

THE ROLE OF THE OIL INDUSTRY IN ENVIRONMENTAL POLLUTION - EFFECTS AND SUGGESTED SOLUTIONS

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Abstract

The issue of environmental pollution at the present time is one of the most difficult challenges facing the world, due to the high rates of pollution in its various forms, air, water and soil, and one of the most important causes of pollution is the increase. In the use of fossil fuels in general and oil in particular. Because they leave residues in the environment consisting of liquid waste, gaseous and solid materials that have a negative impact on the elements of nature and contribute to the disruption of natural structures and thus affect and reflect on life in general and on human health. and other livelihoods. It led to the death of living organisms, increased global warming, the widening of the ozone layer gap, acid rain, the spread of fires and high temperatures. Poisoning and other diseases that threaten human life, as well as heavy losses resulting from those phenomena related to pollution directly and indirectly. At every stage of the oil industry.

It was not limited to presenting the causes and effects resulting from oil pollution, but rather the researcher moved to present proposals and solutions to reduce the danger of pollution, as the researcher sees some of the measures taken by countries and oil companies that do not rise to the level of danger that threatens the world, and he took this paragraph as a hypothesis for research, which It has been proven through research experiments, and the hypothesis has been proven that the procedures and precautions must be more stringent, through follow-up and auditing, and it requires quick and deterrent measures because the dangers and disasters are imminent.

Introduction

The world is witnessing a noticeable increase in the phenomenon of pollution that has taken many forms, which has caused negative effects in the formation of natural elements. The pollution of water, soil and air has increased, and the effects of environmental pollution have been reflected on life in general, and on humans and living organisms in particular, and one of the most important causes of environmental pollution In its various forms is the oil industry, which includes multiple stages starting from exploration and extraction, through transportation, refining and end use, and the volume of pollutants that each stage leaves in nature.

Environmental pollution is an economic and social phenomenon before it is a biological or chemical phenomenon, because pollutants are unused resources and energies, either for technological, technical or financial reasons.

The research focuses on an important aspect of pollution related to the oil industry, with its multiple stages of exploration and extraction from the ground, and then transportation, assembly, refining, manufacturing, marketing and final use.

The oil industry plays an important role in the economic aspects of producing and consuming countries alike, and through what it achieves of revenue and added value as an important source of energy that contributes to the operations of factories and machines, and contributes to advancing the growth and prosperity of society.

The research discusses the role of the oil industry in environmental pollution in a brief and focused manner, and explains the effects of pollutants generated from the oil industries, and suggests solutions that contribute to reducing the severity of pollution and reducing the damage resulting from it.

Research Importance:

The importance of the research is related to the importance of the issue of the environment and its direct connection to life, and the environmental imbalance that the world suffers from as a result of the pollutants formed by the oil industry, which led to anger. Nature, increasing global warming and increasing the rate of incurable diseases, death and deterioration of the lives of many organisms.

Search Objective:

The research aims to:

- 1 - Shedding light on the impact of the oil industries' stages on environmental pollution.
- 2 - A statement of the forms and types of pollution for each stage of the oil industry and the extent of the negative effects.
- 3 - Putting forward some proposed solutions to reduce the negative effects of oil pollution.

Research Problem :

The issue of pollution is a major challenge that the world is experiencing at the present time, which requires concerted efforts to take quick measures to reduce the catastrophic damage caused to life in all its forms.

Research hypothesis:

The measures taken by countries and companies producing and consuming oil and its derivatives do not rise to the level of danger resulting from pollution, but rather there is neglect and a decrease in the level of control and accountability on a global level.

Research Methodology :

The research used the descriptive and analytical method for the data available from the sources concerned with the environment.

Search duration:

A time period for the research was not specified, since the issue of pollution is an old topic and still threatens humanity. The focus will be on recent data and the recent effects and damages that occurred due to the increased production and use of oil and its derivatives.

Structure search:

The first part of the research is devoted to the conceptual framework of pollution in particular, the second part discusses the impact of the oil industry on the environment and for each of the stages, and the third topic is devoted to providing solutions to reduce the effects. . and tackle pollution.

At the end of the research, the researcher presented the results he reached and explained some solutions and suggestions.

The first topic: the concept of environment and pollution in general and oil pollution**First: - The concept of environment and pollution.**

1 - The concept of the environment: Given the urgent need for specialized studies, which resulted from environmental developments in recent decades, specialists tended to find a new branch of economics, which is environmental economics, which is concerned with environmental affairs and their economic effects, using different standards and influences, and is concerned with the optimal use of material and human resources. In order to achieve greater followers of needs and achieve prosperity at the lowest costs. Ecology is defined as the field or spatial environment in which man lives, including natural phenomena, elements and living organisms that he is affected by and affects. (Al- rkabi and Al-Battat, 11, 2017)

The word environment means the set of natural and social conditions in which people live. It is also used to denote the aspects that surround a person and affect his thoughts and morals. The environment contains two things, one of which occurs naturally without human intervention, and the other represents human interference and the negative and positive influence in the elements of nature

And the scientist (Radu Tun) divided the environment into four groups

(a) The natural environment: includes the land and its resources, as well as the climatic conditions, animals and plants.

b- The social environment: represented by the population, its structure and distribution, and the services related to society, including cultural, health and political ones

C - Economic environment: concerned with the various economic activities resulting from the interaction of the factors of production (capital, labor, land, technology) and the pursuit of prosperity. (Hassan, 2008, 100).

