THE ECONOMIC POTENTIAL OF MARITIME OFFSHORE ACTIVITIES

Cătălin C. POPA[1]
Corneliu GRIGORUȚ[2]
[1]Lecturer Ph. D., „Mircea cel Bătrân" Naval Academy, Constanta, Romania
[2]Professor Ph. D., „Mircea cel Bătrân" Naval Academy, Constanta, Romania

Abstract: *The maritime sector is one the most complex economic activity all over the world, embedding all international legal and technical issues into a comprehensive framework for global transport network idea. Because of its international vocation, general public get a limited perception and appreciation of maritime transport influence and role as being fundamental in terms of social and economic development, and as a potential source of excellent employment and career opportunities, even if several million people currently working in activities and companies directly and indirectly involved in naval industry worldwide. Historically, the shipping and fishing industry have experienced a continuous trend of increase both in their fleets and in total trade volume and fishing capacity respectively. In parallel to the extraordinary increase of traditional sea-related activities, the maritime sector has experienced a significant qualitative and quantitative expansion with the appearance and development of one new industrial growth pole: the offshore activity. This paper has the chance to evidence the position and role of offshore activity in maritime trade.*
Keywords: *maritime transport, off-shore, sustainable development*

1. INTRODUCTION

The most common definition we find available: Offshore construction is the installation of structures and facilities in a marine environment, usually for the production and transmission of electricity, oil, gas and other resources. Construction in the offshore is very dangerous and harmful to the environment. Construction and pre-commissioning is typically performed as much as possible on land or inshore areas. To optimize the costs and risks of installing large offshore platforms, different construction strategies have been developed. [1]

One strategy is to fully construct the offshore facility inshore, and tow the installation to site floating on its own buoyancy. Bottom founded structure are lowered to the seabed by de-ballasting (see for instance Condeep or Cranefree), whilst floating structures are held in position with substantial mooring systems. It all started in the late years of the 18th century, when began the exploitation of numerous springs of crude oil and natural gas in California. After drilling a large number of wells, the first entrepreneurs noticed that the wells nearest the ocean were the best producers. That initial discovery led them to drill on the beach itself. The idea was so successful that, in 1.887, they came up with a more ambitious scheme consisting in building a wharf, extended into the ocean, and erecting the drilling equipment on it. [2]

Today, there are almost 4,000 production facilities on the Outer Continental Shelf. Offshore activities take place in waters of more than half the nations on earth. Wells are now drilled from modern steel or concrete structures, which involves a wide range of technologies similar in many cases to those used to find, produce and transport oil and gas on land, although offshore operations involve meteorology, naval architecture, mooring and anchoring techniques and buoyancy, stability and trim. Besides, it must be considered that drilling and producing oil and gas wells are important phases of offshore operations, but the scope goes further. Offshore operations include exploring and transporting oil and gas from their point of production offshore to refineries and plants on land [11].

As technological progress increased and more reserves are being discovered in deep water, the need to design and build deep-ocean compliant structures, such as tension leg platforms, continues to evolve to meet technical and economic needs for deepwater development. This rapid evolution in technology needs to be independently verified to ensure continued safety of operations and protection of the environment. Floating installations have became the main solution for this sort of industry, along with another sophisticated systems for the exploration in deep waters, such as FPSO vessels (Floating Production Storage and Offloading), which are a major breakthrough in drilling-unit design for offshore use [7]. As a result of almost 150 years of discovery and enhancement, the platforms can now be put in different categories, as we can see in the picture below:

