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THE ANALYSIS OF MARITIME ACCIDENTS IN 2017

ABSTRACT

Study presents the analysis of accidents that took place in marine areas and on board of the sea units in 2017, including: vessel carrying passengers, cargo vessels and offshore drilling and production installations, as well as offshore support vessels. The aim of the article is to indicate a wide spectrum of events related to: total losses of vessels, accidents on boards of the vessels and other accidents which happened in marine areas. The study presents numerous data, which were presented in the form of graphs and tables, based on international reports and own experience gained during work experiences. The analysis also referred to data from previous years to show better spectrum of the present situation.

Keywords:
Major accidents, maritime hazards, total losses of vessels, maritime casualties.

1. INTRODUCTION

Shipping is a lifeblood of the global economy. About 90% of trade exchange takes place by sea. More than 50,000 vessels operate in maritime areas, carrying various types of goods, passengers and work in offshore industry. Therefore, ensuring safety in shipping is a priority aspect of all sea users.

The main aim of the article is to indicate a wide spectrum of events related to: total losses of vessels, accidents on boards and other accidents which happened in sea areas. The paper also shows a number of factors and events referring to total losses of the vessels, hazards, accidents, casualties which happened on board and threats which

occur in the sea area. Also the background of accidents which happened in 2017 and previous 10 years is shown in the article. The research problem is an attempt to determine how the situation in the area of maritime safety have been changing for years and show a current trend. In order to show the subject of the paper, the authors used the analysis of available international reports and experience gained while working on different types of vessels as well as in the shipowners' office.

Primary sources during writing were statistic data from Safety & Shipping Review published by Allianz Global Corporate & Specialty, Lloyd`s List Intelligence Casualty Statistics, and International Ice Patrol 2017 and science articles from The Annual of Navigation and The International Journal on Marine Navigation and Safety Sea Transport [Hanchrow 2017, Herdzik 2016, Dyrcz 2016]. Numerous websites especially www.fleetmon.com, www.marineinsight.com and www.maritimeworldnews.com were used as an additional support.

The work was divided into four chapters. The first one presents the analysis of hazards that occurred in marine areas. The second one discusses the total losses of vessels in 2017 which were compared to the data from 2016 and previous years, indicating the trend from over the last 10 years. The data also concerns different types of vessels. Next chapters indicate reasons for the total losses of vessels, in which human factor as well as hydrometeorological conditions and machinery failure played main role.

Authors also indicated emergencies that took place in the offshore industry, including accidents on offshore installations and offshore support vessels. Description of this subject was caused by the revival of offshore market and opening new oil and gas exploration and production projects or backing to suspended activities. This way the risk of accident may increase.

At the end of the work, authors encourage reflection on the current safety situation in maritime areas and summarize the whole analysis with conclusions.

Through this article authors want to draw attention to the safety situation in the sea area and on board of the vessels. Also to emphasize that the problem is still current in spite of implementing numbers of regulations and procedures.

2. HAZARDS IN SHIPPING

In 2017 there were almost 3000 reported accidents in total compared to 2016 with 2511 cases [Shipping review 2018]. It is an increase of over 4%. In 2015 the result was reversed and the number of events decreased by 4% compared with 2016.

Taking into account accidents in maritime areas, it is a base to indicate the emergencies and phenomena that may be the cause of an accident or a dangerous situation. Currently, there are noticeable phenomena which increasingly threaten shipping:

- violent weather conditions, unpredictable, abnormal and variable,
- developments and accidents on the North Sea Route,
- increased crossing of icebergs in the North Atlantic, including crossed 48° N Latitude,
- development of maritime management area, including wind farms,
- pollution of the marine environment,
- cyber-attacks,
- an increase in the size of vessels,
- lack of the safety requirements and procedures particularly in domestic routes,
- others.

Changing climate associated with global warming generates weather conditions considerable intense and variable. In 2017, one noted an increased number of catastrophic weather conditions, such as hurricanes "Hervey", "Irma" and "Maria" (HIM) which hit the Caribbean Sea, the East Coast of the United States and Florida and typhoons in the South of Asia: "Damrey" and "Hato". They caused nearly 30 vessels' sinks. Only during the typhoon "Dimery" 6 vessels off the coast of Vietnam sank and more than 63,000 pleasure yachts during the raging "Irma" and "Havery" were got lost or were destroyed. Weather conditions were one of the reasons for closing ports, disturbances in passenger vessels schedules, shortages in cargo deliveries, fuel price increases and others.

