

Oil is a strategic and economical source of energy that is damaging the environment**DJELDJEL Hanane ^{1♦}, SALEM Khalil ²**¹ University of Oran2 Mohamed Ben Ahmed, (Algeria), igmo2025.m@gmail.com² University of Oran2 Mohamed Ben Ahmed, (Algeria), szinaisalem@gmail.com**Received:** 06/08/2025**Accepted:** 04/11/2025**Published:** 25/11/2025**Abstract:**

Energy is an indispensable commodity product in people's daily lives. The whole society is based on its consumption. Among energies, petroleum is the main source used worldwide. A non-renewable fossil resource, oil plays a key role in the global economy, as it is used in a wide variety of fields (transport, industry, housing, petrochemicals, etc.).

Consumption of petroleum is estimated at 41% of the total of all renewable and non-renewable energies. Oil is considered as the engine of the economy. It is also considered to be an energy that is harmful to the environment and greenhouse gas emissions, due to its effects and multiple impacts on living beings and above all on the health of the population.

Keywords: Petroleum, The uses of petroleum, The challenges of petroleum, The market and the price of petroleum, The impact of petroleum products on the environment.

JEL Classification: Q11, Q31, Q32, Q51, Q53

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1. Introduction:

The quest for energy has always been vital to mankind. It's essential to our survival and development, enabling us to cook, heat, light, make tools and, more recently, operate machinery. Taking over from wood, which for a long time was the only source of energy apart from human and animal muscle power, coal began to be used on a large scale as an energy source in the 18th century, making the Industrial Revolution possible and enabling man to enter the modern era. While it hasn't disappeared (far from it!) as an energy source, it no longer occupies the central position it once did until the middle of the 20th century, when it was replaced by another energy source, oil.

Now the world's leading source of energy, oil is a strategic resource for a modern economy. Oil has considerably accelerated the development of land, air and sea transport on a global scale, making it an essential element in today's globalization. But while oil is essential for everyone, and therefore of great strategic value, its reserves are very unevenly distributed around the world, which explains why it is naturally the subject of numerous appropriation strategies on the part of major consumer countries, producer countries and private oil companies alike.

Crude oil is of vital importance in the modern world, as it is, along with natural gas, the main source of energy. It supplies 60% of the world's energy needs, and its various components are used to manufacture energy products such as lubricants, bitumen and petrochemicals, the variety of which is constantly increasing (synthetic fibers, plastics, solvents and detergents)¹.

From the foregoing, the problematic of our research emerges through the following question:

Is oil a blessing or a curse for the world and for economic development?

To answer this question, we need to analyze the following hypotheses:

- H1 : What is the role of oil in the world economy?
- H2 : What are the effects of oil abuse on the environment?

So the importance and purpose of this research is to find out indirectly:

The advantages and disadvantages of this valuable energy source, because oil is an important and much-used resource for mankind, with many practical uses. First, we'll look at how oil is formed, its various uses and its importance in the global economy. Then, we'll look at the problems linked to the exploitation and use of this energy, and to deal with this subject and answer the problematic, we've used: the deductive approach with its tools of description and analysis.

2. Definition of petroleum:

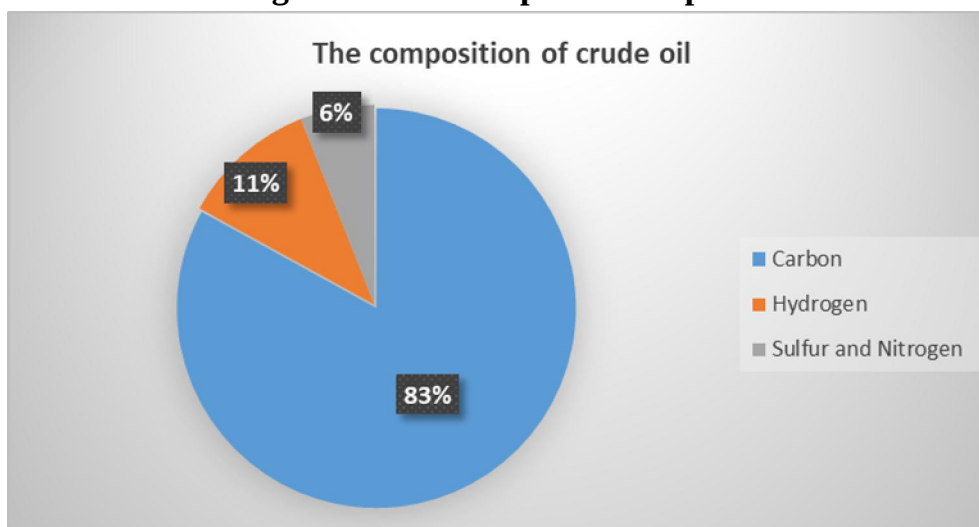
Oil or black gold, also known as crude oil, is one of the most precious commodities on the planet's markets. Comprising just over a third of the world's energy reserves, it is vital to many industries and nations. Petroleum is a natural mineral oil used as a source of energy. It is derived from a variable mixture of hydrocarbons (molecules made up of carbon and hydrogen atoms) combined with other atoms, mainly sulfur, nitrogen and oxygen. Some of its components can be gaseous, liquid or even solid, depending on the temperature and pressure. This explains the varying consistency of oil, from viscous to liquid.