D - Aesthetic environment: It includes public parks, recreational areas and green spaces.

2 - The concept of pollution.

A polluted thing is the opposite of a clean thing that causes damage and health problems to human life and other organisms. Pollution is defined as a change in the environment surrounding living organisms by human action and its various activities that leads to the generation of harmful substances that are not appropriate to the place where the organism lives, and can be avoided. This is done by finding technical ways to exploit these materials and waste, make them useful, or dispose of them in ways that prevent or reduce their negative impact. There is a relationship between the environment and pollution, where the environment represents a group of living and non-living factors and all that man has created from different facilities, and pollution is the thing that affects the elements and compounds that make up the environment. Pollution is of two types: the first is a physical type, which is the mixing of any foreign component of the substance with the substance itself. The other type is non-physical pollution, which is intended to contribute to spoiling the thing and changing its properties. (Ali and Al-Faisal, 2015, 183).

The basis of environmental degradation is human intervention, the use of methods that do not correspond to the characteristics of nature in production processes, equipment and even in everyday life

Pollution is divided into: (Al-Rakabi and Al-Battat, 37, 2017).

1- Acceptable pollution: It is pollution that does not affect the balance of the ecosystem and does not result in harmful environmental risks.

2- Serious pollution: it is the increase in the disposal of harmful waste, which greatly affects the elements of nature and negatively affects and represents the critical ecological limit.

3- Destructive pollution: It is the stage of the collapse of the ecosystem, and it becomes unable to provide the environment and balance naturally and automatically due to its changing systems. : (Al-Demerdash, 2006, 67)

(a) Living elements, such as plants, animals, birds, bacteria, as well as humans. (b)- Non-living elements, such as air, water, and soil, and each element forms its own surroundings that contain the matters associated with it.

Second: Types of pollution:

Specialists divide environmental pollution into two main types:

1- Natural pollution: It is caused by pollutants emitted from nature without human intervention, such as volcanic smoke, gases, carbon dioxide, carbon monoxide, earthquakes and floods, and natural phenomena such as wind and rain may contribute to causing some forms of pollution. It cannot be regulated or managed by man because it is the result of the forces of nature. (Araibat, 2004, 34).

2- Industrial pollution:

It is produced as a result of human agricultural, industrial, service, and recreational activities, and it is concentrated in what is issued from factories of waste, automobile

exhaust, use of pesticides and noise, and industrial and agricultural waste. Pollution is divided according to the environment as follows:

1 - Air pollution.

One of the most important sources of air pollution is the combustion of various forms of fuel and smoke from transportation sources that use gasoline, diesel, gas waste, radioactive materials and pesticides. Carbon, CO₂, nitrogen oxide, carbon dioxide and hydrogen sulfide, and these elements have a negative and harmful effect on human health directly or indirectly. (Hassan,2008,109)

2- Water pollution.

The hydrosphere occupies (73%) of the Earth's area, and water pollution results from defective and damaged water quality so that it becomes unusable by its primary use, and the types of water pollutants are divided into surface water pollutants and these pollutants (Ali and Al-Faisal, 2015, 186).

A - Infectious pollutants that are present in the intestines of animals and humans, such as bacteria and viruses.

b - Waste that consumes oxygen, such as food waste and sewage water.

C - Increasing the concentration of phosphorous or nutritional enrichment that contributes to the growth of harmful substances.

D - Sediments brought by wind and running water.

E - Toxic organic materials that are used in industry and agriculture.

f- Thermal pollution through the water used in the generation of electricity.

As well as groundwater pollutants and ocean pollutants.

3- Soil pollutants

It includes pollution with heavy metals such as lead, chromium, mercury, cadmium and arsenic, as well as pollution with pesticides that are used frequently and indiscriminately, as well as the use of some locally and internationally banned pesticides and damaged pesticides as well as insecticides. Radioactive contamination, especially with the use of prohibited weapons in wars (Al-Badi', 18, 2000).

Third: oil pollution

Oil is a mixture of hydrocarbons, nitrogen, sulfur, oxygen, and some metal compounds. Some organisms can use some hydrocarbons, such as lubricating oils, paraffin, kerosene, and methane, and convert them into compounds that contribute significantly to environmental pollution. The composition of oil helps the growth of some organisms and is a suitable medium for them. The use of oil and its derivatives by humans in various fields, and this is at the same time a means to increase pollution due to the high percentage of toxic pollutants that are put into nature in the form of sulfur oxides, ammonia, nitrogen and others. (Al-Kharabsheh and Al-Amri, 2000, 56)

Oil pollution is one of the most prominent pollutants of the marine environment, the reason for the wide movement of transport and marine fleets and the throwing of pollutants into the sea. Therefore, the most important areas of impact of oil pollution will be discussed.

1 - marine pollution

The causes of marine pollution are due to human factors, especially the oil industry directly, through the use of oil derivatives in the movement of transport, and pollution occurs either for reasons beyond human control, or due to negligence such as accidents and delinquency, in addition to marine production operations as a result of the presence of oil tanks in In the middle of the seas, such as North Sea oil, and the occurrence of leaks as a result of errors or perfusion of valves and the difficulty of rapid control, and the acceleration of the development of maritime transport, especially the production of supertankers, and because maritime transport is characterized by low costs and a relative decline in risks compared to other means, and on the other hand large capacities and capacity The quantities carried by ships are feasible. For these reasons, the trend towards the use of maritime transport has increased, and through the intensity of the movement of oil and merchant ships to transport other goods, accidents affecting the marine environment have increased.