Violence and increased frequency of hurricane winds have opened up an international debate on early warning and thus preparing for approaching dangers and ways of protecting units, especially smaller ones, including pleasure yachts that cannot find a place of refuge on other waters and have to stay in harbors during rage catastrophes. Larger vessels could proceeded to safe waters, although smaller ones were unable to do so. According to that there was also indicated the highlighted of preparing the scenarios of threats related to the possibilities of protection against maritime infrastructure damage. Moreover, providing a better organization of the supply chain including planning alternatives routes and means of transport selection should be taken into consideration. Changing climate makes it necessary to consider a new approach to integrate and ensure the best safety solutions.

Three powerful hurricanes ravaged sea areas in one month, when the harbors repaired the damages. To ensure deliveries vessels were directed to other ports, and transport of the necessary cargoes was carried out by land or awaited in a safe place to improve the situation, causing disturbances in the supply of goods. In this state of affairs transporting cargo by sea should be considered not only in the context of orders but also possibilities of their delivery on time and to their destination.

Changing climate, and thus the melting ice, opened up the possibility of delivering cargoes along the northern route, but also increased the hazard of crossing icebergs in the North Atlantic. 2017 was the nineteenth (19^{th}) and the most dangerous year in terms of descending icebergs since 1900. There were 1600 icebergs reported in the North Atlantic, including 1008 icebergs crossed 48° N Latitude in the North Atlantic [International Ice Patrol, 2018]. Compared to 2016, the number increased by almost 40% (from 990) and icebergs that exceeded 48° N were 626 which means a sharp increase of 38%.

In the last decade numbers are as follows: all the icebergs were in the number 6000, and those that across the Latitude of 48° N were over 5,600. Worth mentioning is the year 2014 in which nearly 1600 icebergs went down below 48° N. To improve the monitoring of the region in 2017, International Ice Patrol introduced a new system of monitoring areas "Ice Reconnaissance Detachments (IRD)" to conduct aerial reconnaissance in search of icebergs in the Atlantic and Labrador Sea, the leading operating from St. John's, using U. S. Coast Guard (USCG) Long Range Surveillance Maritime Patrol Aircraft (HC-130J) from USCG Air Station Elizabeth City (ASEC) [International Ice Patrol 2018]. In addition to the data obtained from the system, information provided by aircrafts and ships passing through was invaluable, which together with the satellite image analysis allowed for the current alarming of the situation. Undoubtedly, proceeding in such areas requires above all an experienced crew, proper information about all the danger and in case of emergency providing immediate rescue or assistance.

Changing climate and global warming, apart from hazards, open up new opportunities for transporting cargo by sea. In the summer season, the northern route becomes free and allows to shorten the route of vessels, for example, from China to Europe. This means that the way from Shanghai to Rotterdam through the Suez Canal is 10557 Nautical miles and through the North Route - 8046. It is a 24% shorter route. Such data at the present time, when looking for cheaper transport solutions, seem like a tempting proposition. In addition, we should take into consideration blocking Malacca Strait, the Suez Canal and the Red Sea by Saudi Arabia and Egypt. What is more, the threat of pirate attacks extending across the Indian Ocean or competition between India and China are now current.

However, the possibilities offered by nature at the present time, should be considered and analyzed in order to ensure the highest level of safety passage of the ship through these virgin areas, so as not to damage them and not pollute them. Disturbing is the fact that with the increase in the number of marine units moving on the silk arctic route, the number of accidents increases by almost 30% year by year.

Potential of sea areas is enormous in terms of its use, it obtains of various resources and raw materials so it develops sea areas. However, the lack of skills in its proper use and the lack of protecting measures for conducting activities, can generate further dangerous situations. All efforts and risk assessment should be made so that developing marine wind farms does not pose a threat to shipping as well as to living organisms in those areas. Of course, it must be emphasized that this is a safer way of acquiring energy compared to atomic ones. Moreover, the prices with an increased number of wind farms are at the level of conventional energy costs. But the hazards which can generate marine wind farms must be considered more precisely. It cannot only refer to risk of collision or threat environment or living organisms, but also should refer to disruption in the movement of a huge masses of air.

It is worth emphasizing that the Northern Europe is a global leader in marine wind energy production. In 2017 the number of wind farms increased by 25% compared to 2016. In the year 2016 till 3230 marine turbines with a total capacity of 11027 MW were installed. Every year, not only the number of installed turbines is growing, but also the production and effectiveness of offshore wind technologies. Currently, the largest installed generators have a rated power of 7 MW and in the test phase there are turbines with a capacity of 10 MW. It is predicted that in the near future the power of turbines will be even higher and can reach 15 MW. This means that a 315 MW offshore wind farm will meet the electricity demand of over 83 000 households. Poland has significant potential for the location of marine wind farms, in particular in the Exclusive Polish Economic Zone [Szymańska, 2017].

