Seas and Oceans Pollution: Aspects Regarding the Pollution with Hydrocarbons

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Abstract: Water, in its many forms, is one of the major elements of geographical landscape for both direct uses for humans and for normal activities of the biosphere, obviously, essential for human survival and welfare. The human influence on oceans dramatically varies from one ecosystem to another. The most affected areas are the coral reefs, sea grass, mangrove groves, rocky reefs and platforms. The least affected ecosystems are oozy bottom areas and surface areas from the high seas. The pollution affects all the world’s oceans, but coastal waters are more affected than those on the high seas, as there are many more sources of pollution from industrial plants to maritime transport.

Keywords: Ecosystem, Water pollution, Biosphere, Environment laws, Shipping, Natural resource

1 Introduction
From the 510 million square kilometres as a whole, Terra has a huge volume of water, representing 70.8 per cent, and only 149 million square kilometres, i.e. 29.2 per cent.

According to the United Nations Conference with the subject ‘water resources’ from Mar del Plata, the total volume of water existing on Earth is estimated at 1400 million km$^3$ distributed as follows: total volume of freshwater is only 37.8 million km$^3$ and is only 2.7 % of the amount of water on Earth. The fact that only 0.46 % of fresh water can be used directly should be noticed, the remaining 99.54 % is represented by: water vapours in the atmosphere (0.04 %), glaciers and ice caps (77.2 %), water lakes and marshes (0.35 %), groundwater and soil moisture (22.41 %) and watercourses (0.01 %), it is only 0.04 % of total fresh water on earth. The total fresh water available is only 0.009 % of all quantity of water on Earth. Therefore, the percentage of sea water is higher. The major threat to health, productivity and biodiversity of the marine environment comes from human activities developed in the coastal areas and islands.

2 Present General Framework
More than 80% of the polluting load comes from drainage, the discharge of economic activities: industrial, agricultural, tourism and town. Coastal and island areas are generating industrial raw materials, supplies and materials of touristic interest. According to the committee of experts in the field of marine environment (GPA), the total value of goods and services in the areas of marine ecosystems is double than those from the terrestrial ecosystems. Nearly one billion people currently live in the coastal urban centres. Their existence depends on the health and productivity of coastal ecosystems. The marine pollution and the habitat destruction undermine the sustainable use of seas, oceans and coastal areas and affect human health through direct contact with polluted water or the use of contaminated marine nutrient sources.

The recognition of the threats created by the increased marine pollution led in 1995, in Washington, to the issuance of Global Program of Action (GPA) for protection of the marine environment.

The program assessed the existence and manifestation of new categories of polluting sources, such as: Sewage, Pesticides, Radioactive substances, Heavy metals, Hydrocarbons (oil), Nutrients, Sediments (silt), Garbage (household waste), Physical alteration and habitat destruction. In 2006, the program GPA Coordination Office has published a report on the state of the marine environment which highlights the trends, measures and progress made in relation to the mentioned pollution sources and economic development in various regions of the World Ocean.

The paper presents the comparative effects of the new pollution sources named by GPA in the following zones sequence: Arctic Ocean; Atlantic Ocean with Caribbean and West, Central and South Africa areas; Pacific Ocean with East Asia areas; Indian Ocean with the South Asia, Persian Gulf, the East Africa areas; Black Sea.
The marine pollution appears with the human presence in coastal areas, but the strong impact occurs in the second half of the XX century.

3 The long – term trends and actions
The diversity of pollution sources and their effects have triggered the alarm which led, on the one hand, to the modification and the adaptation of the research concerns to the new requirements, and on the other hand, to the collaboration between research centres which get institutionalized character in international research programs, either regional, zone and national level.

Arctic Ocean is located in the vicinity of the Arctic Circle and include an area of 20 million square kilometres grouped in two categories. The first category consists of specific water of coral reefs and the second consists in deep ocean waters. The Arctic Seas are open seas, where water exchange is minimal through the Bering Strait and extended in Barents Sea. The greatest risk is the incidental pollution from oil extraction or the transport of hydrocarbons.