Accidents of leakage and marine pollution represent a large percentage of the total environmental pollution rates, up to (77%), in addition to pollution resulting from loading and unloading ports. (Al-Rakibi and Batat, 2017, 38).

Table (1) Sources of marine oil pollution

Source	the reasons
1- ships -Container ships and commercial transport Passenger ships - oil tankers	- Deviation and collision - Fire, coup and drowning -During the refueling process -Operational operations during loading and unloading -Leaks from storage
2- Export terminals and ports	-Leakage from marine pipelines and their breaks
3- Oil and offshore wells	-Disposal of waste motor oil
4- Tourist boats and fishing	-Leakage during extraction from offshore wells

Source: The table is from the research work based on

Al-Rakabi, Hilal's Symposium, and Al-Battat, Muntazer Fadel. (2017). Basics of Environment and Pollution, 1st Edition, Axis Center for Studies and Strategic Planning, Basra, p. 37.

From the above table, it is noted that there are multiple sources of oil pollution, and the diversity and different causes, all of these paragraphs give indications of a high rate of oil pollution in seawater, and pollution affects sea water by creating insulating fatty layers that prevent the insulating exchange from reaching the light, and because of a defect in the food chain, which It causes damage to all marine organisms, and this is an economic loss, especially with regard to fisheries, and affects the ecosystem because the substances thrown into the sea are some of them toxic and lead to the death of animals, seabirds and fish and affect coral reefs.

Fourth: the effects of oil pollution on the air.

The combustion process of oil and its derivatives leads to the emission of dangerous and toxic gases, and causes harm to the public health of humans. Among the toxic gases that are emitted into the environment are carbon dioxide, sulfur dioxide, nitrogen oxide and hydrogen, and a high percentage of salts such as sodium chloride and calcium, and amounts up to (20- 25%) of the soot and all of these materials pose a danger to the environment due to their high toxicity levels. (Talaba and Saab, 2009, 54)

Fifth: The impact of oil pollution on the soil.

Crude oil contains harmful compounds that pollute the whole earth and turn it into an uninhabitable land . Whether they are for plants or animals, but even for living on them, because pollutants are often toxic and dangerous and their effect lasts for a long period of time, and among the compounds that destroy soil, especially fertile agricultural crops such as (phenols, sandiest, sulfide compounds). As insulating materials that kill beneficial bacteria and clog soil pores, trees are killed.

1- Gaseous pollutants.

- | | |
|-----------------------------------|-------------------------|
| A - carbon monoxide CO gas | E- nitrogen dioxide gas |
| b- carbon dioxide CO ₂ | F- hydrocarbons |
| C- nitrogen sulfide gas | G - oxide gas |
| D- nitrogen oxides | H - hydrogen gas |

I - Carbon Trioxide

2- Solid oil pollutants (Al-rkabi and Al-Battat, 2017, 41)

- A - digging mud's and mud
- B - blocks of rock extracted from the depths
- C - Pipes used in drilling and other tools
- D- petrified blocks of oil

E- Barrels and cans for improved materials such as tetraethyl lead

3 - Liquid oil pollutants. (Al-Fraih, 55, 2010)

- A- Oil leakage from pipelines or tankers
- b- Water that is pumped to increase the pressure in the ambush is contaminated
- C- Pollution of ground water

E- Substances that are used to liquefy oil and facilitate its flow.

The second topic: the stages of the oil industries and the resulting pollution processes

First: Pollution in the drilling and production phase.

Pollution during the drilling process and the use of a variety of chemicals added to the drilling mud in order to perform the required function as well as to improve the quality of the extracted oil. The oil areas that are extracted during drilling contain large quantities of different minerals with different concentrations, and it was clear through studies conducted on heavy clays that there is a concentration of these minerals greater than their concentration in water, because those minerals are present in the ground and precise measures must be taken to get rid of them, and the table The following shows the concentration of different minerals in the soil. (Al-Hiti, 2000, 23).

Table (2) Concentration of minerals present in drilling mud's mg/L

component	Focus in the mud	concentration in water
Calcium	207	156
lead (soluble)	3.97	3.36
Magnesium	65.47	17.21
manganese	4.74	77.67
potassium	313	750
Sodium	1819	2125
zinc	52.24	5.07
Carbonate	136	56
chlorides	2204	3639
bicarbonate	582	474
sulfuric	929	551
hydroxyl	45	0.47
pH	8.79	8.10

Source: The table is from the researcher's work with the help of the following source

Al-Hiti and Ahmed Hussain. 2000. Oil Economics, Dar Al-Kitab for Printing and Publishing, University of Mosul, p. 44.

It is noted from the above table that there are many substances associated with water and mud extracted from wells during the drilling process. These substances, when interacting with air or with each other, generate toxic substances and are dangerous to life. In general, for example, calcium reaches (207) mg per liter of clay and (156) mg per liter of extracted water, and sodium, which represents the highest in water, as it reaches (2125) mg / liter and (1819) mg / liter in clay, which is a large percentage, as well as other substances Like chlorides that reach (3639) ml g / liter in water from the table numbers, we know the magnitude of the danger resulting from the mud extracted

from the pits, and in order to study the concentration of some different minerals, we use several studies to find out the size of the concentration for each mineral mg / gram.