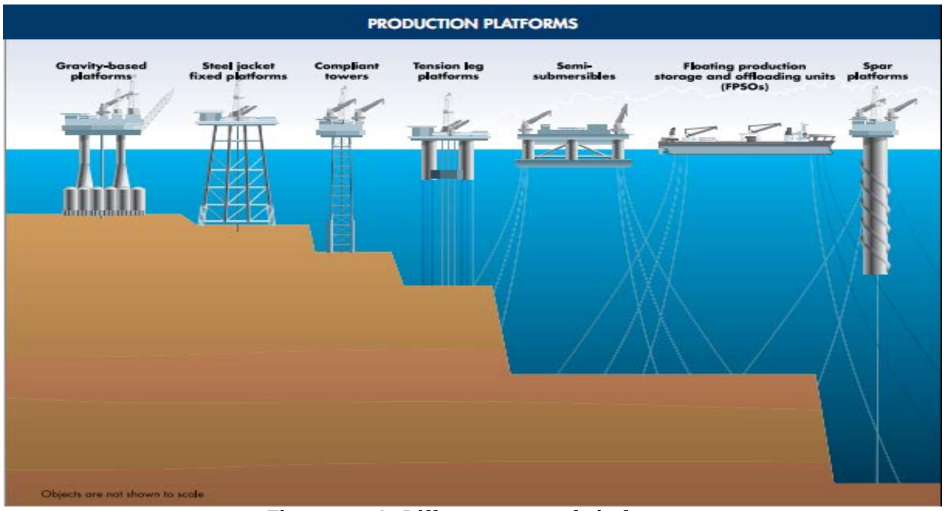


Figure no. 1: ***Different types of platforms***

2. MAIN OFFSHORE ACTIVITIES

Offshore structures are used worldwide for a variety of functions and in a variety of water depths. The most commonly known activity for an offshore structure is that of drilling. The main purpose of this is to extract natural resources from the seabed.

An oil platform, often referred to as an offshore gingerbread platform or, somewhat incorrectly, oil rig, is a large structure with facilities to drill wells, to extract and process oil and natural gas, and to temporarily store product until it can be brought to shore for refining and marketing. In many cases, the platform contains facilities to house the workforce as well. Depending on the circumstances, the platform may be fixed to the ocean floor, may consist of an artificial island, or may float. Remote subsea wells may also be connected to a platform by flow lines and by umbilical connections; these subsea solutions may consist of one or more subsea wells, or of one or more manifold centers for multiple wells. Not much different for platforms that drill in search for natural gas. [2]

Another activity, not too well known to the public is the offshore wind farms. Offshore wind power refers to the construction of wind farms in bodies of water to generate electricity from wind. Better wind speeds are available offshore compared to on land, so offshore wind power's contribution in terms of electricity supplied is higher. However, offshore wind farms are relatively expensive. Unlike the term typical usage of the term "offshore" in the marine industry, offshore wind power includes inshore water areas such as lakes, fjords and sheltered coastal areas, utilizing traditional fixed-bottom wind turbine technologies, as well as deep-water areas utilizing floating wind turbines.

Europe is the world leader in offshore wind power, with the first offshore wind farm being installed in Denmark in 1991. In 2008, offshore wind power contributed 0.8 Gigawatt (GW) of the total 28 GW of wind power capacity constructed that year. By October 2009, 26 offshore wind farms had been constructed in Europe with an average rated capacity of 76 MW, and as of 2010 the United Kingdom has by far the largest capacity of offshore wind farms with 1.3 GW, more than the rest of the world combined at 1.1 GW The UK is followed by Denmark (854 MW), The Netherlands (249 MW), Belgium (195 MW), Sweden (164 MW), Germany (92 MW), Ireland (25 MW), Finland (26 MW) and Norway with 2.3 MW. [11]

Offshore wind power can help to reduce energy imports, reduce air pollution and greenhouse gases (by displacing fossil-fuel power generation), meet renewable electricity standards, and create jobs and local business opportunities. However, according to the US Energy Information Agency, offshore wind power is the most expensive energy generating technology being considered for large scale deployment". The advantage is that the wind is much stronger off the coasts, and unlike wind over the continent, offshore breezes can be strong in the afternoon, matching the time when people are using the most electricity. Offshore turbines can also be "located close to the power-hungry populations along the coasts, eliminating the need for new overland transmission lines".

In figure no.2 is presented a list of the top 15 offshore wind farms that are currently operational, rated by nameplate capacity. In the case of a tied bottom place in the table, the wind farm with the earliest commissioning date is used.