Thriving is noticeable in the field of oil and gas production, which are located under the seabed. The offshore projects are being opened. Due to of this, the risk, in particular related to oil spill should be considered increasing. The offshore market, both oil and gas and renewable energy is estimated to increase steadily by 2023 [www.businesswire.com, 02/08/2018].

To protect and prevent from environment damage by oil and gas production, the European Union introduced Directive 2013/30/EU of the European Parliament and of the Council on safety of offshore oil and gas operations and amending Directive 2004/35/EC. This document defines the major accidents and ways of protecting

mining operations which are carried out in sea areas. What is more, it introduces regulations to ensure the safety of extraction and production energetic resources, especially, financial responsibilities and liability for losses to the natural environment.

The other hazard which has been invariable for years, is pollution of the marine environment caused by vessels and activities in marine areas. The harmful substances can get not only into the water but also into the atmosphere. The necessity to further reducing emissions of harmful substances requires proper preparations. Vessels need to rebuild their propulsion systems and newly-built vessels require innovative solutions which are expensive compared to the profits of their operation.

The number of accidents with tankers is worrying because it has been increasing in comparison to recent years. These incidents mainly concern collisions, sinking, fires and explosions and also grounding. More information is given in the further part of the article.

Another hazard is a threat of cybercrime. In June 2017 there were cyber-attacks on an unprecedented scale, which caused losses of about 3 billion dollars in all industries, including sea transport. In 2017 computers were infected with the NotPetya virus, which demanded that the ransom was to be paid in exchange for unlocking the files. This new threat forced to introduce new solutions in securing computer networks. Many shipping companies make efforts to improve cyber security onboard, separating IT systems for various facilities such as navigation, machinery and referring to cargo handling operations. Maearsk experienced significant losses in the previous year when its network became a victim of cybercrime. After that the company was coming back to the balance for many months. According to the information given above there is no sense constructing unmanned vessels which would be threaten by cyber-attack from the shore.

The hazard is also generated by the technological progress. Moreover, other emergencies are connected with building bigger vessels with a larger cargo capacity and capable of taking on board several thousands of passengers.

Danger also refers to substitute the crew by modern equipment, integrated systems and innovative technologies. The limited number of crew and the increase in the capacity of vessels make it very difficult to carry out a quick and effective rescue operation directly on board of the ship by the crew, but also by the search and rescue services. According to historical data base, the capacity of container vessels has increased by 1500% in the last 50 years but the crew was reduced. The reasons for the total losses of ships, constructive damage and accidents are not only on the side of system failures or crew faults but they are also a result of lack of proper declaration of

cargoes, the lack of rescue measures and adequate management of the resulting situation. “Modern" threats must be analyzed by ship operators in order not to generate economic losses but also to ensure proper solutions for newly built vessels.

Current state of affairs also requires additional and reasonable risk management, which will not cause overstretching the form over the content. Examples of such situations are fires in particular on the (ultra-large container ship) m/v Maersk Honam (March 2018), m/v Mearsk Pemborke (August 2107) or m/v MSC Daniela (April 2017), m/v CCNI Arauco (September 2016), m/v MSC Flamina (July 2012).

Nowadays new larger passenger vessels are built, which can take on board more than 20 000 TUE and 8 000 people. Ensuring safety on board in emergency situations require an unprecedented scale of solutions in the organization of rescue, evacuation operations, transport of persons and medical assistance. New regulations must be published to meet the current situations.

New trend in building unmanned vessels is also noticeable but it seems to be unjustified and require deeper analysis - in an emergency situation on board of the vessels or in the sea areas, they will not be able to defend properly. In particular, against the current threat that cyber criminals can generate or cause in the event of a failure. Additional issue is to take responsibility for the losses incurred: the operator on the counter, the software producer or other people responsible for introducing modern technology.

For many years there have been other hazards such as: increased ship traffic, especially in narrow passage, communication errors, lack of proper communication, not meeting the requirements of safety procedures, vessel’s equipment failures, human errors and sequences of adverse events leading to tragedies.

