever the challenges may be, he is recognised as the key partner of the sea world and guarantor of France's maritime vision.

Wind farm construction needs to be planned in advance by identifying potentially suitable areas that do not jeopardise maritime security, commercial shipping, professional fishing and recreational activities.<sup>27</sup> The general conditions for the construction of the first six wind farms stipulate the implementation of a consultative body as well as the monitoring of maritime activities per park in collaboration with the Maritime Council of the implicated coastal state. Wind farms must be equipped with maritime signalling devices. A study was conducted by the Maritime Rescue Coordination Centre (MRCC) to define maritime intervention and emergency plans in collaboration with maritime prefects. This is a crucial element in the development of these parks. The construction and decommissioning of these types of facilities are equally important phases for maritime security.<sup>28</sup>

**Raza Ali MEHDI, Michael BALDAUF, Dimitrios DALAKLIS, Jens-Uwe SCHRÖDER-HINRICHS**, Maritime Risk & System Safety, (MaRiSa) Research Group, World Maritime University (Sweden), consider the scope of simulators for offshore renewable energy installation navigational risk assessment: *Making the Case: Simulators for Offshore Renewable Energy Installations Navigational Risk Assessment*. In the analysis at hand, the authors consider if, and how, ship handling simulators can be used to feasibly augment existing navigational risk assessment (NRA) studies – particularly those concerning offshore renewable energy installations (OREIs). In order to achieve their aim, they have conducted an experimental pilot-study that allowed observing, assessing and quantifying the navigational behaviour in the vicinity of an offshore wind farm (OWF). Subsequently, they consider the typical parameters that are also identified in the existing NRA models and methods; in addition, they suggest possible ways to take advantage of simulation exercises with the aim to improve the quantification of these parameters. Finally, they have included a discussion of how simulators can be used to augment traditional stakeholder 'workshops' under the notion of further optimisation of the use of limited sea-space.

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27) PAUL Gw. *Le droit éolien*, Ed. du Papyrus, Neuilly-Plaisance, 2014 - BOILLET N., "La planification des EMR en droit français", in *Energies marines renouvelables – Enjeux juridiques et socio-économiques*, préc., pp. 53-7 ; BETTIO N., " La procédure d'implantation des éoliennes offshore en droit français ", préc. pp. 73-92. – BORDEREAUX L., "Les éoliennes à l'épreuve du droit du littoral", *Actualité du Droit Administratif* AJDA 2012, p. 177.

28) BONIS A., *L'implantation des installations énergétiques à l'épreuve du droit, L'exemple des énergies marines renouvelables en mer*, Université de Versailles St-Quentin-En-Yvelines, 2013, sous la direction de SAULNIER-CASSIA E., - SCHNEIDER F., *Les énergies marines renouvelables face au droit*, Thèse Droit, université de Nice, mai 2013, sous la direction de PIQUEMAL A. - *Les énergies marines renouvelables - Approche juridique en droit international, européen et comparé*, Ed. A. Pédone, Paris, 2015 - MICHALAK S., *Marché des EMR et milieu marin, Contribution à l'étude des spécificités du cadre juridique des EMR*, Thèse Droit, Université de Bretagne Occidentale, mars 2016, sous la direction de CUDENNEC A.

**Gérard PODEVIN**, PhD in Economics and Demography. Researcher at the CEREQ (Centre for Study and Research of Qualifications, France), centre affiliated with the Faculty of Economics of Rennes, *raises the question of if sea-based renewable energies will create new employment opportunities*. The emergence of sea-based renewable energy does not create new jobs per se. It will, however, influence the manner in which workers are recruited by redistributing their skill base and how training courses will be restructured. It will also foster the professionalism of sea-based employment, such as in the case of wind turbine maintenance technicians.<sup>29</sup> Most jobs associated with this industry are from the metallurgy, mechanical, shipbuilding and electro-technical sectors. It represents more than a hundred field jobs in the UIMM (Union of Metal Manufacturing, Mining, Engineering, Electrical and Metal Equipment and Allied Industries) and would help these sectors which had been experiencing shortages. Social representations of these technical professions must be updated. The shipbuilding sector fears it will no longer be attractive to workers. These revamped professions correspond to new engineering initiatives in regards to industrial procedures. These initiatives are multidisciplinary and bring together various sectors that are closely interlinked. Mechatronics engineers and wind turbine maintenance technicians are representative examples of these revamped professions. The sea-based renewable energy sector needs to focus on promoting these poorly-known employment opportunities and focus on making them more attractive to workers. The marine environment will need to be incorporated: should engineers be "maritimised" and seafarers "technified"? Governments must play a decisive role in the development of the latter by bringing together industries and training centres. Oceans lie at the core of this industry because it determines the types of employment needed. Moving land wind employment to offshore has its challenges and cannot be swiftly implemented.

**Pierre LEONIDAS** is an offshore project consultant in France and the author of a report on the reform of the French mining code as a result of offshore operations.<sup>30</sup> He considers the legal framework of projects that shall be carried out by several industries, such as the multi-use offshore platform systems. There is currently a project being carried out by the Autonomous Port of Guiana (French Guiana) in collaboration with DCNS and the group Bouygues.<sup>31</sup> The project consists of developing scalable infrastructures that would enable the progressive exploitation of sea-based resources and integrate its activities on multi-use offshore platform systems. It represents a

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29) PODEVIN G., "Quand l'éolien prend la mer : un vent nouveau sur des métiers existants", Bref du Cereq, n° 336, juin 2015, <http://www.cereq.fr/publications/Cereq-Bref/Quand-l-eolien-prend-la-mer-un-vent-nouveau-sur-des-metiers-existants>

30) LEONIDAS P., *La réforme du code minier pour l'exploitation du pétrole offshore - Analyse des besoins d'exploitation du pétrole offshore et des nouvelles exigences environnementales*, Editions universitaires européennes (EUE), Strasbourg, 2014.

31) Présentation du projet par le port autonome de Guyane : <http://www.portdeguyane.fr/wp-content/uploads/2015/02/Conf%C3%A9rence-GPM-POMU-VF.pdf> 15 janvier 2016.