Wind farm	Total (MW)	Country	Coordinates	Turbines & model	Official Start
Greater Gabbard	504	United Kingdom	51°52′48″N 1°56′24″E	140 × Siemens 3.6-107	2012
Walney (phases 1&2)	367.2	United Kingdom	54°02′38″N 3°31′19″W	102 × Siemens SWT-3.6-107	2011 (phase 1) 2012 (phase 2)
Sheringham Shoal	315	United Kingdom	53°7′N 1°8′E	88 × Siemens 3.6-107	2012
Thanet	300	United Kingdom	51°26′N 01°38′E	100 × Vestas V90-3MW	2010
Thorntonbank Phases 1 & 2	215	Belgium	51°33′00″N 2°56′00″E	6 x REpower 5M, 30 x 6M	2012
Horns Rev II	209	Denmark	55°36′00″N 7°35′24″E	91 × Siemens 2.3-93	2009
Rødsand II	207	Denmark	54°33′0″N 11°42′36″E	90 × Siemens 2.3-93	2010
Chenjiagang (Jiangsu) Xiangshui	201	China	34°29′00″N 119°52′00″E	134 × 1.5MW	2010
Lynn and Inner Dowsing	194	United Kingdom	53°07′39″N 00°26′10″E	54 × Siemens 3.6-107	2008
Robin Rigg (Solway Firth)	180	United Kingdom	54°45′N 3°43′W	60 × Vestas V90-3MW	2010
Gunfleet Sands	172	United Kingdom	51°43′16″N 1°17′31″E	48 × Siemens 3.6-107	2010
Nysted (Rødsand I)	166	Denmark	54°33′0″N 11°42′36″E	72 × Siemens 2.3	2003
Bligh Bank (Belwind)	165	Belgium	51°39′36″N 2°48′0″E	55 × Vestas V90-3MW	2010
Horns Rev I	160	Denmark	55°31′47″N 7°54′22″E	80 × Vestas V80-2MW	2002
Ormonde	150	United Kingdom	54°6′N 3°24′W	30 × REpower 5M	2012

Figure no. 2: ***Top 15 Wind Farms***

Probably the least known of the offshore activity is: Offshore aquaculture. Offshore aquaculture, also known as open ocean aquaculture, is an emerging approach to marine culture or marine farming where fish farms are moved some distance offshore. The farms are positioned in deeper and less sheltered waters, where ocean currents are stronger than they are inshore. Offshore aquaculture can potentially fill a gap in European production, while mitigating social aspects of carrying capacity but the technological challenges of the open sea are significant, and will be reflected in business costs, including insurance and also potential negative interactions with coastal areas include species exchanges and disease. There is also the combination between offshore wind farms and aquaculture.

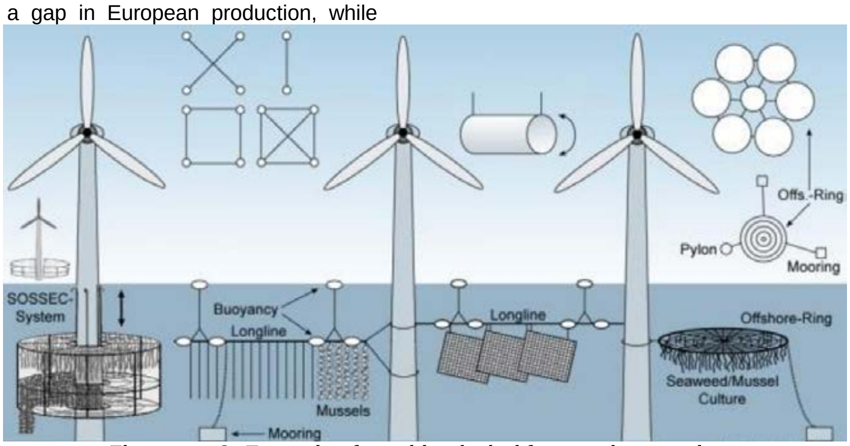


Figure no. 3: ***Example of combined wind farm and aquaculture***

3. GLOBAL OFFSHORE OIL AND GAS PRODUCTION

Today the offshore industry is an increasingly important part of global oil and gas supply. Indeed, as conventional onshore production has leveled-out, and in some cases declined, it has been new offshore developments that have sustained the level of production required to meet increasing global demand for hydrocarbons. According to Infield Systems' Offshore Energy Database, total offshore oil production accounted for 22% of global production in 2000 – 1% of which was from deepwater. In 2010 these figures had risen to 33% and 7% respectively. The prospects for the future remain equally.