It is also worth mentioning that threat caused by pirates attacks is still current in spite of the decreasing numbers of piracy attacks, international maritime forces which operating on shipping routes (especially in High Risk Area) and others efforts like employed armed security on board of the vessels. They generate losses in the shipping and global economy by changing ship routes, increasing ship speeds, paying ransoms, increasing insurance costs, using additional equipment on board and other efforts for protecting vessels against piracy attack. Also political tensions that occur around shipping routes, in particular in the Middle East, may disturb the safety of shipping which can be considered in a global scale. All above must be consider to reduce of occur of different kinds of hazards and improvements safety in shipping.

3. TOTAL LOSES OF VESSELS

In spite of occurring hazards in shipping the number of total losses of vessels increase according to reported data. In 2017 ninety four sea vessels sank. Compared to the year 2016, the number decreased by 4%. During the last decade there is a noticeable steady decline from 171 sinking that took place in 2007 and 151 in 2008. The chart in Figure 1 shows the number of total losses in period of 2007 - 2017. Shipping losses have declined by 38% over the last 10 years.

Figure 1. Total losses of vessels 2007 – 2017.Sources: Own study on the base: [2], [10], [11].

The region with the largest number of ship losses and accidents with nearly 32% cases is the area of South China, Indochina, Indonesia and the Philippines. Due to numerous incidents, it was named the New Bermuda Triangle. A number of elements could influence that:

- location of this area which consist of over 12,000 islands,
- not applying international safety standards (regulations) but only local,
- bad technical condition of vessels and lack of proper maintenance,
- overloading,
- failures using of vessel`s equipment,
- lack of proper communication,
- failures done by ship's crew as well as the operator on shore.

In addition, this area experience various natural disasters such as: typhoons, under water earthquakes and changing atmospheric conditions and other threats such as attacks of organized criminal organizations, including piracy attacks, armed robbery, smuggling and others.

Due to such situations, local authorities try to improve and ensure safety in this area by implementing security and safety measures, such as, indicating security area, military forces, protection equipment and obligatory registration each vessel which

can proceed this sea area. Table 1 shows the list of total losses of vessels in 2017, 2016 and in the last 10 years.

Table 1. Total losses of the vessels by region in the last decade.

Name of the regions	Total losses by regions		
	2017	2016	2008-2017
South China, Indochina, Indonesia and Philippines	30	23	252
East Mediterranean and Black Sea	17	12	169
British Isles, North Sea, English Chanel and the Bay of Biscay	8	7	89
Arabian Gulf and approaches	6	2	62
Japan, Korea and North China	6	11	126
South Atlantic and East Coast South America	5	4	
West Mediterranean	4	4	48
East Africa Coast	2	4	34
West African Coast	3	1	51
Bay of Bengal	2	3	28
All other regions such as a:	11	13	241
▪ South Pacific	2	1	
▪ Baltic Sea	2	0	
▪ Russian Artic and Bering Sea	1	2	
▪ Canadian Artic and Alaska	1	2	
▪ Iceland and Northern Norway	1	1	
▪ Gulf of Mexico	1	1	
▪ Unknown location	2	5	

Sources: Own study on the base of [10] and [11].

Apart from New Bermuda Triangle the hotspot region, with a largest number of sinking is the Eastern part of the Mediterranean and the Black Sea. Comparing last years the region of Japan, Korea, North China, East Africa Coast and Bay of Bengal indicate a decrease while the others an increase.

Table 2 shows a number of ship sinking by type. The data shows that cargo vessels (79) are responsible for more than half of them. Since last year fishing vessels and

passenger vessels have reported declines but bulk cargo carriers and tankers have accounted for increases including the largest load capacity in the last 10 years (up to 5 units).

Table 2. Total losses of the vessels by type.

Type of the vessels	2017	2016	2008-2017
Cargo	79	75	864
Passenger	5	11	68
Fishery	8	10	174
Offshore	2	2	23
Total	94	98	1129

Sources: Own study based on [10] and [11].

The number of total losses of passenger vessels has decreased significantly. It means that in 2017 there were 5 occurrences whereas in the previous year there were 11. In the available data in 2017, there were no sinking of ro-ro ships, compared to the past year 2016 which reported 9. On May 19, 2017, a ro-ro passenger vessel named Mutiara Sentosa 1 sank because of a fire on the east coast of Java. She was 134.6 meters long and could take both passengers and wheeled vehicles on board. The most probable cause of the accident was the explosion of a gas cylinder, which was in one of the vehicles on the car deck, and then a fire got out of control. Therefore, the captain ordered to abandon the vessel. Due to emergencies 5 people died and nearly 200 people were rescued. It is worth emphasizing that the number of passengers on board was not known. During the rescue operation it turned out that 197 were saved, not 178 like it was previous thought. It pays attention to the safety situation in that region [https://www.maritimeherald.com/2017/one-dead-four-injured-explosion-product-tanker-ebrahim-1-al-hamriyah-port/ ,08/08/2018].