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360° economic approach and ensures complementarity between offshore and onshore activities. The platform will be located near the Panama Channel (3500 km), and even closer to offshore oil facilities. Furthermore, it opens up French Guiana which is subject to difficult maritime access because it lacks sufficient draft. The development of a regional logistics hub is being planned.

DCNS initiated sea-based renewable energy development in 2008 because the need for alternative energies was an environmental concern. There exists technological and industrial synergy with naval defence, which lies at the core of DCNS's business. The firm invests in four major technologies: tidal power, ocean thermal energy, floating wind turbines and wave energy. DCNS strives to be a world class leader in the field of tidal power. Through its acquisition of the Irish company OpenHydro in March 2013, it has been able to make significant progress. OpenHydro developed an innovative tidal turbine which generates competitive electricity prices. OpenHydro is currently working on developing several tidal farms in the United States of America, Canada, France, Ireland, Scotland and the Channel Islands.

The financing and support for the development of innovative concepts for Multi-Purpose Offshore Platforms has become a strategic initiative of the European Union. It aims not only to ensure sustainable use of the marine-maritime environment but also to stimulate industrial development and job creation in emerging sectors such as renewable energy, offshore engineering, marine biotechnology and offshore exploitation of living resources in a more sustainable manner. Several projects in Europe and the world are under consideration and the strengths of French industry (shipbuilding, offshore, BTP) places it at the forefront in the development of these Multi-Purpose Offshore Platforms.

Multi-use offshore platforms can be compared to facilities that are neither ships, nor artificial islands for legal purposes. They can be built by coastal states anywhere within the maritime zones, territorial sea, Exclusive Economic Zone and continental shelves that fall under their jurisdiction. They can also be built by any coastal or non-coastal state in the high seas with the aim of driving economic activity. Semi-floating oil and gas platforms are completely comparable to multi-use offshore platforms. French Law does not recognise the particular status of permanently anchored or fixed floating objects to the sea bed in areas under French sovereignty or jurisdiction. It only recognises ships, facilities or equipment related to navigational safety. In territorial seas, a temporary occupation permit is required. Decree No. 2013-611 of 10 July 2013 regarding regulations applicable to artificial islands, facilities, works and associated facilities located onshore, in the economic zone and the ecological protection zone, as well as submarine cables and pipelines, stipulates the implementation of France's sovereign rights in the areas under its jurisdiction.





## Offshore platforms and exploitation of the continental shelf

Oil and gas exploration and exploitation at sea have undergone significant developments in the last decades. Almost a third of the oil and a quarter of natural gas are extracted from sub-sea reservoirs. The recent drop in the price of oil barrels has considerably slowed down investments. Firms are making efforts to cut costs. ENI began production at the Nooros field, discovered in July 2015, off the coast of Egypt. The Zohr gas field will begin production in July 2017. The eastern part of the Mediterranean Sea looks promising for the development of sea-based energies. The following accidents showed how ecological risks can result in significant damages: Montara in Australia (2009), Deep Water Horizon in the USA (2010), Penglai in China (2011), Elgin in the United Kingdom (2012) and Kulluk in the USA (2012). These accidents revived the need for an international framework.<sup>32</sup> It also brought forth the gap in international conventions that recognised oil tankers but not offshore facilities.<sup>33</sup> At the end of the 1970s, the International Maritime Committee (IMC) requested that the International Maritime Organisation (IMO) elaborate a draft convention regarding offshore mobile units. The draft was reviewed in 1990. In 1996, the Canadian Maritime Law Association published a discussion paper, which was revised in 2000. In 2004, the IMC working group identified that there is little support for this initiative. Several international agreements regarding regional seas take into account the risks generated by offshore activities and determine the prevention regulations.<sup>34</sup>

Directive 2013/30/EU of the European Parliament and of the Council of 12 June 2013 on safety of offshore oil and gas operations is the first regional approach.<sup>35</sup> The directive

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32) ROCHETTE J., "Activités pétrolières et gazières en offshore et protection de l'environnement", in *Le contentieux extractif*, NGWANZA A. & LHUILLIER G. (dir.), ICC, Paris, Chambre de Commerce Internationale, 2015, pp. 125-136.

33) CAMERON P. (2012), "Liability for catastrophic risk in the oil and gas industry", *International Energy Law Review*, Volume 6, pp. 207-219 – SCOVAZZI T. (2012), "Maritime accidents with particular emphasis on liability and compensation for damage from the exploitation of mineral resources of the seabed", In de Guttry A. et al. (Eds), *International disaster response law*, Asser Press, The Hague (The Netherlands), 2012. pp. 287-320.

34) ROCHETTE J. & CHABASON L., "L'approche régionale de préservation du milieu marin : l'expérience des mers régionales", in *Regards sur la Terre 2011*, JACQUET P., PACHAURI R. & TUBIANA L., Armand Colin, Paris 2011, pp. 111-121 – ROCHETTE J., WEMAËRE M., CHABASON L. & CALLET S., *En finir avec le bleu pétrole : pour une meilleure régulation des activités pétrolières et gazières offshore*, Studies N° 01/2014. Iddri, Paris, 2014. 40p. "Seeing beyond the horizon for deepwater oil and gas: strengthening the international regulation of offshore exploration and exploitation", IDDRI, Study N°01/14, 36p.

[http://www.iddri.org/Publications/Collections/Analyses/Study0114\\_JR%20et%20a1\\_offshore\\_FR.pdf](http://www.iddri.org/Publications/Collections/Analyses/Study0114_JR%20et%20a1_offshore_FR.pdf)

35) THIEFFRY P., "Un régime 'Seveso' pour les accidents majeurs liés aux opérations pétrolières et gazières en mer (Directive 2013/30 du 12 juin 2013, relative à la sécurité des opérations pétrolières et gazières en mer et modifiant la directive 2004/35/CE)", *Rev. Trimestrielle de Droit Européen*, Dalloz, 2014 p. 553 et s. – CHAUMETTE P., "Opérations pétrolières et gazières en mer – Adaptation du code minier français au droit de l'Union européenne", <https://humansea.hypotheses.org/405>



is applicable *ratione loci* to territorial sea, the Exclusive Economic Zone or the continental shelf of the Member State within the meaning of the United Nations Convention on the Law of the Sea (Article 2 § 2). It does not include operations conducted in inland waters of member states or those conducted at high seas. By way of prevention, member states must oblige operators to ensure all the necessary measures have been adopted to prevent the occurrence of major accidents during gas and oil operations at sea. In the event of a major accident, member states shall also ensure that operators take all suitable measures to limit its consequences on human health and the environment. In addition, offshore oil and gas operations are to be carried out on the basis of systematic risk management so that the residual risks of major accidents to persons, the environment and offshore installations are acceptable (Article 3). French Law No. 2015-1567 of 2 December 2015 modified its Mining Code as a result of Directive 2013/30/EU of 12 June 2013 on safety of offshore oil and gas operations and Directive 2004/35/EC. The Directive presents gaps in regards to safety measures imposed on operators, especially regarding decommissioning. It does not include European controls which are left to member states. It does not give any accountability to European operators with facilities in non-member states.

