

The Analysis of Hydrocarbons Polluting Industrial Sources on the Romanian Sea Coast in the Context of a Lasting Development

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Abstract

The industrial activities developed on the Romanian sea coast are also represented by those corresponding to the shipping industry. From this point of view, the shipping transport constitutes one of the best represented sectors in the world economy. In the near future, the globalization process will lead to important changes in the field, starting with an increased change of goods and services by means of merchant ships and also with the development of modern technologies in the shipbuilding industry or in the port activity, with a reduced impact on the environment.

The paper establishes a framework founded on the durable principles of development so that medium and long term projects will lead to a harmonious, coherent and balanced evolution specific to the European maritime policies.

1. Introduction

Romania, as an integral part of Europe, tries to regain its role on the international maritime and river market considering that the shipping transport and port activities are essential for the international trade at least from the perspective of relations established in accordance with the world economy. In this context, the Romanian maritime and river transport can represent a catalyser for other economic sectors, [1]. Previous experience and evidence show that, apart from economic benefits in the field of shipping transport and port activity, the impact of associated activities is huge. The present paper intends to underline these aspects and at the same time to build an efficient and coherent framework for the lasting development of this sector of activity.

Maritime hydrocarbon pollution was first acknowledged during the WW I (1914-1918). Starting with the year of 1920, different countries have adopted preventive measures regarding the hydrocarbons discharges in territorial waters, trying to penalize the illegal overflows. The adoption of international measures was achieved only after WW II. Since 1950, the maritime transport of hydrocarbons has been extended, the contamination danger being more and more

increased. Between 1970-2004, 9,266 major international maritime pollution with hydrocarbons incidents were registered and over 5,454 tons of crude oil was discharged by accident. Major, accidental pollution with hydrocarbons have produced important damage at the ecological, social and economic international level.

Accidental discharge of hydrocarbons has an economic impact, significant both for activities developed on the coast and for those which exploit the marine resources. The presence of hydrocarbons on the sea surface cause physical, biological and social consequences.

2. The analysis of the hydrocarbons pollution sources on the Romanian sea coast

Hydrocarbon pollution is varied having different characteristics according to: the quantity that is likely to be discharged (minor, medium, major pollution), the location (offshore, onshore), the cause (accident), the type of hydrocarbon (the group the pollutant belongs to), the source (maritime transport, atmosphere, drilling and extraction platforms, oil terminals, industrial units, rain discharges, etc), [1]. The pollution sources are generated by economic activities developed along the coast area or at sea and consist in:

- Pollution sources from **drilling and extraction activities**. The pollutant in this case is the crude oil, gas or injection fluid type. The degree of pollution can range between level one up to level three in case of an uncontrollable accident.
- Sources from **shipping transport of goods and persons**. The pollution coming from these sources can be accidental, chronic or intentional, being caused by strong gales, navigation errors which can lead to ship collisions, grounding, terrorist attacks, inobservance of maritime traffic rules in the area, inobservance of oil ship building rules (bulkheads, double bottom and side plating), the increase of the maritime traffic volume in the area, tanks and bilge cleaning in restricted areas, etc.
- Sources from the **shore** such as rain leakage and discharges of used waters from urban areas, activities developed on the production platforms of the petroleum processing units, activities developed in ports, shipyards, etc. Pollution can be of minor or medium level.
- Sources **from the atmosphere** such as gas and smoke expulsion as a consequence of burned hydrocarbons resulted from technological production processes, transport activities, etc.
- Sources from **natural causes** refer to gas or hydrocarbons natural eruptions which can take place in the oil fields situated at the sea or ocean bottom.

The amplitude of a pollution phenomenon is given by the gravity of the incident according to the quantity of hydrocarbons discharged or bound to be discharged from the above mentioned sources, [5]. The establishment of the type of intervention procedure is accomplished primarily by taking into account the gravity/level of the pollution incident. In this context, according to OPRC Convention (1990) the following levels of gravity have been established taking into account the hydrocarbons quantities discharged during pollution, such as:

- Minor marine pollution (level one) <7 tons;
 - Medium marine pollution (level two) between 7 – 700 tons;
 - Major marine pollution (level three) over 700 tons.
- A certain intervention system is required for each level of pollution, such as:
- For level of pollution one and two, there are local intervention plans with the implication of the polluter or local authorities;

- For level two of pollution, where the local authorities can not handle the situation, and for level three of pollution, the intervention national plan is activated and national structures nominated are involved according to the regulations in force.

The factors which contribute to the increasing number of accidents accompanied by major pollution are as follows:

- The increased quantity of shipped oil;
- Local characteristics of navigational errors: traffic density, hydro-meteorological conditions, sea depth, reduced visibility, inexistence of strict radio communication rules,
- Poor organization of operations such as: clear in/out the harbor, charging/discharging goods, fuel supply.
- Lack of warning signals in case of maritime accident, etc.