Table (3) Concentration of minerals in drilling mud

component	American Petroleum Institute API study	International Environment Agency study	private study
Calcium	47.2	7.17	31.2
Iron	21.2	15.1	15.1
Lead	0.059	0.064	0.064
Magnesium	4.72	3.72	3.72
manganese	0.97	0.91	0.27
potassium	1.85	Does not exist	2.6
Sodium	3.78	5.6	2.36
zinc	0.189	0.68	1.20
Arsenic	0.008	0.029	0.003
Chromium	0.017	0.081	0.016

Source: table from the researcher's work based on:

Campbel R.McConnel&Stanley L.Bre &Sea M.Flynn, Microeconomics (principles, probles and policies United States.2012.

It is noted from the table the magnitude of the danger caused by the drilling mud's, due to the high minerals contained in them, as calcium is the highest among the elements, reaching (47.2) mg / g

According to the study of the American Institute, it is a very high percentage, followed by lead, which reaches (21.2) mg / g. The lowest percentage is arsenic, which is a very dangerous and toxic substance, and it reaches (0.008) mg / g, according to the study of the American Institute (API). (Oraibat and Mazahra, 2004,35)

2- Pollution in the production stage.

In the oil production process, various chemicals are used that are mixed with the extracted oil, such as materials that protect against rust and some materials that break emulsions such as alcohol, acidic oils and some detergents to remove dust from the wellhead and in the ground for the purpose of allowing the flow of oil as well as in liquefaction operations. Chemicals that facilitate the flow and transportation of oil, such as those that reduce density and viscosity, oil antifreeze in pipes, and all chemicals added are harmful to the environment, but they are used for the purpose of facilitating the oil production process vere procedures for treatment and purification to reduce the damage issued by it, and it must be noted that water and some materials are used to pump into the oil reservoir to increase pressure and raise the speed of the outflow of oil due to pressure, knowing that the quantities used are very large, reaching hundreds of cubic meters of water to produce a ton of oil and after using these

Quantities of water are considered polluted, and treatment techniques must be used and then recycled after reducing the pollution rate (Tittenberg, 2000, 43).

The production process is accompanied by the following materials Se:

A - The water associated with the production of oil (Product water)

It is one of the most important challenges in the pollution process and represents the largest percentage in the water that flows with oil and causes the problem of polluted water and outside with oil because it contains oil or chemicals, dissolved minerals, dissolved oxygen and some minerals and salts, including sodium chloride, with a large concentration of hundreds of parts per thousand and when compared With sea water that contains (35) parts per thousand of sodium chloride salt, as well as other salts such as magnesium, calcium, and potassium in a high concentration as well, arsenic, radon, radium, phosphorous, manganese, lead, silver, gold and other radioactive substances called (natural occurring radioactive material (NORM) are added and others. Table (4) shows the concentration of heavy metals associated with the produced water (Tittenberg, 2014, 24)

Table (4) Concentration of various minerals associated with water produced from some oil fields. $\mu\text{g/L}$

Metal	concentration
Cadmium	27
copper	104
chrome	186
nickel	192
Lead	315
zinc	170
Silver	62

Source : Dare O, ROURK, Sarh CONNOLLY : just oil ?The distribution of environmental and social impacts of oil production and consumption Annual Reviews, 2003.

It is noted from the above table that lead is the highest among the metals, with a percentage of (315) micrograms / liter

It is dissolved in water, and it is a dangerous substance, toxic and polluting the environment. Then comes the element nickel, which reaches (192) micrograms / liter, and cadmium, which is the lowest, which reaches (27) micrograms / liter. These quantities are very large and are relatively dangerous and toxic pollutants in most of it.

B - Hydrocarbons in waters produced with oil

The water flowing with oil contains hydrocarbons dissolved in water, and emulsions, before they are separated in isolators, and the concentration of these materials ranges between (15-30) milligrams / liter and does not exceed (100) milligrams / liter, and

the upper limit of concentration has been determined According to the US Environmental Protection Agency, hydrocarbons in water for the best treatment technology are (29) mg / liter per month, provided that it does not exceed (42) mg / liter (Al-Hiti, 32, 2000.).

Among the most important hydrocarbons associated with water (phenol with different concentrations up to (1049) μg / liter) in the fields of the Gulf of Mexico, and gasoline with a concentration of up to (1318) μg / liter, in addition to naphthenic, either natural gas contains phenol at a concentration (4743). Micro grams / liter and gasoline with a concentration of (706) micro grams / liter in addition to other substances such as C2 and others with different concentrations. (Aribat and Mazahera, 55, 2004)

Third: Pollution resulting from transportation and storage operations

During the transportation and storage phase, which is an important phase in the oil industry, cases of pollution occur as follows.

1 - Leakage and spillage

When oil materials spill into water bodies, especially marine ones, for various reasons that lead to pollution of the surrounding area, and then the pollution is transmitted through the water current, causing a great and wide danger. (Al-Musayyib, 2005,65)

It directly affects marine organisms, and its impact may be transmitted to humans through fish, causing cancerous diseases, and the pollution process is an obstacle to beach tourism. It is noted that (15) million barrels of crude oil are released or leaked into the environment every year, which constitutes one-fifth of the amount consumed daily, and leakage and spillage occur due to the various accidents and cases discussed in the previous pages.

2 - Fires, explosions and corrosion accidents.