**Fayokemi OLORUNDAMI**, PhD Candidate, University of Aberdeen (Scotland), conducted a comparative study of several high-sea mining regulations for the development of an international legal framework for the environmental regulation of offshore mining. *Developing an international legal framework for the environmental regulation of deep sea mining: a comparative analysis of the deep sea mining regulations of Papua New Guinea, the Cook Islands and the United States.*

Deep sea mining in maritime areas within national jurisdiction (that is, the exclusive economic zone and continental shelf), as opposed to maritime areas beyond national jurisdiction, is the focus of this paper. Under the United Nations Convention on the Law of the Sea (UNCLOS) 1982, states have sovereign rights for exploring and exploiting the natural resources of their exclusive economic zones and their continental shelves, which measure at least 200 nautical miles from their coasts. They are also responsible for protecting the marine environment in these zones, as well as managing and conserving the resources within their exclusive economic zones. To this end, therefore, they may enact whatever laws they deem fit to meet these obligations. This state of affairs reveals the undesirable possibility of the application of different standards for marine environment protection insofar as it concerns deep sea mining. In view of the negative impact on the environment that these mining activities could occasion and in light of limited knowledge of the extent thereof, scholars have called for the application of the precautionary principle to halt deep sea mining or for the adoption of an international legal framework to guarantee protection of the marine environment. In the absence of any such international legal framework and in view of increasing interest in deep sea mining, this paper embarks on a comparative analysis of the few available deep seabed mining laws, namely that of the United States of America, Cook Islands and Papua New Guinea, assessing their fitness for purpose in terms of the protection of the marine environment and identifying best practice, trends and

loopholes that might be useful as preparatory material for any future conclusion of an internationally acceptable legal framework for deep sea mining. This is based on the notion that a legal regulatory framework is vital in the quest to protect the marine environment.

**Yann TEPHANY**, PhD Candidate of European Research Program Human Sea, Maritime and Oceanic Law Centre, University of Nantes (France), addresses the powers of coastal states regarding intentional and unlawful acts against offshore platforms. Offshore oil and gas activities contribute substantially to the total world production. Therefore, exploration and production are essential for coastal states' domestic economies. However, as transnational criminal activities have increased, the vulnerability of platforms in the face of potential attacks has been revealed. The United Nations Convention on the Law on the Sea adopts a zonal approach to indicate coastal states' legal competence in delineated maritime areas for limited purposes. However, the evolution and the multiplication of threats to maritime security have led the international community to adapt the existing legal framework. The changing security landscape and concerns about the threats of terrorism and piracy to offshore oil and gas installations are major issues for energy companies and governments worldwide. Despite these developments, coastal states are facing with persistent difficulties in order to protect against these dangerous situations that occur at sea.<sup>36</sup> The most prominent example of that are the offshore installations situated in the exclusive economic zone. The purpose of this presentation is to give a global perspective of the coastal State jurisdiction in order to protect offshore platforms, and discuss the potential benefits an extension of its jurisdiction.

The case of the Arctic Sunrise illustrates the difficult exercise by the coastal state of its jurisdiction over the exclusive economic zone. It is clear from the arbitral sentence that the Russian authorities manifestly exceeded their jurisdiction in the exclusive economic zone. As this space is marked by a spirit of freedom affirmed in Article 58 of the UNCLOS, the action of a coastal state must be permitted by international law. In the present case, as stated in the sentence, protest at sea constitutes "use of the sea for internationally lawful purposes connected with freedom of navigation."<sup>37</sup>

Operators are requesting the extension of the safety zone beyond the 500 metres stipulated in Article 60.5 of UNCLOS in order to ensure the effective protection of offshore platforms. Although it is theoretically satisfying, the external limits of these zones make them ineffective at ensuring optimal protection of offshore installations. Professor Kaye points out that a vessel sailing towards an offshore platform at 25

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<sup>36</sup> KASHUBSKY M. (2016), *Offshore oil and gas installations security: an international perspective*, ed. Informa Law, Routledge, 520 p. - HAREL A. (2012), "Preventing terrorist attacks on offshore platforms: do states have sufficient legal tools?", *Harvard National Security Journal*, vol. 4, p. 171.

<sup>37</sup> Communiqué de la Cour Permanente d'Arbitrage, "Arctic Sunrise Case (Pays-Bas c. Russie)", 24 août 2015.



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knots can cross a safety zone in 39 seconds. This makes these zones inoperative in regards to protective measures in the face of threats posed by the sea.<sup>38</sup> In addition, many arms have ranges that exceed the limits of the safety zones. Although the request to extend the safety area may seem legitimate, it was not retained by the IMO. IMO guidelines recommend flag states to comply with the relevant conditions when sailing near offshore platform safety zones.<sup>39</sup> Operators have implemented information and surveillance measures that exceed the stipulated limits. They have proposed that the platforms be used by coastal states as surveillance systems of marine spaces complementary to onshore semaphores and beacons. Collaboration among private stakeholders and neighbouring states is part of this area.

**Claire Asiago BERRYL**, PhD Candidate, International and European Energy Law, UEF Law School at the University of Eastern Finland (Joensuu, Finland), examines the "role of Angolan local content requirements: A means for benefit sharing or an end in itself?"