For the Caribbean Area, the wastes are considered to be the biggest problem the authorities have to face. The growth of population, increased industrial activities and tourism continuously create problems to the infrastructure by the quantity of garbage. According to the most recent statistic, pollution from human activities is the greatest threat to the marine environment and also to the human health. Actually, the pollution of aquatic ecosystems includes the alteration of natural habitats and the entire environment of the vast islands. It is estimated that the pollution in this region is about 80-85 per cent, an amount that comes from the wastes of agricultural, industrial and other activities, and also waste waters transported into the environment by infiltrations in the atmospheric air and soil.

The extraction of oil, natural gas and their processing are the main causes of pollution. The risk factor is very increased in some areas of the region such as:

- Trinidad, the biggest producer of oil and gas,
- Aruba - Bahamas, as the region is characterized by heavy maritime traffic and especially oil tankers which increase the risk of disasters.

While oil transport at sea is a great risk of pollution by accidents that may occur, in many cases it is still difficult to distinguish between the impact of pollution from marine activities and those arising from land ones.

West, Central and South Africa waters form a broad region that includes the coasts and sea waters of West and Central Africa, and also the countries (WACAF) from the Atlantic Ocean to the Sahara Desert and the shores of Chad Lake and Angola to Senegal. The countries from this region are Angola, Benin, Burkina, Faso, Cabinda, Cameroon, Central African Republic, Chad, Congo, Cote d’Azur, Equatorial Guinea, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo. Although the island of Cape Verde is part of West Africa and its drainage basin built by people limited the impact on the marine environment.

Despite the multitude of benefits, the oil industry brings also the threats arising from the oil extraction and the pollution of the ecosystem. Mining activities in areas near the seas and extracting oil should be considered the main sources of pollution with hydrocarbons, mainly produced by cracks in pipes for drilling products and their infiltration into soil and discharge into the water. Otherwise, the oil pollution is one of the most common pollution and it has the most harmful effects. The oil slicks being carried by sea currents affects waters, residential areas near the coast and also other regions that are not producing oil.

There are many risks of sea pollution among which frequently, the following are the main:
- Shipping and possible accidents that may result from chemicals discharge or other products which may affect the marine environment.
- Improper sewage system.
- Discharges of products from industry or other factors from the atmosphere.

The oil and heavy metals activities equally affect the marine environment. In South Africa, the main activities that lead to alteration of the marine environment by exploiting these resources are water from industrial activities, water containing impurities from hydrocarbons and oil, domestic sewage from highly urbanized areas, river and maritime transport.

In Namibia, some pollutants are primarily introduced into marine environment through activities that occur in ports but one can hardly talk about considerable damage along the coast.

The Angolan oil refineries and other oil activities are located in many places along the coast and they are considered important sources of pollution with heavy metals and hydrocarbons. Congo River, located to the north of Angola, is considered the only means of navigation in
Democratic Republic of Congo and therefore it represents a big pollution source but it is difficult to quantify the damage effects produced by the uninterrupted transport of oil and heavy metals.

The East Asia and the Pacific Ocean include the seas of the West area of Pacific Ocean: The Yellow Sea, The Sea of East China, The Sea of South China, Sulu Sea, Celebes Sea and the Seas of Indonesia. The rapid industrialization and economic growth have significantly changed the environment in these seas where the pollutants come from land sources. In most countries, more than 60 per cent of habitats have been modified, as a consequence of the loss of various species.

The coastal and marine environment in the eastern region of Asia is facing three great dangers:
• Pollution, from both land and marine sources;
• Direct danger to the ecological environment by overfishing and uncontrolled extraction of resources;
• Coastal change due to tourism and urban construction.

In Asia and the Pacific Ocean, an important source of pollution is the oil pollution from ships. The oil stains accidentally spilled over the shipping routes, or in places of loading or unloading of these oil tankers are frequently reported. In Malacca Strait 490 of maritime accidents were reported between 1988 and 1992, large quantities of oil spills were released.

In Japan, the most common form of marine pollution is the oil spill. Annually 150-180 of incidents take place followed by oil pollution. Also on the continent such kind of pollution can be due to the population density, mining activities and the high degree of industrialization in the coastal areas.