The fact of accidents involving tankers is worrying. According to the reported data, in 2017, 2 tankers sank. On May 14, 2017, m/t Ebrahim 1 sank as a result of an explosion and fire during unloading at the Al Hamriyah Port in Sharjah (United Arab Emirates). As a result of the accident 4 port workers were killed, none of the 16-person Indian crew (aged 22-30 years) were injured.

On June 26, 2017 m/t Rama 2 capsized and sank in the Gulf of Aden in a rough sea, during their voyage from the port of the United Arab Emirates to the port of Mogadishu. The cause of the sinking was unfavorable weather, including high waves. After sending MAYDAY rescue services and nearby vessels immediately proceed to give assistance. Thanks to an effective and fast rescue operation 13 seafarers were

rescued but one died. Also in 2017, two other tankers went aground. In none of these events leaked harmful substances from the ship's holds or from the tanks was not reported.

In case of m/v Damia Desagnes, which grounded as a result of a power failure, the traffic must have been stopped at a distance of 3.5 Nautical miles from Irquois on Lake Ontario (Canada). To reduce the emergencies of vessel`s construction damage by currents form vessels crossing nearby, together with local strong currents. In comparison, in the last 3 years there were no reported events of sinking of this type of vessels. For the last 10 years, there was a total number of 16 sunken tankers. In the present situation when the protection of the environment from pollution must be ensured, this information is warning [http://www.maritimeherald.com/2017/one-dead-four-injured-explosion-product-tanker-ebrahim-1-al-hamriyah-port 08/08/2018].

The major hazard occurred on January 6, 2018, when the tanker m/t Sanchi collided with the bulk cargo carrier m/v CF Crystal in South East China Sea. The tanker brought 111000 tons of oil condensate from Iran to China. As a result of the collision on the tanker there was explosion and fire, causing death of the 32-person crew (Iranians and citizens of Bangladesh). On January 14, the ship sank and the oil spills speeded to almost 200 Nautical miles. A month later the oil spill reached the coast of Japanese Island degrading and threatening the marine environment.

4. CAUSES OF TOTAL LOSS

The causes of all dangerous events, accidents, emergency situations may vary. The most common reasons are events generated by adverse hydrometeorological conditions, human factors, machinery damage, failure ships` equipment, shifting of cargoes, lack of proper declaration of cargoes, interference of third parties, not meeting the safety procedures, misunderstanding and other numbers of causes related to the type of ships and cargoes being carried or resulting from the sequence of adverse events. All emergencies can lead to collisions, sinking, capsizing, flooding, grounding, different types of accidents on board and in the end to total losses of the vessel.

Nowadays, the emergency situations are mainly generated by hydrometeorological conditions which are variable, unpredictable and violent which makes changes of the passage voyages. But not all vessels manage to find a port of refuge, safe routes or sail to safer waters so they have to face with hazards. In addition, the impact from the owner and cargo manager causes pressure on the captain and crew to leave the port

in any conditions or accelerate cargo handling operations. This can make lower concentration and fatigue which can lead to mistakes and emergency situations. Being under pressure and giving incorrect decisions may occur tragically in the end, as it was in the case of the El Faro ship's tragedy.

According to statistics, human factors account for 75% of all events. Human errors can be also one of the other factors such as adverse weather conditions. The weather conditions are accounted for 18% dangerous events. However, human element should be considered not only as a mistake of the crew, but also as a fault of the shipper, ship owner or ship operator, as well as with the improper functioning of safety management system on the board and in the ship owner's office. Other causes of ship sinking are technical failures, machinery damage and misunderstandings or a sequence of adverse events (Table 3).

The major hazards are fires on board which are not extinguished immediately, they spread and make it impossible to take control. Nowadays the size of the vessel and reduction of crew member makes it is difficult to take effective fire extinguishing actions. Although the ship is equipped with a number of portable and fixed firefighting installations, they are not always used in total. For example the CO2 system cannot be activated when there are people inside the space of fire. In this situations fire teams go to the place of the incident and break down the fire using portable firefighting equipment. But both factors: ship dimensions and reduced crew members, do not manage to control the situation. Moreover, the undeclared cargoes also increase emergency and can be a cause of fire due to the lack of proper segregation and compatibility with other cargoes.