Over the last 40 years, the Angolan petroleum industry has undergone major structural, legal and fiscal changes to ensure equitable sharing of petroleum benefits. Nevertheless, those changes have not reflected positively on social development among Angolan citizens thereby prompting the introduction of Local Content (LC) requirements. This article argues that LC plays an important role in accelerating the process of benefit sharing. However, the formulation and implementation thereof creates a discord between the stakeholders. Currently, LC has become a legal obligation that reflects the commitments undertaken by the exploration and production companies for acquiring local labour, goods, and services. Under the Angola petroleum legal regime, LC percentages are meant to generate economic benefits for the local economy that go beyond fiscal benefits. LC serves as judgement criteria (along with signature bonuses and minimum work programs) at the bid rounds for the award of both onshore and offshore blocks as may be determined by the national oil company Sonangol. Presently, both governments and oil companies continue to debate the realities of how best to achieve these mandates without affecting investments. The introduction of a rule-based regulation to pursue LC development with limited clarity causes concern as to whether LC is a means to benefit sharing. This article therefore concludes that formulation of LC alone, with limited implementation procedures and without strong mechanisms for oversight, risks becoming a recipe for underdevelopment instead of development. The transparency and accountability of state-owned companies that act as commercial players and sector regulators are

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38) KAYE S. (2007), "International measures to protect oil platforms, pipelines, and submarines cables from attack", *Tulane Maritime Law Journal*, vol. 31, 2007, p. 381 - KLEIN N. (2011), *Maritime security and the law of the sea*, Oxford University Press.

39) KRASKA J. & PEDROZO R. (2013), *International Maritime Security Law*, ed. Martinus Nijhoff, 2013 p. 79 - OMI, "Guidelines for safety zones and safety of navigation around offshore installations and structures", SN.1/ Circ. 295, 7th December 2010.

paramount in the pursuit of economic development. Otherwise, serious concerns like loss of revenues for the state, extra-budgetary spending that bypasses Parliament's budget oversight and political patronage continue to be a cause for alarm.<sup>40</sup>

**Buba BOJANG**, PhD Candidate, University of Aberdeen (Scotland), analyses *the relationship between economic exploitation and management: an analysis of the continental shelf regime*. Under UNCLOS, coastal states have the right to exploit continental shelf resources without an explicit management duty. On the other hand, states have a duty under relevant international legal and policy Instruments to manage natural resources. To resolve this tension, the paper will analyse the continental shelf regime and discuss the relationship between exploitation and management.

### **IT security of ports, ships, and platforms - *Safety of the installations: Towards an international certificate of IT security?***

Cybersecurity is the body of technologies, processes, regulations, devices, risk management methods, training and practices designed to protect networks, computers, programs, data and people (directly or indirectly connected to a network) in states and organisations. It does not only refer to IT system security but also to IT management, embedded computing and connected devices. It requires a comprehensive approach. According to the European Union, cybercrime encompasses three categories of criminal activity: hacking (denial of service attacks), traditional forms of crime (scams, data thefts, fraud, fraudulent credit card payments and identity theft), and the dissemination of illegal material (child pornography, racist and xenophobic material).

The Convention on Cybercrime was adopted by the Council of Europe in Budapest on 23 November 2001. The Convention was the first international treaty on crimes committed via the Internet and other computer networks, dealing particularly with infringements of copyright, computer-related fraud, child pornography, hate crimes, and violations of network security. It also contains a series of powers and procedures such as the search of computer networks and lawful interception. Its main objective, set out in the preamble, is to pursue a common criminal policy aimed at the protection of society against cybercrime, especially by adopting appropriate legislation and fostering international cooperation.<sup>41</sup>

40) RENOARD C., "De la contribution de l'industrie extractive au développement socio-économique des populations riveraines - Le coq, la papillon, l'écureuil et la fourmi", in *Le contentieux extractif*, NGWANZA A. & LHUILLIER G. (dir.), ICC, Paris, Chambre de Commerce Internationale, 2015, pp. 96-105 et "Pétrole et lien social. Pour une responsabilité politique de l'entreprise", *Revue Française de Socio-Économie*, La Découverte, Paris, 2015/2, Hors-série, pp. 89-104.

41) QUEMENER M., *Cybersociété, entre espoirs et risques*, L'Harmattan, 2013 - QUEMENER M. et

## Cybersecurity applied to the maritime field

In modern societies, we can see a progressive extension of the use of computers and automatics, in industry in particular. That extent goes with a general spread of malevolent software, which has formed an exploding threat throughout the past years. In 2007, synchronised devastating attacks in Estonia against official sites, media, and bank system were a clear step into a cyber-warfare era. Then in 2010, the Stuxnet virus destroyed centrifuges of the Iranian uranium enrichment programme. This is another huge step into attacks by Advanced Persistent Threats (APT), able to target industrial objectives, such as SCADA systems (Supervisory Control and Data Acquisition for industrial automatons). These APTs implement complex and specific architected attacks, written in planned strategy and conducted over a long time. Today, not a week goes by without big scale cyber attack reported in media.

France is conscious of these threats on a political level (Bockel Report 2012), a strategic level (Strategic Defence and Security Reviews (*Livre Blanc*) of 2008 and 2013) and a joint level. The Chief of Defence Staff considers cyberspace to be the 5<sup>th</sup> warfare environment after land, air, sea and space, and this global warfare is carried out by the Cyber General Officer in the Strategic Joint Headquarters (CPCO in Paris Balard). Within this framework, the Cyber Defence of Naval Systems chair as well as many education initiatives and partnerships with academies (Naval Academy, Telecom-Bretagne) and industry actors (DCNS, Thales) were created. The French state is committed with new and reinforced structures such as Cyber Command, Armed Forces Services Headquarters, DGA (Delegation for Armament), ANSSI (National Agency for Security of Information Systems) and CALID (Analysis Centre for Cyber-Defence).

Maritime actors are especially sensitive to cyber threats, due to geopolitics and business concerns. In addition to that, the maritime world is very vulnerable: ships at sea are partially isolated, with limited crews and more and more complex technologies aboard, controlling almost all the ship's functions particularly some of the most vital ones (navigation, engines and weapons systems for warships). These systems are quickly deprecated (on average, a ship's life lasts 30 years), leaving the ship more vulnerable in the face of the constant development of cyber threats. Beside the ships, it is also a whole ecosystem of ports, harbours, oil and marine renewable power infrastructures that can be targeted. All the situations caused by human actions, mistakes or failures can be provoked by cyber-attacks (missile launching, load ripping, collision, grounding, oil spills), with human consequences (passenger ships) and other damages.