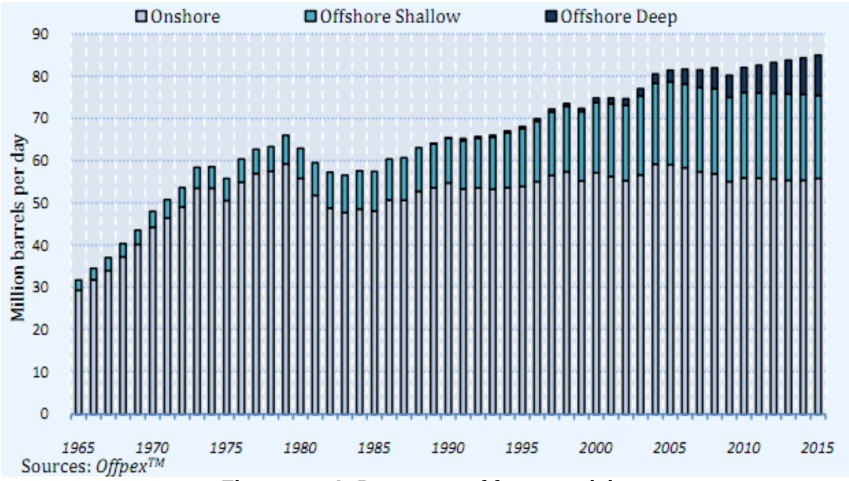


Figure no. 4: ***Prospects of future activity***

The problem consists of more increasing demands of oil and gas at a global level.

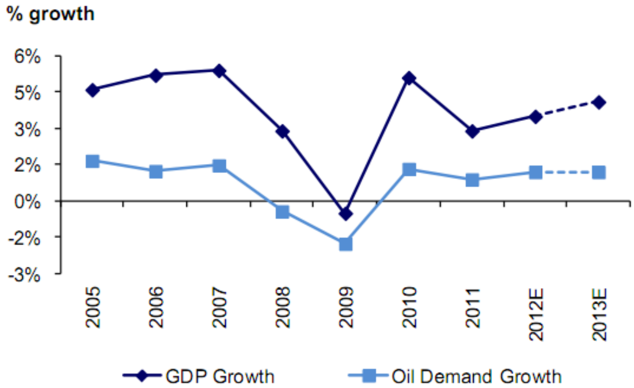


Figure no. 5: ***Oil consumption vs. GDP growth***

This also influences the crude oil prices as it can be stated consulted the below graph.

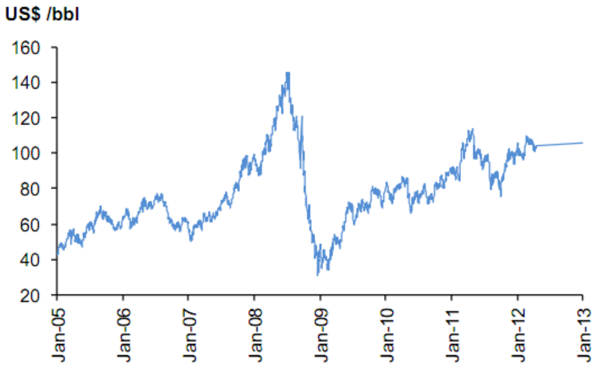


Figure no. 6: ***Crude oil prices***

With the increase necessity of new places from which to get oil, and the prices being on the rise, new solutions were searched out in order to achieve this so it was inevitable that the exploration trend was to go deeper and further.

Country	Number of Offshore Fields	Average Water Depth (feet)	Distance from Shore (km)
Angola	10	4,970	156
U.S.	25	4,751	173
Brazil	30	3,514	156
Nigeria	7	2,054	63
Malaysia	8	1,171	99
Norway	18	761	141
Australia	7	499	149
United Kingdom	14	361	122
India	16	230	100
China P.R.	7	226	38
Others	39	666	83
Total	**181**	**1,896**	**126**

Figure no. 7: ***Recent offshore activity***

An increase in offshore activity also meant an increase in off-shore support vessel industry.