Table 3. Purpose of the total losses of vessels in the last decade.

All casualties	**2017**	**2016**	**2008-2017**
Foundered (sunk)	61	48	593
Wrecked (grounded)	13	20	229
Fire/explosion	6	12	112
Machinery damage (failure)	8	10	67
Collision	1	1	57
Hull damage	5	4	43
Miscellaneous	0	1	15

Sources: Own study on the base of [10] and [11].

While discussing the total losses of vessels and hazards, authors pay attention to the number of fatalities and casualties as a result of incidents or injuries. In 2017, 2712 casualties were reported [Shipping review, 2018, Herdzik, 2016]. According to data in the last decade there were over 25,000 casualties with 1129 fatalities [Lloyd`s, 2018].The situation changes from year to year and the largest number of casualties took place in the eastern regions of the Mediterranean and the Black Sea (464) and in the region of the North Sea, in the British Isles, the English Channel and the Bay of Biscay (430). In the Baltic Sea there were 162 cases. The cause of all incidents are usually machine failures (42%), collisions (13%), drowning (12%). Analysed accidents, casualties, emergencies pose an essential question why, despite introducing daily and emergency procedures, implemented safety management systems and numerous inspections, human life is still lost and accidents occur.

In connection with the data given above, current situation should be considered. Including factors such as human nature, tight schedule of vessels, impact by the ship's operator, the recipient of the cargo, work under stress conditions, fatigue, various misunderstandings and barriers including language on board and between ships.

5. ACCIDENTS ON THE OIL AND GAS FIELDS

Currently, there are over 2,000 drilling and production installations and over 3% of the world's fleet support offshore vessels. The price for the barrel of oil has been increasing for months. So it made it profitable to carry out work in the offshore oil fields. Hence, many offshore units which were out of work have been restored to start working according to regulations. It may be a potential risk of occurring accidents, emergencies, breakdowns and other events. In fact the major hazard is posed by oil spillage.

Events that took place in the sea exploitation fields and the events of 10 April 2010 on the Gulf of Mexico began an international debate aimed at introducing regulations on the exploration and production of oil and gas in sea areas. In particular, attention was focused on preventive activities consisting of: securing the conduct of works on sea fields, immediate and, above all, proper conduct in the event of a threat and increasing the awareness of threats among the public and entities conducting operations.

An important aspect of the analysis of the current safety situation in the offshore industry is the fact that the installations used there, both underwater and navigational, have repeatedly reached the age of 25-30 years and more, thus approaching the original planned operational periods. Therefore, an aging fleet requires appropriate risk

management in order to reduce the number of accidents (including at work) and introduce appropriate safeguards. According to Lloyds List Intelligence and Westwood Global Energy Group installations erected 20 years ago or more constitute: in the Northern Europe - 68%, in Latin America - 70%, in North America - 71%, in Africa - 75%. In North America 30% offshore installations and pipelines are 30 years old or more. This forces the introduction of regulations and mechanisms for proper monitoring of the situation, broadly understood security measures and proper response in the event of an incident [Mrozowska, 2018].

The weather conditions are the major hazards for gas and oil fields. Offshore units which work on oil and gas production are threatened by hydrometeorological conditions. Natural hazards, which may lead to construction`s tension, devices failure, release of dangerous substances, threatening the crew of individuals unsealing which can lead to pollution, drifting, disturbances in delivers and technological accidents. During the hurricanes in 2017 in Gulf of Mexico a number of oil field infrastructure was destroyed. Also gas and oil fields located in the North Europe are plagued by strong storm winds and abnormal waves that can reach 20 meters and more. Such phenomena cause additional stresses in the construction, dragging, deformation of materials. Also, not only the violence of phenomena but also their increased number are warning. In addition, material fatigue and corrosion cause weak links that contribute to an increased number of accidents. The most common events taking place in the marine exploitation fields include:

- Accidents connected with lifting people and cargoes,
- Accidents at work,
- Fires and explosions,
- Evacuations and musters,
- Collisions,
- Oil spills.

In table 4 there is data placed of over the last 10 years, which have been reported to the American administration. According to the United States Bureau of Safety and Environmental Enforcement (BSEE), 428 injuries were reported on offshore oil rigs during 2017. The graph in the figure no 2 shows numbers of all events that took place in the last decade worldwide [statistic.com/statistic/279100/numer-of-offshore-rigs-worldwide-by-region 02/09/2018].