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PINTE J.M., *Cybersécurité des acteurs économiques : Risques, réponses stratégiques et juridiques*, Hermes Science Publications, coll. "Cyberconflits et cybercriminalité", Lavoisier, Paris, 2012 – QUEMENER M. & CHARPENEL Y., *Cybercriminalité - Droit pénal appliqué*, coll. Pratique du Droit, Economica, Paris, 2010.

Cyberspace is physical, logical and social. Threats really exist and come from states, enterprises, criminal or terrorist organisations and hackers. This cyber-war is included in a global information war that covers military and industrial intelligence and psy-ops. Organisations are more and more targeted. Advanced Persistent Threats (APT) are developing. To be secured, a system needs to guarantee the availability of its service, integrity of information and confidentiality of its secrets. Security policies are technical and non-technical (physical protection, organisation, human considerations). Cyber-security is composed of cyber-protection (protection to prevent attacks), cyber-defence (detection, adaptation, response) and cyber-resilience (continuation of mission). In this very complex framework, Naval Systems Cyber-Defence chair conducts research around issues like SCADA, real-time, sensors and AIS signals. Cyber, in spite of appearing nebulous to seafarers, is now completely integrated in their work environment. Cyber-security has become a significant base for safety and for security as well.

**Paul TOURET**, Director of ISEMAR (Saint-Nazaire, France), analyses the automation of terminals, vessel monitoring and the associated security issues. The computerisation of maritime and port processes has its risks, just like all other human activities that have digitalised their operations. For different reasons, the ships are both traced and sometimes directly controlled by their shipowners, in particular to impose the routing and bunkers consumption. Inside ports, the terminals are affected by a vague automation where human labour mutates the gear to computerised monitors. The arrival of new technologies in the maritime industry is bringing new challenges to a world that is very attentive to security issues.

An automated container terminal is not a thing of the future. Automation was introduced in terminals years ago and it is becoming more and more of a common practice. In certain terminals, container fleet management (stockpiling and movement) is conducted entirely by automation. In some terminals, automated vehicles are used to move stockpiled containers to ship-to-shore gantry cranes. It can include AGVs and straddle carriers. IT management is used in terminals to manage container stockpiling and movement in regards to ship planning and inland connection tools.

**Bernard DUJARDIN**, Professor of economics at ENSTA, University of ParisTech (France), analyses the principle of Highly Reliable Organisations and how it can be applied to ground control ships. The ground control ship (GCS) is based on a paradigm of security/safety reducing the maritime risk. Security is achieved by implementing a fail-safe principle in which redundancy is the key word. HRO (Highly Reliable Organisation) and HSO (Highly Sure Organisation) are applied to the GCS. HSO treats secure communications by an intrusion alarm system in the multi-layer network and neutralising any layer plagued by a virus.

Ground control ships sail under the strict compliance of IMO Conventions and thus ensure safe navigation. Ground control ship operations require the highest levels of

reliability. He believes the insecurity factor in navigation lies within human factors. "All properly conducted manoeuvres are narrowly averted catastrophes". This seems to be a simple conclusion to draw: the fewer human factors involved in a technical process, the higher the chance of ensuring security. Reducing human factor during circadian cycles reduces risks. Ground control ships are operated by crews with successive 8-hour shifts, including night hours. "Crews" are located in Navigation Workstations that operate several ships simultaneously. GCSs will remain the ships of the future for a short while. They are not a substitute for crew-operated ships but they complement the maritime transport offer. IMO Conventions are currently being updated to include this type of vessel among global maritime traffic. GCSs will be part of the maritime landscape in the 2020s if the IMO completes its work in time. Navigational security has considerably improved in the last half of the century even if maritime security has worsened. GCSs are part of ensuring safer oceans, both in regards to security and safety. Security is prioritised over safety during times of peace.

**Gersende LE DIMNA**, lawyer and teacher at ENSM (National Maritime College, Le Havre, France), analyses the legal aspects of cybercrime risks in maritime security. The maritime sector is highly dependent on cyberspaces and wireless IT systems. The Convention on Cybercrime was adopted by the Council of Europe in Budapest on 23 November 2001. An additional protocol of 28 January 2003 came into force on 1 July 2004. The IMO adopted interim guidelines on maritime cyber risk management in collaboration with the Maritime Safety Committee and the Facilitation Committee (MSC.1/Circ. 1526). The European Parliament and Council adopted Directive 2016/148 concerning measures for a high common level of security of network and information systems across the Union on 6 July 2016. Cybercrimes can take different forms and generate several types of risks. Any attack against computer systems creates a significant risk and could have severe consequences that could lead to loss of human life and/or harm to the environment and the economic interests of not only private firms but governments. It is thus necessary to attribute civil and criminal responsibility to unlawful behaviours.

**Awa SAM-LEFEBVRE**, PhD in law, researcher and trainer in maritime security and safety at ENSM (National Maritime College, Nantes, France) and member of the Maritime and Oceanic Law Centre at the University of Nantes (France), addresses the following question: *Are ships of the future a tool to increase maritime activity reliability?* Ships of the future must be able to reduce shipping risks. These vessels must be environmentally-friendly and be built of recyclable materials. Decommissioning must have been taken into consideration in their design. Its mode of propulsion needs to protect marine and aerial environments. They are intelligent and connected, though these characteristics carry their own set of risks. The more ships become performant because of innovative devices, the more they become vulnerable. International regulations and industry certifications need to be determined in the face of these changes. The risks of piracy and terrorism must be also apprehended.