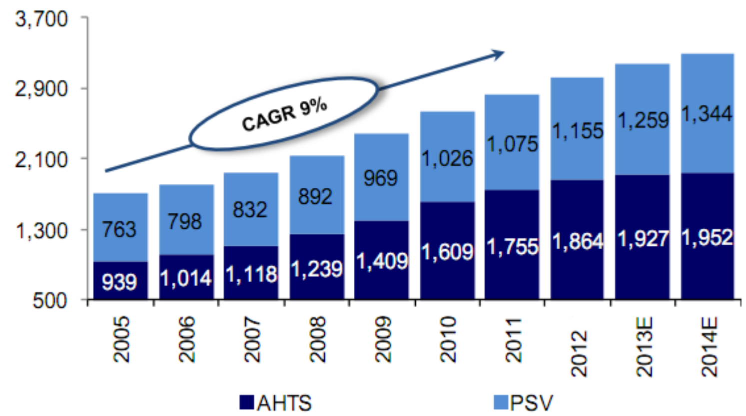
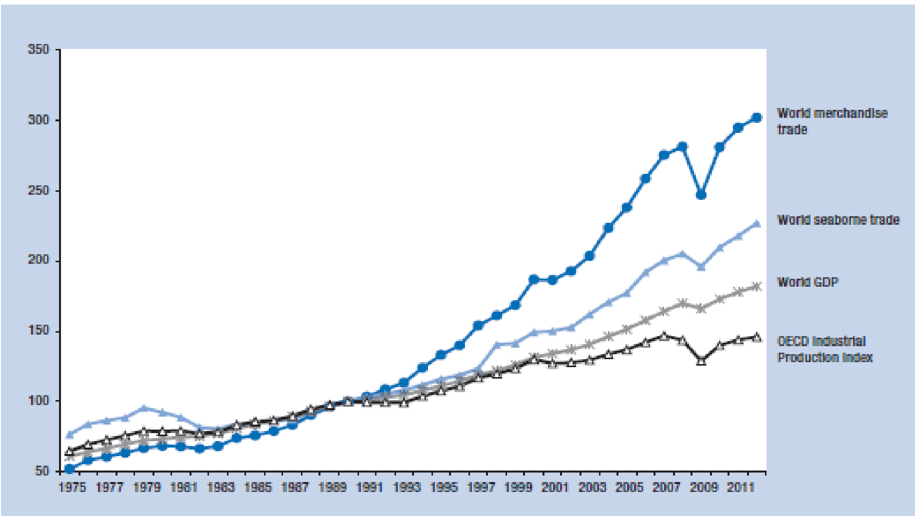


Figure no. 8: ***Fleet development by number of vessels***

It is becoming clear that the market is on the rise and there seems to be no breakeven point in the horizon.

4. LATEST PROGRESS OF OFFSHORE ACTIVITIES

As we can see from the figure below, it would appear that the worst part of the global economic crisis has finally been passed, and thing are getting back on track.



Source: UNCTAD secretariat, on the basis of OECD Main Economic Indicators, May 2012; UCTAD, *The Trade and Development Report 2012*; UNCTAD *Review of Maritime Transport*, various issues; World Trade Organization (WTO) (table A1a); the WTO press release 658, April 2012, *World Trade 2011*, Prospects for 2012. The 2012 index for seaborne trade is calculated on the basis of the growth rate forecast by Clarkson Research Services in *Shipping Review & Outlook*, spring 2012.

Figure no. 9: ***Global seaborne trade evolution in last three decades***

The composition of the world fleet reflects the demands for seaborne trade of different commodities, including dry and liquid bulk and manufactured goods. As manufactured goods are increasingly containerized, the containership fleet has increased its share from 1.6 per cent of the world fleet in 1980 to over 13 per cent in 2011. This has happened mostly at the expense of general cargo vessels, whose share has dropped from 17 to 7.8 per cent during the same period. Refrigerated cargo is also increasingly containerized, and very few new specialized reefer ships are being built. It is estimated that in 2010, only 35 per cent of seaborne perishable reefer cargo was transported by specialized reefer vessels, while 65 per cent was already containerized – a share which is forecast to grow to 85 per cent by 2015. Most of the exporters of refrigerated cargo such as bananas, other fruit, beef and fish are developing countries, which need to adapt their supply chain to this trend of further containerization. The growing trend of offshore activity had the normal effect of continuous rise of number of vessels that support its operations, as we can see in the figure below [13].