When safety procedures are neglected, fire accidents or explosions may occur in pipes or storage areas, which leads to significant environmental damage, especially when those oil materials are burned.

3- Throwing oily wastes (engine oils used by ships) as well as oil-polluted water, especially the water used to balance ships that are filled from the sea at a rate of (60%) of their volume for the purpose of balancing, and when washing ships' tanks.

4 - Military operations and wars. (Al-Tai, 2012, 22)

5- Oil production in offshore wells.

Fourth: the pollution that occurred during the refining process.

The stage of oil refining and extraction of derivatives involves many pollution risks, including:

A - smoke emissions into the air

During the process of petroleum combustion, gases and solid substances are generated that contribute to air pollution, and the world today is witnessing many uses of oil

derivatives, and the gases emitted from the combustion process are toxic and polluting to the environment. Increasing the use of cars, vehicles and trains. (Ali and Al-Faisal, 2015, 189)

B - used water

Large quantities of water are used during refining operations, and some of it is used when generating electricity, and this waste water is polluted water and comes out with dangerous and toxic compounds and is thrown into marine and river waters, causing great damage, especially water that is used to reduce and remove salinity and de-sulfur because it contains Salts and acids interact with other compounds that generate toxic and dangerous substances.

C- Hazardous substances and hydrostatic test water

It includes waste, spent catalysts, solvents, mineral alcohol solutions, sweeteners, as well as equipment used in transportation and storage operations, such as pipes and tanks.

D - waste.

Some materials, mud deposits and solid waste mixed with toxic chemicals and elements, as well as some casings and barrels in which the materials used in refining are placed, are considered toxic materials and are waste that needs to be disposed of by modern methods. C - noise.

One of the things that is not noticed is noise, which is one of the pollutants that cause harm to human life and organisms

And other animals, and at the stage of refining and operating the factories, an effective noise is generated, through the operation of machines and equipment, especially for working people or areas near the factories. (Masoudi, 2009, 188)

The third topic: Suggested treatment methods to reduce and prevent the negative effects of oil pollution

First: Precautionary measures to prevent oil pollution.

The process of managing the oil waste file is a dangerous matter, and it requires high skills, and these steps begin with removing oil from the contaminated debris, and may include temporary storage, transportation, treatment and final disposal in safe ways. The quantity and volume of waste are taken into consideration, as well as the available capabilities.

This process faces multiple challenges, and therefore the issue must take multiple steps: (Jamal, 2012, 36).

1 - Avoiding the expansion of the polluted area and striving to reduce the volume of waste by:

A - Choosing a highly efficient way to carry out the cleaning process.

- b- Preventing the spread and expansion of the pollution cycle.
- C - Reducing the equipment used for the purpose of reducing pollution and the use of expendable equipment.
- D - Seeking to benefit from the waste by recycling as much as possible.
- E- Using the burial process as a last resort to prevent pollution to groundwater and soil.

2- Preparing the plans:

It is necessary to develop emergency plans for cases of pollution expected to occur in countries and companies that have a direct impact on the issue of oil. These plans shall specify:

- A - Roles, responsibilities and authority to manage the emergency.
- b- Determining a supervisory body that will follow up and be held accountable for maintenance and safety procedures.
- C - Building relationships with international bodies and specialized organizations to assist in emergency situations, or even training and the use of expertise.
- d- Establishment of treatment plants and industrial incinerators, as well as storage places.
- E- Establishing a database on the costs, effects and damages of pollution for compensation purposes.
- 3- Determining the source and type of pollutants and the risks involved, and preparing a map of work sites where leaks, spills or fires are expected.
- 4 - Creating trained work teams capable of taking the necessary procedures and treatments, and the most important point in this matter is that there should be experience in choosing the method of treatment and disposal of pollutants, because there are several methods and each method suits a specific case of pollution.

Second, some treatment methods

*There are several methods of treatment, represented by several steps, and there are steps that precede the treatment aimed at separating the waste.

*The mechanical method includes distillation, filtration, centrifugation, and sifting

* Thermal method, through heating and thermal absorption

*The physical and chemical method through the use of solvents, sand washing and sediment stabilization.

Biological treatment, by activating biodegradation, then other steps come and may be simultaneous with each other.

Third: - Getting rid of the burial permanently

Oil materials and waste or the final residues from treatments (such as ash, clinker, etc.) are stored in controlled and licensed landfills, meaning they are designated for this purpose, with measures and precautions taken to prevent environmental pollution

in the long term. Waste management is carried out in several steps between collection and disposal. There are several steps required:

- 1- Reducing pollutants at the site through: (Masoudi, 2009, 189).
 - A- Removing debris, weeds and weeds.
 - b- Using methods and techniques to reduce the volume of sediments.
 - C- Use of personal appliances and cleaning equipment.
 - d- Make the pollution area a no-go area.
- 2 - Sorting materials at collection sites.

Separation operations must be carried out during collection, by collecting similar materials on each side, and this depends on the size of the spill and the quality of the oil.

- 3 - Preparing places for storage. (Al-Fraih, 2010, 67)

Storage sites, after collection, should be temporarily tested near the cleaning sites, before selecting the facilities that carry out the treatment. There are three levels of storage:

A - Temporary or emergency storage.

It represents an emergency platform close to the work site to facilitate the quick treatment process.

B - medium storage.

It is an isolated site to avoid filling temporary storage sites, and treatment facilities are prepared and must be specified for those places in advance within the contingency plans C - long-term storage.