Work in the offshore industry is considered as one of the most dangerous because of constant threat due to the type of operation carried out and the impact of the natural environment on work.

Table 4. Number of accidents in the shelf of America.

Year	Lifting	Injuries	Fatalities	Fire and Explosions	Evacuations and musters	Gas realise	Collisions	Oil spills	Loss of well control
2017	126	150	0	73	53	16	11	10	0
2016	155	150	2	86	50	17	9	16	2
2015	163	206	1	105	70	21	9	24	3
2014	210	285	2	135	52	21	0	21	5
2013	197	276	4	116	68	21	21	24	8
2012	167	280	1	132	48	27	13	30	3
2011	110	221	3	113	36	17	11	4	5
2010	118	253	12	134	31	20	14	9	4
2009	243	260	4	148	55	33	26	7	7
2008	185	263	12	141	43	22	28	33	7

Sources: Own study based on https://www.bsee.gov/stats-facts/offshore-incident-statistics (02/09/2018).

Activities must be carried out throughout the year, both at high temperatures and extremely low temperatures, during intense rain as well as strong winds. This causes a number of major accidents which occurred in the oil fields or was connected with offshore activities.

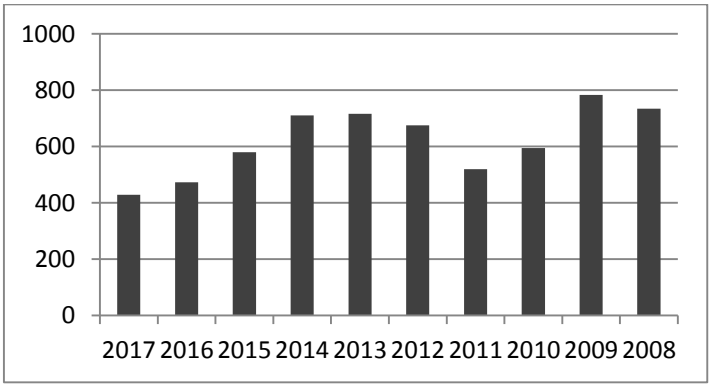

Figure 2. Number of total accidents in the oil fields.
Sources: https://bartbernard.com/maritime/6-types-of-offshore-oil-rig-accidents/ (02/09/2018)

Table 5.Events that took place in the offshore industry according to define of major accidents to Directive 2013/30/EU.

Place and time of occurrence	Name	Results	Causes
The coast of Angola 28-09-2016	Oil rig helicopter (chevron)	Number of fatalities:6	Machinery damage.
The North Sea 29-04-2016	Super Puma oil rig helicopter	Number of fatalities:13	Machinery failure. After series of accidents, that flights were suspended.
60 Nm off the coast of Brazil 12-09-2015	Cidade de Sao Mateus	9 people were killed, 26 people injured, the oil production was less than 10%.	Increasing of the output.
55 Nm from the shores of Louisiana 23-07-2013	*Herkules 265* Platform	collapse of the Texas and Derrick deck.	Incorrect calculation of the drilling mud density by the drilling crew.
North Sea, 180 km from Aberdeen 16-08-2011	*Gannet Alpha* Platform (Shell)	Oil spill has been limited to 5 barrels (instead of 88,000 ones) of crude oil per day.	An oil leak in a flow line.
Gulf of Mexico 20-04-2010	*Deepwater Horizon* Platform	About 5 million tons of oil got into the water, causing contamination of the coasts of the states of Louisiana, Mississippi and Florida, as well as the killing of many thousands of animals	Sudden increase in pressure in the deposit and release of hydrocarbon from a badly secured well and failure to act in the critical situation of the explosion-proof head.
PetroleosMexicanos 65 Nm from the coast of the Tabasco region 21/24-10-2007	*Usumacinta* Platform	22 people died, about 120,000 barrels, out of 442 thousand, got into the water (the rest was recovered)	Extreme weather conditions, the cold front created a wind speed of 130 km/h and 8 meters of waves. As a result - the deck and production valves were damaged, there was a leak, there was a passage of spark and fire which caused significant losses in the construction of the platform.

Sources: own study supported by website www.marineinsight.com.12/2016 worldmaritimenews.com (07/2017).

Selected disasters presented above indicate that the conducted activity is exposed to the risk of threats to the natural environment and to people on every stages of the reservoir exploitation. Failure causes contamination of the sea area both at the accident site and many kilometers from it. It contributes to the disruption of the functioning of ecosystem, is a real threat to the life of living organisms, but above all to people staying in a contaminated environment. Returning to the condition from before the disaster

takes many years, during which toxic substances enter the natural environment all the time.