## High Reliability Organisations at Sea

### ***Concept and conditions – Organisation of the shipping company – The interface board / technical system***

**Francis BERTOLOTTI**, President of the Supervisory Board of the Port of Nantes / Saint-Nazaire (France), presents the complexity of High Reliability Organisations. The complexity of a system can result from the organisation of elementary components that interact with or react to their environment. Observers consider the state of the system to be unreliable and chaotic, even if they have a sound knowledge of the components. The behaviour of a complex system is not predictable, even if it is subject to a hidden order and recurrent relations. Only systematic measures prevent the occurrence of identified risks. Individuals do not know when the use of a safety belt will be useful but the fact that they are equipped with it during each journey, almost ritually, eliminates an entire category of risks. The identification of weak signals is a good prevention measure in terms of security. It is possible to use statistics to rate unsafe situations based on their level of gravity and frequency of occurrence. In fact, the largest array of prevention methods was developed in the industrial sector. For example, failure modes, effects and criticality analysis (FMECA) is a good operational safety tool. When a risk is identified, a criticality analysis is performed by charting the probability, severity and detection capabilities of a failure. The failure mode criticality is then rated based on acceptance criteria. Risks are also rated. Defining acceptance criteria is the key for High Reliability Organisations. Digital tools and artificial intelligence play an increasing role in prediction determination, notably via simulations and the growing power of algorithms. Digital simulation provides an opportunity to create virtual scenarios of risks. Modelling techniques can simulate multiple complex situations at the same time. Industrial systems can be tested at full-power in accident conditions and unscheduled events.

**Benoît JOURNÉ**, Professor of Management Science at the Institute of Economy and Management of Nantes/Institute of Business Administration (IEMN-IAE) at the University of Nantes (France), discusses managerial implications in high reliability models.

High Reliability Organisations can be described as organisations that have succeeded in avoiding catastrophes in an environment where normal accidents can be expected due to risk factors and complexity.<sup>42</sup> These organisations achieved a high level of safety because they recognise safety as a top priority even if they operate in at-risk industrial sectors where the occurrence of accidents is quite high. Organisational reliability of high-risk industries is feasible if everything is well considered and implemented. Although actors are defined with clear sets of skills and responsibilities,

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42) PERROW C., *Normal accident: Living with High Risk Technologies*, New York, Basic Books, 1984.



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there are additional available, informal and temporary resources associated to local organisations that ensure flexible adaptation in the face of unexpected events. High Reliability Organisations are mindful and are continuously reinventing themselves.<sup>43</sup> Safety may have been attained but it is not guaranteed: organisations must be willing to continuously learn. There is often a gap between regulations and practices. A balance between centralisation and decentralisation, planning and resilience, safety regulations and managed safety must be struck – facts management tend to ignore. They should, in fact, help stakeholders manage these tensions. Safety management tools are too often conformity tools and not reflexivity tools. Day-to-day operational errors should be studied, even those that have had no consequences. It is best to manage the unexpected and draw lessons from events.

What about vessels, ports and the relationship between onshore/offshore port/vessel relationships?

**Hubert ARDILLON**, President of the European Confederation of Shipmasters' Associations (CESMA), former ship captain of oil and gas tankers, trainer at the ENSEM navigation simulator (du Havre, France), analyses the ship and technical system interface; the ship, its captain and reliability.

At first, automatisisation gave some help to seamen in conducting the ship. It could be a warning, or a pre-warning, but also a help with the decision. Of course, seamen adapted the decision using their professional knowledge and standards. The same can be noted with ISM Code. The training delivered to seamen on such technical systems, technically but also on human factors, is very important. How to be, how to react, to live in the face of such technical systems? Nowadays, ECDIS and very large vessels bring new opportunities to improve seamen's knowledge. But it could raise a conflict between captain and shore team on how to conduct the vessel. The future is, or could be, ships without crew. Let us consider the advantages, but also the disadvantages, that this kind of vessel could bring to the maritime environment.

The key word to retain is training. Both technical and human training is the best way of improving security at sea and to strive towards achieving zero accidents. Costs remain the challenge but there is a return on investments when the occurrence of accidents is low. Any type of technical system requires users to be properly trained in regard to technical functions and system behaviours. Stating that 80% of accidents are the result of human factors is not sufficient to implement unmanned cybernetic

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43) BOURRIER M., *Le nucléaire à l'épreuve de l'organisation*, Presses Universitaires de France (PUF), Paris, 2001 – JOURNÉ B., "Les organisations à haute fiabilité" in *Management des risques pour un développement durable*, MICHEL X. & CAVAILLÉ P. (dir.), Dunod, Paris, 2009, pp. 367-384 – SUTCLIFFE K.M., "High reliability organizations (HRO)", *Best Practice & Research Clinical Anaesthesiology*, 25/2011, pp. 133-144.

systems, given that there is still a lot of misunderstanding regarding the human-machine interface.

**Carl SANDBERG**, PhD in Sociology, Senior Lecturer in Sociology, School of Health, Care and Welfare, Mälardalen University (Sweden), examines *Globalisation and Organisation on Swedish-flagged Merchant Ships*. This chapter emphasises the impact of globalisation on Swedish-flagged merchant ships. Hiring low cost crews is synonymous with ships that sail under flags-of-convenience. This phenomenon has also had an impact on the national fleet in many countries. In Sweden, the solution has been to approve a system of temporary employed staff to work on board Swedish-flagged ships. The purpose of this chapter is to show how the global labour market impacts on the daily work on board these ships. The chapter is based on ethnographic fieldwork that was conducted on board two Swedish-flagged merchant ships in motion. The ships have had mixed ethnic crews from Sweden, the Philippines and Poland. The results show that the ships were stratified by ethnicity, where the Swedish crew was at the top of the organisation. The results also indicated the presence of a conflict regarding how things should be done on board these ships, such as how orders should be delegated and tasks distributed.<sup>44</sup> There is a way that Swedes do things, which is informal, and a way that Filipinos do things, which is formal. This conflict between ways of doing things is interpreted as a consequence of having crews that work under different terms and conditions: while Swedish crews belong to a national labour market, Filipino crews belong to a global labour market.<sup>45</sup>

**Jonathan RUILLE**, PhD in Management, at LEMNA, Postdoctoral research fellow in the European Research Program Human Sea at the University of Nantes (France), presents his work: *Can a passenger ship be considered a High Reliability Organisation?*

Passenger ships are means of transport that have the potential to cause catastrophic consequences. Reliability is thus imperative. These entities are at the heart of a hyper-complex system, comprised of millions of connections which ensure safety standards are respected. This chapter sheds light on the different players who play an important role in the design, maintenance and distribution of reliability.