It is considered a remote and safe area and is stored for years and is resorted to when the processing capabilities exceed the designated stations.

4 - Transfer and follow-up.

It is very important to take care of the transportation process from cleaning sites to other places, and the necessary supplies for these operations must be provided, such as trucks, cranes, vehicles operating in special terrain, landing ropes or treatment aircraft such as helicopters, etc., and these means must be appropriate and avoid the spread of pollution through them. Monitor transport operations, avoid negligence and follow safety measures, and an appropriate traffic plan must be used to reduce risks, especially when transporting hazardous waste. (Al Taweel, 2012, 97)

5- Preparing volunteer teams.

Leaks or cases of pollution may occur. It is difficult for specialists and workers in the pollution treatment sector to control the matter. Therefore, it is necessary to open up to the community, prepare volunteer cadres, provide them with support, including tools and equipment, and involve them in advanced training courses, increase communication with them, and launch labels on those volunteer teams encouraging them.

Fourth: The economic vision of oil pollution

The process of paying attention to oil pollution is not only because it is harmful to the environment and public health, but to the existence of economic aspects and waste of resources as well as the draining of energies in the treatment process. Production, goods, services, and distribution processes for the elements of production and the returns achieved. Each element of production has a return. The land generates profit and capital and brings interest and work for it wages and the organization of the return on profit. This logic does not include other indirect factors, which are called external costs)) When any product is produced For example, oil does not calculate the cost of the damaged land, trees and birds, but even damage to the air from the rising smoke, and therefore it does not calculate the costs and environmental damage incurred as a result of the production process referred to, and also does not calculate the amount of effort and amounts spent for treatment and indications, and all of this costs incurred.

1- The economy is not included in the calculations.

While the second concept of environmental economics takes into consideration two things, namely the production process, environmental impacts, social costs, proper resource management and reducing waste. The environmental return is calculated after deducting those costs.

A- The economic costs of oil pollution. (Al-Hiti, 2000, 56)

All spending and monetary commitment that is spent in order to preserve the environmental system from oil pollution of equipment, tools and other things related to that are called economic costs of oil pollution, in addition to the expenses paid by companies for the purpose of complying with safety standards and indicators and preserving and improving the environment.

The US Environmental Protection Agency defined it as the monetary and non-monetary effects that occur as a result of activities that affect the quality of the environment, and this includes explicit and implicit costs and potential tangible costs. And the depreciation of environmental assets, which creates a threat to the future ability of the economy, which is:

A- The costs of environmental quality deterioration resulting from oil pollution.

The productivity of the land declines, the production capacity is weak, and the vital system generates useful biological materials, and the land absorbs waste and oil residues resulting from human activities in the stages of the oil industry in an excessive manner, and the matter is directly proportional to the increase in oil production under conditions of public ownership, which is reflected on the Food security and policies to reduce poverty and the decline of the fertility of the land.

B- the costs of imbalance.

An environmental imbalance occurs as the number of living organisms declines or some of them are subject to extinction, and this indicates an imbalance between the footprint and biological capacity, as:

Ecological footprint – incapacity = ecological deficit

The ecological footprint refers to the blind lands allocated by countries to produce the resources they consume and sanitary landfills and waste. In calculating the ecological footprint, types of arable land, pastures, forests, oceans, seas, lands covered with buildings, and the necessary methods for plants capable of absorbing carbon dioxide resulting from burning fossil fuels. (Ali and Al-Faisal, 2015,45)

Biological capacity = area X biological production capacity

Ecological footprint = number of people X consumption per capita X resource and waste intensity

The optimal situation is that the biological capacity is equal to the ecological footprint in order to maintain the balance, and this matter can be overcome by importing from countries that have a surplus in the biological capacity, which is known as selling pollution rights to cover the deficit or the use of rationalizing the consumption of resources.

C- The costs of oil pollution to the environment

It is difficult to determine the costs resulting from oil pollution due to the presence of negative external interlocking effects, but there is a negative relationship between the level of pollution and treatment costs.

Oil pollution costs are divided into two groups:

The first: quantifiable damages, and they can be expressed in monetary amounts, and they are either direct or indirect costs and include direct costs. (Masoudi, 190, 2009).

a- The value of the resources emitted as a result of production processes and causing pollution.

b- The costs of the health sector resulting from health damage.

c- The value of the decrease in production due to the increase in the consumption of natural resources.

d- Costs of rising prices of substitute items.

E - Decreased factors of production and labor in particular.

F- Decreased return on capital.

g- Pollution control costs.

As for the indirect costs, they represent the losses resulting from the occurrence of pollution and include: (Al Taweel, 2012, 98)

1- The costs of avoiding the effects of oil pollution.

2- Opportunity costs.

The costs of the second group include:

A- Physical and psychological pain and aches resulting from pollution.

b- Losses resulting from the protection of nature.

c- Damage resulting from oil pollution in agriculture, birds and water bodies.

From the above it is noted that the process of calculating the effects, harms and costs of oil pollution is a difficult matter that requires a sophisticated database and needs specialists, and because the effects of pollution in general and oil pollution in particular may take a relatively long time, so it is noted that the lack of attention,

neglect and deliberate negligence due to the lack of deterrent measures limiting Pollution, especially oil being the most harmful, and with the existence of some legislation and laws related to environmental and oil pollution that they do not rise to the level of danger and there are no deterrent measures against violators of safety conditions, and procedures must be activated before pollution cases occur, such as reducing smoke and rising fumes, using periodic maintenance and others, and imposing Fines for entities that do not comply with environmental controls. (Al Taweel, 2012,122)

4 - Important Incidents of Oil Spill Operations in the World
 Eco-nature, eco-nature, eco-nature, eco-nature, nature, nature, nature, nature, nature.