A measure aimed at introducing appropriate preventive measures before the occurrence of serious threats is the introduction of Directive 2013/30/EU for EU operators and operators in EU maritime areas. Its aim is to reduce risk of threats by defining the framework of activities for EU Member States carrying out mining activities and, above all, obliging operators and owners to implement appropriate solutions in this area. The Directive lays down minimum requirements for the prevention of major accidents arising from offshore oil and gas activities. It applies to works related to operation of installations for exploration and extraction of energy resources in sea exploitation fields. It seems that it can be the most effective means to regulate issues related to safety of operations as well as to protect the marine environment from its degradation due to the entry of additional toxic agents as a result of exploration, drilling and oil and gas production. Currently, at the coast of Europe, there are at least 1,000 oil and gas exploration operations under the seabed, according to Det Norske Veritas report. The risk associated with major accidents can be assumed to exist. It should be emphasized that 80% of oil and gas production in Europe is located in fields located in sea areas. According to data from January 2018, 184 platforms are located in the North Sea.

6. DISSCUSSION

The article presents a wide spectrum of events that took place in marine areas as well as on board of vessels. Indicating that, despite the introduced safety measures, accidents in which human life and degraded natural environment are constantly lost. Therefore, it is necessary to consider what measures should be taken to improve the situation. Proposed solution is to strengthen the training system and increase the awareness of threats from both crew and ship operators to eliminate pressure from them. It is constantly reported that more than seventy percent of all events are burdened with the human factor. Authors of the article, working with different nationalities and personalities, noticed varied approach and quality work, and understanding of tasks. Moreover, in a small space of vessels, the crew must live, work and rest with foreign people, different cultures, nationalities and religions. No one is used to working in such conditions. In addition, they are often not aware that their improper work can lead to disaster. Hence, every work done, should be done with diligence.

Each crew member ought to take into account that through our work they take responsibility for others on board. So any mistakes or weaknesses must be eliminated immediately. Which is undoubtedly difficult.

Furthermore, the fatigue of the crew, time pressure, thigh schedules can definitely lead to accidents. Operators of vessels have been searching for solutions to reduce human errors (including conversations and behaviors on bridge) and control of the ship maneuvers. One of the way is the idea to use Voyage Data Recorder on line. However, the International Maritime Organization (IMO) does not consider introducing such solutions. Only the IMO members pay attention to strengthen effective training system on vessels, including psychological support, especially for people who have experienced traumatic incidents.

CONCLUSIONS

The article discusses a wide spectrum of different types of hazards which can threat shipping. Nowadays, the sea area and all maritime industry are experienced by new threats, in spite of the fact that the old ones are still current.

Despite introducing many measures to improve safety in shipping, the accidents still occurred and human life is still lost and threat. However, the number of total losses of ships shows a downward trend but the reason for total events in the sea area are still the same (actual). Human factor play the main role. It must be considered more widely taking in to account the pressure from ship`s owner, ship`s operator, cargo`s operator, receiver's cargo or others.

Knowing about past accidents is an important contribution to risk assessment initiatives and helps to ensure that known risks are properly understood. The maritime global database of accident can be mainly support and very useful base of information to analyses to improve safety in shipping. They show the number of accidents and events by unit type, geography, function, accident type and more - extremely useful for Quantitative Risk Analysis (QRA). One can see how events have passed from the initial event through the chain to the final endpoint. This can provide lessons to vessel`s designers, vessel`s operator, masters, crew and other sea users and identify threats to reduce risk and help eliminate failures and prepare to face the threat of maritime disasters.

Authors realize that the subject is very wide and all aspect of analyzing safety in shipping were not discussed, but they will be developed in the next publications.

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STRESZCZENIE

W opracowaniu przedstawiono analizę wypadków jakie miały w 2017 roku miejsce na obszarach morskich, włączając w to: statki przewożące pasażerów, jak i różnego typu towary oraz morskie platformy wiertnicze i wydobywcze, a także statki przeznaczone do obsługi morskich pól eksploatacyjnych. Celem artykułu jest pokazanie szerokiego spektrum czynników oraz zdarzeń związanych ze stratami całkowitymi statków, wypadkami na jednostkach morskich oraz zagrożeniami, które występują na obszarach morskich. W opracowaniu przedstawiono liczne dane, które zostały przedstawione w formie wykresów i tabel, opartych o międzynarodowe raporty oraz własne doświadczenia uzyskane podczas pracy zawodowej.