The Titanic, the pride and joy of the the White Star Line, sank during its maiden trip from Southampton to New York City in April 1912. The *Titanic* struck an iceberg and

44) SANDBERG C. (2014), *On Board the Global Workplace: Coordination and Uncertainty on Merchant Ships*, Stockholm Studies in Sociology 57, Doctoral Thesis in Sociology at Stockholm University - THORVALDSEN T. & SONVISEN S.A. (2014), "Multilingual crews on Norwegian fishing vessels: Implications for communication and safety on board", *Marine Policy*, Vol. 43, pp. 301-306.

45) See also, RINGBOM, H.M. (2015), "National employment conditions and foreign ships - international law considerations", *Marlus, SIMPLY 2014*, The Scandinavian Institute's Maritime and Petroleum Law Yearbook 2014, n° 456, pp. 109- 151 - ZHANG P., *Seafarers' Rights in China - Restructuring in Legislation and Practice Under the Maritime Labour Convention 2006*, Springer, 2016, 184 p. - CHAUMETTE P., *Notes de lecture*, <http://humansea.hypotheses.org/714>



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sank. It resulted in 1,513 casualties. This was not the only shipwreck. The Law of the Sea is a post-catastrophic law, that is, a law that is created or is modified following a shipwreck or serious event.<sup>46</sup> The Channel holds a strategic position because vessels that set sail from northern Europe have no other alternative than take the maritime corridor. Approximately 20% of the world maritime traffic circulates through these waters.

The merchant marine system is a dynamic one in which all the players, private and public, work in close collaboration to ensure security and safety at sea. The research has demonstrated that the vessel is continuously connected and its reliability does not depend solely on the crew or the company: it depends on several players who each view the vessel through their own prism. This is an important factor to take into consideration in the framework of HROs because the vessel is an open unit in comparison to the other players. A ro-ro passenger ship is not only a floating engine but also a complex system comprised of a 5-storey hotel, resting on a multi-level garage under which lies a mini-power plant. This type of machine is by nature unstable so it is necessary to properly distribute weight and use ballasts to ensure operational safety. There are several potential failure modes and the crew is constantly facing challenges that could thwart safety. The ship never stops moving so, consequently, neither does the work. The ship is isolated but connected. Safety culture is inherent and surveillance is permanent. Training and procedures are complex and in accordance with the SOLAS Convention of the IMO. The ISM and ISPS are also part of said convention. However, there is a level of tension between the mechanistic and organic approaches to safety. The crew is able to face unexpected situations and, to do so, chief masters resort to unusual elements during drills. The objective is to be able to manage the unexpected by using "thought and action during the process of communication and research in a challenging situation". When the emergency plan is activated, six teams (deck, machine, security, rescue, medical attention and passengers) are put into place and they are all capable of self-organisation. Reliability is assumed in a decentralised manner.

**Cyrille PELLETIER DOISY**, Professor of Maritime Education at ENSM (National Maritime College, Nantes, France) and PhD Candidate at LEMNA (University of Nantes, France), provides her point of view on the subject: *Onshore and Offshore: The Professionalisation of Marine Merchants via Management Tools*. French Merchant Marine officers are professionalised through the French Merchant Marine Academy. Officer training is completed with a training period aboard a merchant vessel. Several managing tools were used to link these periods up according to the development of international rules and technologies. According to many officers' testimonies, training

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46) RUILLE J., *Management des risques intégré des navires et de leurs armements – Un ferry peut-il être une organisation à haute fiabilité?*, Thèse Gestion et Management, Université de Nantes, 2015, <https://tel.archives-ouvertes.fr/tel-01232734/document>

practices on board have not evolved much from post-war to the beginning of the 21<sup>st</sup> century.

The French particularity is made evident by the existence of two different branches. Branch B is monovalent (deck or engine officer) and Branch A is polyvalent (deck and engine officer). France is one of the few countries to provide a polyvalent education. The first graduates to emerge with this type of education date back to 1965 at the National Merchant Marine School of du Havre. Alternance training includes navigation (a core course in maritime education) where students were required to complete a boarding notebook which was graded by the shipmaster. In 1989, nautical education was reduced and only a technical dissertation was required. In 1995, the STCW Convention was amended to define maritime training practices and assessment criteria. On-board training was amended by including the documentation of said training in an approved training record book. It also stipulated which skills and competences need to be assessed during the course of seafarers' service on board the ship. This information is presented in the form of a table. The re-implementation of on-board training record books seems to have been barely used. It was similar to the box-ticking quality procedures implemented during the 1990s by the ISM.<sup>47</sup> French shipowners wished to refer to the model adopted by the International Chamber of Shipping (ICS). In 2011, the ENSM re-introduced these educational tools after being pressured by the CTI (the French Engineering Accreditation Association) – the main objective behind the school's reform.

**Marie-Thérèse NEUILLY**, PhD in Sociology and expert in risk and crisis management (Nantes, France), addresses cruise ship safety and security. Can we build the resilience of these types of ships? The argument presented by cruise operators is economic in regards to the development of large passenger vessels because its objective is to offer sailing opportunities to as many people as possible. Large liners have become recreational areas where stopovers most often are not important. Even though gigantism a common term nowadays, it has been around since 1854 with the launch of P&O's vessel *Himalaya* which measured 113.9 metres long. It was in service until 1940. Jules Verne's *A Floating City* was first published in the *Journal des Débats* from 9 August to 6 September 1870. It was then published as a novel by Hetzel on 17 July 1871. The author, who was born in Nantes and died in Amiens, tells the story of a woman aboard the ship *Great Eastern*, a ship the author used to sail from Liverpool to New York City.

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47) ISM: International System of Management: International code of quality management implemented in 1996 and included in the SOLAS Convention of the IMO.



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Victor HUGO, *Open Sea, The Legend of the Ages (1883)*.

The last century has seen on the Thames  
The growth of a monster in the promise of unbounded blue,  
And for long, the Babel of the seas, had London whole  
Raising its eyes in the shadows the yard  
Abominable, with its seven masts and five stacks  
Neighing, with each crashing wave.  
Carrying, in the whistling north wind  
Ten thousand men, ants scattered in its belly,  
This Titan, joyous, hurtling into the storm;  
Reaching up past the dome of St. Paul's;  
Shadows of human spirit, upright on its deck,  
Stupefying the sea that was no more than a lake.