World fleet size by principal types of vessel, 2010–2011[a] *(beginning-of-year figures, thousands of dwt; market share in italics)*

Principal types	2010	2011	Percentage change 2011/2010
Oil tankers	450 053	474 846	5.5
	35.3	*34.0*	*-1.2*
Bulk carriers	456 623	532 039	16.5
	35.8	*38.1*	*2.3*
General cargo ships	108 232	108 971	0.7
	8.5	*7.8*	*-0.7*
Container ships	169 158	183 859	8.7
	13.3	*13.2*	*-0.1*
Other types of ship	92 072	96 028	4.3
	7.2	*6.9*	*-0.3*
Liquefied gas carriers	40 664	43 339	6.6
	3.2	*3.1*	*-0.1*
Chemical tankers	7 354	5 849	-20.5
	0.6	*0.4*	*-0.2*
Offshore supply	24 673	33 227	34.7
	1.9	*2.4*	*0.4*
Ferries and passenger ships	6 152	6 164	0.2
	0.5	*0.4*	*0.0*
Other/n.a.	13 229	7 450	-43.7
	1.0	*0.5*	*-0.5*
World total	1 276 137	1 395 743	9.4

Figure no. 10: ***World fleet size and structure***

The year 2010 set a new record in the history of shipbuilding, which was the result of vessel orders that had been placed before the 2008 economic crisis. The deliveries recorded amounted to 3,748 ships, with a total gross tonnage of 96,433,000 GT. Although this is a historic record, it is lower than was expected in early 2010, because owners and shipyards continued to defer some deliveries. In the container sector especially, “non-deliveries” amounted to an estimated 39 per cent of the order book [13]. New ships built that were needed for offshore activities can be seen in the figure below.

Deliveries of newbuildings, different vessel types (2010) *(concluded)*

	1 000 GT	Percentage	Units	1 000 TEU	1 000 dwt
Offshore					
Drilling ship	612	0.64	11	0	596
Anchor handling tug supply	538	0.56	235	0	441
Platform supply ship	223	0.23	92	0	265
Offshore support vessel	129	0.13	18	0	88
Pipe layer crane vessel	90	0.09	4	0	38
Offshore tug/supply ship	79	0.08	43	0	74
Diving support vessel	67	0.07	10	0	42
Crew/supply vessel	14	0.01	47	0	8
Other offshore	151	0.16	10	0	186
Subtotal offshore	1 904	1.97	470	0	1 739
Total deliveries in 2010	96 433	100.00	3 748	1 475	149 746

Figure no. 11: ***Offshore fleet size and structure***

5. CONCLUSIONS

There are great risks at building and operating an offshore platform that can have dire consequences, but still their number is rapidly growing. Today, approximately 35% of the world's oil and gas are being extracted from offshore platforms, and while the globe is running out of surveyed land, there are a lot of possibilities at sea. As Earth, as we know it, is made up of 21% land and the rest oceans and seas, the figure 35% leaves a lot more room for improvement.

The dire need for more oil and gas and the possibility of profit encourages more and more offshore platforms to be built. This does not apply only to natural deployable resources like oil and gas but also to renewable energy source, like wind. As new technologies appear so new solutions will arise for new and better offshore platforms capable of more and more. To look upon a newly built offshore platform is to take a peek into the future.

BIBLIOGRAPHY

[1] Baker, Ron, A Primer of Offshore Operations, University of Texas at Austin, 1998
[2] Clarkson Capital Markets, Overview of the Offshore Supply Vessel Industry, May 2012
[3] Nicolae, F., *Naval and Port Operating System*, Mircea cel Bătrân Naval Academy Publishing House, vol.1, Constanta, 2012
[4] Nistor, F., Haralambie, B., *Prevention Costs of Quality for a Port Operator*, Scientific Bulletin of Mircea cel Bătrân Naval Academy, no.14, vol.2 pg. 142-143, ISSN 1454-864X, Constanta, 2011
[5] Nistor, F., *Value-Added Services of Logistics Centers in Port Areas*, Scientific Bulletin of Mircea cel Bătrân Naval Academy, no.11, pg. 309-310, ISSN 1454-864X, Constanta, 2008
[6] IMF, World Economic Outlook, April 2012
[7] Marine-Base, Clarkson Capital Markets estimates, April 2012
[8] Bloomberg, EIA - Short Term Energy Outlook, March 2012
[9] ***, The Learning Space (http://openlearn.open.ac.uk)
[10] ***, American Institute of Steel Construction [AISC], Inc., Chicago, Illinois, USA
[11] ***, www.sbmoffshore.com
[12] ***, Clarkson Research, The Offshore Oil Market, March 2012
[13] UNCTAD, Review of Maritime Transport, Geneva, 2012.