Maritime transport is one of the most important industries that cause accidents, and then comes the transport pipelines and manufacturing industries in offshore waters, in the deep sea, in the deep sea, in the deep sea, and back at the beginning of the estimated oil spills. About (30) accidents, causing a leak of (10) million gallons or perhaps more for each accident, and the leakage incidents were recorded, and after the world witnessed in the nineties of this century nearly (346) accidents of oil spills, and the amount of oil spilled (1.1) million tons, of which the largest share was ten (75%) of those leaks>

Table No. (5) The largest oil spill accidents in the world

T	Accident name	Leaked quantity	year
1	Stoic oil well ,ciudad del Carmen	140000	1980-1979
2	Amoco caldiz tanker ,offshore Brittany	68670	1978
3	Aegean captain tanker offshore Tobago	48800	1979
4	Production well D-103,trip oil Libya	42000	1980
5	Irene's serenade tanker piles Greece	36600	1980
6	Kuwait storage tank	31170	1981
7	Nowruz field Arabian culf	78500	1983
8	Castillo deelver tanker offshore cape town south Africa	80000	1983
9	Arabian gulf tanker pipelines and terminals offshore Saudi-Arabia	240000	1991
10	Fergana oil well ,Uzbekistan	80000	1992

**Source: The table is from the researcher's work with the help of
 AOPEC Annual Statistical Vienna ,Austria,2011,T67,p87**

It is noted from the table the extent of the size of the leaks and the damage that is reflected on the environment, as well as that these accidents are catastrophic and their impact extends to multiple aspects in the environment, such as the impact on fisheries, coral cells and coastal tourism due to the mixing of large quantities of oil with sea and beach waters. The biggest accident was in 1991, which It caused a spillage of

approximately (240000) million gallons from extraction wells and transportation pipelines in the Arabian Gulf region due to the Gulf War.

It is clear that the international oil companies did not assume their overall environmental responsibility, and their actions were not at the level of the imminent danger. The global environment in all its details, and even the government's measures were not deterrent to companies operating in the oil sector and the weakness of supervision and follow-up. (Al-Fraih, 2010, 77)

As for the historical studies on oil leaks incidents, they show leaks estimated at (10) thousand gallons from the territorial waters of the countries, which were identified by the statistic (112) countries. regions of the world.

Table No. (6) Important leaks in the world by regions

Region	The number of Accidents	Region	The number of Accidents
The Gulf Of Mexico	267	Korea	32
United States (North-East)	140	France south coast coasts of southern Spain	33
The Mediterranean Sea	127		
The Arabian Gulf	108	Britain	49
North Sea	75	Baltic	52
Singapore and Malaysia	39	Japan	60

Usepa ,Enhancing Supply Chain performance with Environmental Cost Information Examples from Commonwealth Edison ,Anderson Corporation and Ashland Chemical Office of pollution prevention and toxics Washington April,2000.

It is noted from the above table that the oil spill accidents are distributed over most regions of the world, and the most important sites for these accidents are the Americas, especially the Gulf of Mexico, the Mediterranean and the Arabian Gulf, because these oil regions are important in the world, and there are oil investments in them and attract giant international companies working in The oil sectors in all its stages, from the stage of extraction to marketing, including Bb and ExxonMobil, but they did not give the topic of oil pollution importance at the global level, and the statements and speeches did not match the practical reality.

Conclusions and Recommendations:

First: the conclusions

1 - Through the course of the research, it is possible to prove the hypothesis of the research according to which oil countries and companies operating in the oil sector do not adhere to the procedures for reducing pollution and preventing its effects in a serious and effective manner, but rather there is negligence and inaction due to the low level of control and accountability.

2 - The increased production of oil and its derivatives and the increase in use as a main source of energy increased the volume and effects of pollution in various aspects of nature such as soil, water and air, in addition to the establishment of some companies that burn gas associated with oil.

3 - Oil companies bear most of the violations and environmental oil accidents, and in return, they do not take effective measures for treatment, and avoid reducing pollution by using advanced technologies and increasing combustion to reduce emissions, fumes, and toxic and harmful materials to the environment.

4 - The use of different and cheap technologies and technologies by some companies, especially in developing countries, to produce oil led to an increase in the severity of pollution and the spread of harmful effects.

5 - There are treatments, methods of prevention and periodic maintenance capable of reducing pollution rates by reducing catastrophic accidents on the environment.

6 - Some countries lack strict procedures and contingency plans, as well as shortcomings in legislation and laws that deter violators of nature.

7- Oil environmental pollution requires the concerted efforts of all oil-producing countries, both producing and consuming, so those countries should take the issue of environmental danger at the forefront of priorities and strive to put an end to environmental violations, and urge companies operating in the oil sector to abide by environmental regulations and laws, as well as find modern legislation that rises to the level of dangers.

Second: Recommendations

1- Circumstances and environmental imbalance globally require a scientific and practical pause aimed at reconsidering the requirements of environmental degradation, striving to protect and improve the environment, striving to achieve sustainable development, deepening the role of oversight and accountability and building the cultures of its society. To preserve the environment and to create a common international grouping aimed at protecting the environment.