The White Star Line built RMS Olympic in 1911. It was 269 meters long, just as long as the Titanic. The French Line (Compagnie Générale Transatlantique) built SS France in 1962 and it was 316.1 meters long; Cunard Line's SS Queen Mary, built in 2004, was 345 meters long; Royal Caribbean Cruise Line's MS Harmony of the Seas, which set sail in Saint-Nazaire in 2016, is 362 meters long. Harmony of the Seas can accommodate 6,296 passengers, 2,000 of whom are crew members. It was estimated that 24.2 million passengers would board cruise ships in 2016. This is 2.5 times more than in 2001. The world fleet will double by 2024 and count on 80 vessels.

The IMO's Maritime Safety Committee reacted quickly when Costa Concordia capsized in 2012, by adopting recommended interim passenger ship evacuation measures in May of the same year. In November 2012, it adopted measures which require organisations to conduct mandatory muster drills prior to setting sail. In June 2013, the Maritime Safety Committee adopted amendments to regulation III/19 of the SOLAS Convention to require musters of newly embarked passengers prior to or immediately upon departure, instead of "within 24 hours" as stated in current regulations. These amendments went into force on January 1, 2015. The MSC also reviewed its long-term action plan and its interim measures (MSC.1/Circ.1446/Rev.2). It included new measures regarding the harmonization of bridge navigational procedures across their fleets; securing heavy objects (companies owning and/or operating passenger ships should adopt a policy to incorporate procedures into their Safety Management Systems (SMS); lifejacket stowage (includes stowing additional lifejackets in the vicinity of assembly stations); the use of accompanying video for passenger emergency instruction notices; and voyage planning in the event of being re-routed. The 2006 amendments went into force in 2010 and are applicable to passenger ships built after July 1, 2010. "The best lifeboat is the ship itself" is based on the Safe Return to Port requirement: evacuation of passenger ships at sea is not feasible, nor easy if run aground. Although cruise lines are encouraged to develop and provide fun activities



onboard, are they to be only informed of safety procedures and their role to be considered passively?

**Dimitrios DALAKLIS**, Assistant Professor, **Aykut ÖLÇER**, Professor, **Fabio BALINI**, Lecturer, and **Jarrod DEWITZ**, US Coast Guard, Lecturer, World Maritime University, (Malmö, Sweden) present their reflections on *Protecting the Arctic Environment: Challenges and Opportunities for Liquefied Natural Gas*. Numerous scientific records of climate indicators and their in-depth statistical analyses testify that the global warming phenomenon's impact is becoming increasingly evident. Weather patterns have already been severely altered in various regions of the Earth, with the case of the Arctic clearly standing out. As ice coverage in this region maintains its downward trend, the creation of new and significant business opportunities should, however, be noted. Maritime routes that were previously covered with ice packs are now becoming available for shipping; the promise for shorter voyages from Asia towards Europe and/or the Americas (and vice-versa) is enticing. Additionally, the status of lesser ice in the wider Arctic region could facilitate the extraction of the numerous natural resources (and especially energy-related ones) available in all those frozen areas, which were previously widely considered as unsuitable for any type of business.<sup>48</sup>

This analysis will briefly highlight the decline of ice coverage in the Arctic and elaborate on its main consequence in relation to the contemporary global maritime transport system: the creation of the so called "Arctic Passages".<sup>49</sup> Additionally, it will provide a summary of the current regulatory framework associated with the region under discussion and especially the provisions of the International Code for Ships Operating in Polar Waters (Polar Code-PCD).<sup>50</sup> Furthermore, considering that the use of petroleum today is the primary marine fuel source within commercial shipping, this analysis will expand upon previous research efforts about how to preserve the arctic environment by limiting the use of such oil fuels. Therefore, it will explore the use of alternative sources, specifically in the form of liquefied natural gas (LNG), in order to

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48) DALAKLIS D. & BAXEVANI E., "Arctic in the Global Warming Phenomenon Era: Maritime Routes & Geopolitical Tensions", in *Nouvelles routes maritimes – Origines, évolutions et perspectives*, DELFOUR-SAMAMA O., LEBOEUF C. & Gw. PROUTIERE-MAULION (dir.), A. Pédone, Paris, 2016, pp. 169-188.

49) DELFOUR-SAMAMA O., "Les enjeux de la protection de l'environnement arctique", in *Nouvelles routes maritimes – Origines, évolutions et perspectives*, DELFOUR-SAMAMA O., LEBOEUF C. & Gw. PROUTIERE-MAULION (dir.), A. Pédone, Paris, 2016, pp. 213-228 - KOZUBOVSKAYA-PELLÉ A., "La route maritime du Nord : Développements régionaux et contraintes techniques", in *Nouvelles routes maritimes – Origines, évolutions et perspectives*, pp. 229-239 - LASSERRE F., "Des autoroutes maritimes polaires ? Analyse des stratégies des transporteurs maritimes dans l'Arctique", *Cybergeo, Revue européenne de géographie*, 2011, n° 537 <http://cybergeo.revues.org/23751?lang=en> - LASSERRE F. (dir.), *Passages et mers arctiques - Géopolitique d'une région en mutation*, Presses de l'université du Québec, 2010.

50) *Shipping in polar waters - Adoption of an international code of safety for ships operating in polar waters (Polar Code) - The Polar Code is expected to enter into force on 1 January 2017.* <http://www.imo.org/en/mediacentre/hottopics/polar/pages/default.aspx>





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reduce the environmental impact of petroleum spilled within the pristine Arctic waters in the event of an accidental discharge, as well as under the notion to decrease air pollutants.<sup>51</sup>

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51) GRUE J. & GABRIELSEN R.H. (Ed.), *Marine Transport in the High North*, The Norwegian Academy of Sciences and Letters (NASL), Norwegian Academy of Technological Sciences (NTVA), Novus Forlag, Oslo, 2011, 124p. [http://www.arctis-search.com/tiki-download\\_wiki\\_attachment.php?attId=219](http://www.arctis-search.com/tiki-download_wiki_attachment.php?attId=219)