3. Evaluation of pollution risk for activities developed on the Romanian sea coast

The potential sources of pollution on the Romanian seashore are usually placed next to urban areas, namely Constanta, Midia-Navodari, and Mangalia,[2].

The following agents belong to this category:

- Commercial agents:
 - Oil Terminal (Constanta harbor / berths 69-79 and warehouses situated in the city)
 - SNP PETROM, (PETROMAR Constanța, Constanța harbor , berth 34, Midia terminal and drilling and extraction platforms from the continental plateau, including the underwater pipes for transporting crude oil and gas discharged in Corbu area)
 - ROMPETROL RAFINARY –PETROMIDIA COMPLEX (475 ha situated on the Black Sea shore in near Midia – Năvodari area)
 - SN Constanța (Constanța harbor/berths 25-29)
 - SN 2X1 Holding (Midia harbor)
 - SN DMHI 2 Mai MANGALIA
 - SC CONPET SA Constanța, with warehouses in Constanta, Midia and Cernavodă.
- Purifying and treatment stations for used waters situated in: PETROMIDIA industrial complex, Poarta Albă, Constanța North, Constanța South, Eforie Sud, Mangalia, Limanu.
- Cargo ships underway on North-South sea routes parallel with the seashore, and East-West towards Ukraine, Russia and Georgia. These routes are used both for persons and cargo transport including also oil tankers of 85.000-150.000 tdw.
- Roadsteads are also placed in the vicinity of urban areas such as Constanta, Midia-Năvodari, Mangalia, and Sulina.

The evaluation conducted, taking into account the above three factors (sources, vectors, targets) highlighted the existence of three levels with pollution risk distributed on areas in the following way (level one being considered with the highest risk):

- Maximum level of risk (I) in the case of the Romanian seashore is identified in maritime ports and adjacent areas (Constanța, Midia, Mangalia),
- Medium level of risk (II) is identified in the area of: sea routes, anchorage, hydrocarbons transport pipes and drilling and extractions platforms belonging to PETROMAR Constanța
- Minimum level of risk (III) is situated in the evacuation areas of cleaning systems (when they are not discharged in ports); beach areas (Vama-Veche – 2 Mai, Neptun - Eforie Nord) and the protected area of the Danube Delta (Corbu – Musura channel).

Taking into account all these evaluations, one can establish:

- Intervention priorities in the area

- Location of bases provided with de-pollution equipment and materials
- The minimum provision required for specialized and auxiliary equipment
- Intervention strategy
- Routes for the areas likely to be polluted.

Major accidents – major pollution, level 3 > 700 tons of crude oil accidentally discharged in the marine environment:

- The study of incidents resulting in massive discharges of crude oil from ships is necessary both as warning devices and documentary material with a view to gaining experience in this unpredictable field, which in certain conditions can generate disasters at national level.

4. The impact associated with activities from the maritime and port sector in case of hydrocarbon pollution

Hydrocarbons discharges reaching the seashore have a negative impact according to the economic level, biodiversity, the type of seashore, the presence urban areas, etc. The following factors are taken into consideration when the vulnerability degree is established:

- Economic impact
- Ecologic impact
- Social Impact
- Political impact
- Type of shore

a) Economic Impact

The economic impact refers to the negative effects of industrial and economic activities in the case of accidental or chronic pollution. The impact upon industrial activities is constituted of **economic factors of risk**, which can be quantified (according to the economic potential, type of activities developed in the area, season, etc.) for each area, and they will be taken into consideration together with the other factors (ecologic, social, politic) in order to establish the vulnerability level of local area,[3],[4].

Economic activities which can be affected:

1. **Touristic activities** (entertainment, hotels, restaurants, etc.)
2. The main onshore **industrial activities** are developed in ports or its adjacent areas.

Cargo and passenger transport as well as loading and unloading cargo represent the main activity developed in a port.

In the case of shipyards, oil terminals and hydrocarbons refinery installations, the interruption of land and sea traffic can hinder the process of supplying with raw materials and energy, the process of production (by stopping the welding operations, oxyacetylene cutting, operations which can produce explosions in the case of volatile fractions evaporation) all these generating significant economic losses with severe consequences upon the involved commercial societies and upon the whole community.

Another type of activity developed in the offshore area is represented by **hydrocarbon drilling and extraction**.

Industrial installations for water desalting, electric central stations situated onshore can also be severely affected by the hydrocarbon pollution.