The Indian Ocean and South Asia comprises the countries from that form the region MAS, with a population of 1.4 thousand million people almost half the global population. The high population density, low income, less developed social factors and high dependence on natural resources are the main characteristic of all the countries in the area. In addition, various forms of political, religious, ethnic instability and language differences contribute to the low economic level for most countries. Almost 500 million people live with an income of less than 1 US dollar a day. The high level of marine pollution is associated with poverty. These people earn their living by exploiting coastal areas and territorial waters.

Discharges, defective legal system, agricultural fertilizers, hydrocarbons, sediments and physical alteration and destruction of natural habitats are identified as the main menacing problems in the region. Although these countries are not high producers of oil and gas, different activities carried on in this area generate a large amount of hydrocarbons which also affect the marine environment, such as: transport and other services alike; motor boats; oil activities that involve factories, oil processing and oil-products consumption; coastal refineries; shipping.

A major contribution to marine pollution with oil products is the oil tankers navigation; an estimated date is that about 500 million tons of oil is annually transported in this region. Either legal or illegal activities take place in this area usually, lead to the discharge of some substances as pitch. Fine oil and natural gas given off are quite rare here, but in 2003 a serious incident occurred in Karak, when a tanker spilled about 27,000 million tons of crude oil at sea. In Bangladesh and India more than 50 per cent of oil pollution in the marine environment comes from the many river ships.

The impact of oil pollution is quite serious on the ecological system, on the marine environment, on the ecosystems and the species of plants, animals and fish and is mainly the consequence of emanation oil powders produced by maritime accidents. However, the information of the negative effects that these chemicals have on the marine environment is not well known. The extraction of oil and gas continue in an inadequate manner. Bangladesh is the main producer of natural gas.

According to the Regional Organization for the Marine Environment (ROPME), the Persian Gulf Area - includes 8 countries: Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates. It is considered as the area with the highest degree of oil pollution and other hydrocarbons in the world. This is mainly due to oil installations on the high seas which extract oil; to the processing plants and the oil-tankers and transporters that transit the area.

6 of the 20 contamination that occurred worldwide took place in ROPME region, where more than 10 million tonnes of substances have been spilled over the years, according to SOMER Oil Spill Intelligence Report. Oil pollution incidents from external sources are still small-scale compared to oil spills from underwater pipes. Almost 2 million barrels of oil are emitted annually into the marine environment from infected water discharges from tanks and from oil and gas platforms in the sea and between 1998 and 2002, 25 such incidents were reported in this area.
The impact of oil pollution could be observed both in marine sediments and underwater life, on the sand-beaches areas and coastal regions as well. The impact is negatively felt by mangroves, coral reefs, phytoplankton and fish. In order to establish the spills from oil terminals and to protect the marine environment from the unloading activities of oil tankers, merchant ships and ports, international organism and policy-makers adopted the Convention from MARPOL and thus the region was declared "special area".

Even if certain measures to protect the marine environment from oil pollution and other pollution were adopted, however, the oil pollution from transport, the offshore activities and unloading and loading activities in ports continue. It is worth hence to mention the ratification of MARPOL 73/78, with the adoption and implementation of other global regulations such as: the Convention on Oil Pollution Preparedness, Response, and Co-operation (OPRC), Convention on Civil Liability for Oil Pollution Damage (CLC). These measures should be corroborated and supported by the international organisms and rules, providing sanctions for those who do not respect them.

In the recent decades many scientists analysed and reported on carbohydrate and other compound hydrocarbons in different parts of the RSA, including coastal areas and high seas areas.

Also national monitoring programs from Kuwait, Oman and Qatar stated that the oil and hydrocarbons level from territorial waters and sediments is high.

The Black Sea zone had always a positive balance of water, fresh water excesses of 300 km$^2$ in the Bosphorus area. Since 1970 and 1980, the agriculture has greatly developed in the Black Sea region. The soil treatment with inorganic substances have increased the transport of nutrients (nitrogen and phosphorus) in the marine environment and other organic substances that have reached the sea but also the rivers flowing into the sea. Low quantity of oxygen resulted and changed from 1974 to 1983, so that tens of thousands of kilometres of west marine area were suffering of hypoxia. Consequently, the environmental changes produced refer to significant decrease of certain species of phytoplankton and other species that live in surface waters.