2 - It has become necessary to make serious amendments to the standards and measures of managing oil companies, and to give international powers to some organizations to conduct control and accounting operations, not to be lenient in oil pollution operations, and to limit the effects. And the damage caused by it, directing media platforms for monitoring.

3- Working on developing oil industry techniques and developing scientific research to find modern technologies that keep pace with development and benefit from them in the production of difficult oil reservoirs to ensure the treatment of pollution and environmental leakage.

4 - Attempting to develop the use of non-fossil energy alternatives, especially environmentally friendly ones, and to continue using them, and to try to reduce costs to reduce the use of oil and its derivatives in some aspects of life. Like transportation, etc.

- 5- Developing oil refineries and producing low-pollution and high-quality derivatives capable of meeting demand, providing air pollutants measuring and monitoring devices in oil and gas companies and refineries, periodic follow-up, conducting periodic maintenance and monitoring pallets. and offshore pipelines.
- 6- Providing the requirements and means of pollution treatment systems, using environmentally cleaner technologies, ensuring their efficiency, treating defects if they occur, and building highly advanced treatment systems.
- 7- Finding a kind of continuous cooperation and coordination between neighboring countries to develop joint plans, and find joint teams to monitor and follow up and work on treatment in case of oil spills and spills, and prevent the use of sea water for marine dumping. Waste because of its significant effects on life and other living organisms.

Resources

- 1- Al-Badi, Muhammad Abd. (2000). The Economics of Environmental Protection, Dar Al-Amin Publishing, first edition, Arab Republic of Egypt, Cairo.
- 2- Titenberg, Tom. (2000). Towards the concept of environmental economics and the laws that deal with it, (The Path of the American Experience, translated by Jalal Al-Banna, the Supreme Council of Culture, Egypt, Cairo.
- 3- Jamal Khaled. (2012). Course of studying and evaluating the environmental impact of oil fields for the period (4-11) April 2012, held in Beirut, Arab Gateway Center for Administrative Development, Egypt, Cairo.
- 4- Hassan, Yahya Hammoud. (2008). The Impact of Environmental Agreements on the Oil Industry in the Arab Gulf Countries, Journal of Economic Sciences, No. 22, University of Basra, College of Management and Economics.
- 5- Kharabsheh, Mazen Abdel Karim, and Al Omari, Abdel Rahman. (2000). Occupational Safety, Dar Al-Safa Publishing and Distribution, Jordan, Amman.
- 6- Al-Demerdash - Talaat. (2006). Social Economy, Zagazig Library, Arab Republic of Egypt, Cairo.
- 7- Al-Rikabi, Hilal's seminar, Al-Battat, Muntazer Fadel. (2017). Fundamentals of Environment and Pollution, First Edition, Axis Center for Strategic Planning, Iraq, Basra.
- 8- Tolba, Mustafa Kemal, Saab, Najib. (2009) The Impact of Climate Change on the Arab Countries, Arab Forum for Environment and Development, Lebanon, Beirut.
- 9- Al-Musayyib, Asaad Ayyash (2005). Methods of protection from oil spills in oil facilities to reduce environmental pollution (a case study of Saudi Aramco), a master's thesis submitted to Naif Arab University for Security Sciences, Saudi Arabia.
- 10- Yahya Al-Masoudi (2009). Problems of sustainable development in light of globalization in the third world - a case study of Algeria, a master's thesis submitted to the Faculty of Science and Facilitation Sciences, University of Algiers.
- 11- Al-Tai Walid Khalaf. (2012). Economic policies, environmental pollution and green economy, Publications of the Iraqi Ministry of Finance, Iraq, Baghdad.

- 12- Oraibat, Bashir Muhammad, Mazahra, Ayman Suleiman. (Environmental Education, Dar Al-Minhaj for Publishing and Distribution, Amman, Jordan.
- 13- Ali, Maan Abboud, and Al-Faisal, Ihab Abbas. (2015). Economic analysis of oil environmental pollution with reference Especially for Basra Governorate for the period from 2003-2013, Gulf Economic Journal, No. 25, Basra Studies Center, University of Basra, Iraq. Basra.
- 14- Freeh Mansur Muhammad Abdullah. (2010). Environmental pollution resulting from power plants in the city of Riyadh and its impact on environmental security, a master's thesis submitted to Naif University for Security Sciences, Saudi Arabia, Riyadh.
- 15- Al-Hiti, Ahmed Hussein. (2000). Oil Economics, Dar Al-Kutub for Printing and Publishing, University of Mosul, Iraq.
- 16- Al-Taweel, Anwar Juma Ali (2012). Monetary compensation for purely environmental damages, a comparative study, Mansoura University, Faculty of Law, Egypt.
- 17- Campbell R. Mc Connell & Stanley L. Brue & Seamus M. Flynn, Microeconomics (principles, problems and policies United States.2012.
- 18 - Dara O'Rourke, Sarah Connolly :just oil ?The distribution of environmental and social impacts of oil production and consumption Annual Reviews,2003.
- 19- AOPEC Annual Statistical Vienna ,Austria,2011.
- 20- USEPA ,Enhancing Supply Chain performance with Environmental Cost Information Examples from Commonwealth Edison ,Anderson Corporation and Ashland Chemical Office of pollution prevention and toxics Washington April,2000