Industrial and sporting fishing

b) Ecologic impact

The ecologic impact refers to the negative effects caused to the ecosystem in case of pollution. From a biological point of view, the effects of the marine pollution with hydrocarbons are characterized by complex activities with different length (long, medium, short): physical contamination of biosphere and habitat, eco-toxicology, bio-accumulation and contamination; the oil pollution effects upon fish, birds and animals, ecologic revival.

The most sensitive areas (from the bio-diversity point of view), situated on the Romanian Black Sea shore, have been transformed in natural reservations being protected by the legislation in force:

- The Danube Delta reservation with a surface of 5,912 km² (approximately 2.5% of the Romanian territory), with 180 km of sea shore on which one can find: 15 localities with 16,000 inhabitants; it is constituted of 25 natural ecosystems with 1,150 vegetal species, 70 species of shells and snails, 1,530 species of insects, 160 species of fish, 16 species of reptiles, 8 species of batrachians and 310 species of birds.
- The marine reservation from Mangalia with a surface of 5,000 ha along 7 km of coast with a rich sea ecosystem.

c) **Social impact**

The social impact refers to the negative effects caused to the society, to the relationships within the communities affected by pollution. Urban areas emphasize the vulnerability level of an area. The more populated the area, the more severe the social effects in case of pollution are. Hydrocarbon pollution of the inhabited areas can have negative effects upon the state of health of population, gas inhalation over the safe limit causing cancer, [1]. Sometimes, in the case of severe pollution and in order to protect the population, the evacuation is required in spite of the negative effects that might occur (accommodation, food supply, sanitary insurance, etc.)

d) **Political impact**

The political impact refers to the negative effects caused by the political pollution. If the pollution crosses the frontiers, several problems (damage, claims, and indemnities) appear between the involved countries. The relations between two river states can be affected if there is not a mutual agreement established in case of pollution. The study of different types of impact likely to appear on a certain type of sea shore is necessary in order to calculate the level of vulnerability in that specific area.

5. Conclusions

The analysis of industrial sources which can produce hydrocarbon pollution on the Romanian seashore shows the existence of risk factors in that area. Thus, the present paper highlights the following areas:

- Economic areas classified according to their economic potential;
- Inhabited areas classified according to their population;
- Border areas, territorial waters, economic area;
- Natural reservation areas classified according to their importance and the level of bio-diversity (number of species, reproduction periods, migration)

The paper suggests the action framework in order to establish the vulnerability degree of the sea shore area. This type of analysis will include information about the type of sea shore, permeability, structure, the level of self cleaning process, etc. All this information will be classified, quantified and graphically represented on special maps which constitute the basic data necessary for the establishment of prevention and protection measures, intervention

strategies and the placement of intervention units with minimum equipment and structured according to their typo-dimensions and efficiency factors.

References

1. Nicolae, F., Golumbeanu M., *Environmentally Friendly shipping – important chapter in merchant fleet education*, Journal of Environmental Protection and Ecology, Official Journal of the Balkan Environmental Association, vol. 8, no.1, 2007, pag. 146-151.
2. Hăulică, D., *Impactul activitatilor economice asupra echilibrului ecologic in zona de litoral a Marii Negre si in Delta Dunarii*, articol la a-XX-a Sesiune de Comunicari Stiintifice Nav-Mar-Edu, Constanta, 2007.
3. Negre, C., *Instrumente și metode în managementul mediului*, Ed. Economică, 1999.
4. **** *Communication from the Commission to the Council and the European Parliament on the review of the Sustainable Development Strategy: A platform for action* COM (2006) 658 final/2 (the documents are available at <http://eur-lex.europa.eu/>, <http://www.consilium.europa.eu>, <http://www.europarl.europa.eu>.)
- 5**** *Analiza pieței mondiale pentru industria marină*, Martie 2005, Douglas-Westwood Limited, Previțiunea Marină seria nr.1, Institutul de Marină, Irlanda.

Analiza surselor industriale de poluare cu hidrocarburi a litoralului românesc în contextul dezvoltării durabile

Rezumat

Activitățile industriale dezvoltate pe litoralul românesc sunt într-o strânsă legătură cu industria navală. Din acest punct de vedere transporturile navale constituie unul din sectoarele cele mai bine reprezentate în economia mondială. În viitorul apropiat procesul de globalizare va fi urmat de schimbări majore și mutații importante marcate de intensificarea schimburilor de mărfuri și servicii prin intermediul navelor comerciale dar și de dezvoltare a unor noi tehnologii cu impact minim asupra mediului în construcțiile navale sau în activitatea portuară. Lucrarea stabilește cadrul general de acțiune bazat pe principiile dezvoltării durabile pe termen mediu și pe termen lung și relevă totodată direcțiile specifice promovate prin intermediul politicii maritime europene.