This process led to the disappearance of invertebrates and some fish species such as carnivorous fish (Mnemiopsis Leydi) and it also caused other serious damage in the whole area of the ecosystem. The level of oxygen saturation has significantly increased. This variation in the level of oxygen in the western Black Sea region is associated with the significant decrease of fertilization activities used in the eastern part of Europe, where waste water from industrial and agricultural activities is treated before discharge.

The low level of oxygen from the sea environment is rarely met. Such event recently occurred in the summer of 2001. But in north western Black Sea, in some gulfs, areas of low oxygen due to the discharges were found. The results were positive and the species of invertebrates living on the sea bed were not affected, however, the ecological system is vulnerable due to anthropogenic factors. The Black Sea is situated approximately between 410-460 degrees north latitude and 280-41, 50 degrees eastern longitude and borders Bulgaria, Georgia, Romania, Russia, Turkey and Ukraine. It is considered to be a real source of life for the ecosystems and thus several programs to limit the risk of pollution were adopted. A comprehensive program to protect the marine environment is carried out through Romania’s and Bulgaria’s collaboration.

Many urban areas exist along the Black Sea coast, but insufficient measures are taken to limit the pollution in these countries. The sewage systems were built during 1960-1970 and many of them require repair. In general, many settlements in rural areas do not have a drainage system, as Russia and Romania demonstrated. There are settlements in Romania which are not connected to a sewerage system. In terms of oil pollution, the tests have shown the existence of about 57,400 tons oil spills in the sea from the countries situated along the sea coast. Additionally, accidental spills of oil particles and of the Danube River are flowing with a yearly total amount of 110.84 tonnes, although the level of pollution of marine sediments has lowered in the last years.

However decreasing trends, the oil pollution from the Black Sea is still a major concern because the risk of accidents of tankers carrying oil increases continuously.

The oil transport costs from Central Asia to Azerbaijan are quite high. Many countries like Georgia carry large quantities of oil and other hydrocarbons and water contamination risk refers to any accidents or gas pollution. Inevitably, serious accidents occur during these activities.

For example, the 16 accidents were recorded in Constanța port during 2000-2002, and 0.42 tons domestic water, 0.55 tons fuel oil and 0.1 to 0.3 tonnes mineral oil were discharged, even if the affected area was relatively small.
There were such accidents in 2000-2003 in Bulgaria, but only one of them was 0.17 tonnes of oil leakage, and on small areas. Such accidents have occurred in Russia, too. In 2003 Bulgaria, Romania, Turkey signed the Black Sea Protocol Contingently Plan to fight against pollution in the Black Sea. During 2005 to 2006, Georgia, Russia and Ukraine joined the Plan.

However illegal is the exploitation of the marine beaches is in the Black Sea, this situation still exists due to the defective tourism development in some poor countries and the lack of legislation measures. The purpose of the problem and the real impact of the beaches exploitation has not been reviewed although there is mentioned in the Convention from Bucharest.

Conclusions
The situation of marine ecosystems of the Oceans worldwide in the last decade of the XX century and the beginning of the XXI century is presented based on materials; the ecosystem from the Arctic Ocean, and Atlantic Ocean - Caribbean and West, Central and South Africa areas - the Pacific Ocean with the East Asia area, Indian Ocean with South Asia areas, the Persian Gulf and East Africa, the references on the Black Sea were separately presented. The negative impact of hydrocarbons pollution in the areas analyzed was presented in the paper.

The references provided data and information about the status of marine ecosystems in areas from developed countries, developing countries and underdeveloped countries. The observations included the examination of the effects of nine categories of polluting sources established in 1995 by the Global Program of Action (GPA) - Washington - USA.

People will always use the oceans for recreation, resource extraction and commercial activities. To protect the marine environment is to realize this thing in a sustainable way so that the oceans should remain in a state of optimum health and should continue to provide resources that humanity needs.

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