The exploitation of petroleum as an energy source, used in particular in transport and petrochemicals (rubber, plastics, textiles, chemicals), is one of the pillars of the contemporary industrial economy. Dense, easily storable and transportable, petroleum supplies almost all liquid fuels.

3. The composition of crude oil:

The composition of crude oil The essential elements making up petroleum are carbon (83 to 87%) and hydrogen (11 to 14%), which form the various hydrocarbon groups. Oxygen compounds, sulfur and nitrogen are also present (up to 6 or 7% in total), and chlorine, phosphate, silicon and other metals have been found in petroleum ash².

Figure 1: The composition of petroleum



Source : PC (Personal contribution)

4. The uses of petroleum:

At the heart of modern civilization, oil is the primary energy source for development, as it is the easiest to transport around the planet. All other energies or resources require heavy infrastructures to be transported to consumers, whereas a tanker truck or gasoline can get oil to the most remote places. In fact, it has become very difficult to do without oil, given the proliferation of industrially-produced products derived from it. We live in a world built entirely on black gold, where almost every facet of daily life depends in one way or another on oil and its derivatives.

Once extracted from the ground, crude oil is refined. In other words, it is heated to separate its various constituents. The least distilled is heavy fuel oil, used for individual and collective heating (around 13% of oil consumed). Next come diesel, kerosene and gasoline, used as essential transport fuels, and finally naphtha. Naphtha is used in petrochemicals, notably to manufacture plastics. Today, the main use is as a fuel. Of the 159 liters contained in a barrel of oil, almost half are used to power cars and trucks. Then there's fuel for planes and ships, asphalt for roads and heating for buildings. Not forgetting that 15-20% of the barrel goes into petrochemicals, with a myriad of uses: from furniture and flooring to clothing, medicines and cosmetics.

5. The challenges of oil:

5.1 Oil is a strategic resource:

The two world wars had shown that oil had become an essential element in the power strategy of nations. Firstly, because it had established itself as the essential source of energy for armed forces, giving them an undeniable advantage in the field in terms of mobility and strike power. On the other hand, this new strategic importance of oil had made the leaders of the great powers of the time realize that it was a key element in the independence and sovereignty of their countries. As a result, it became essential for the political authorities of oil-consuming countries to ensure the country's oil supply, possibly by setting up oil companies, under direct or indirect state control, to ensure the country's security of supply.

5.2 Oil, an essential source for the development of the global economy:

Oil remains the world's main source of energy, and occupies an important place on the global stage. Its consumption is on the order of 100 million barrels a day, or around 4.5 billion tons a year, which represents around 30% of total energy consumption³. Oil is liquid. It's easy to produce, easy to use.

It plays an essential role in the global economy, and has many uses in our lives and in most everyday activities. This dependence has given the oil industry almost monopolistic power over the world economy. In the transport sector, for example, a full tank of fuel takes just a few minutes and covers several hundred kilometers.

The International Energy Agency (IEA) has declared that international demand for oil will increase by 2.2 million barrels per day in 2023 compared with the previous year, 2022.

In a statement to the Algerie Presse Service (APS), the Algerian national consumption of petroleum products reached 18.1 million tons in 2023, compared with 17.3 million tons in 2022, an increase of 3.5% under the effect of the country's economic dynamism, said the Chairman of the Hydrocarbons Regulatory Authority (ARH), Rachid Nadil.⁴

This table shows world oil consumption over the period 2000-2021

Table 1: world oil consumption over the period 2000-2021

Year	Oil consumption in millions of tonnes	Year	Oil consumption in millions of tonnes
2000	3568.3	2011	4015.4
2001	3600.5	2012	4074.3
2002	3628.5	2013	4113.5
2003	3711.1	2014	4139.3
2004	3854.2	2015	4219.5
2005	3887.2	2016	4300.3
2006	3928.3	2017	4361.8
2007	3975.8	2018	4420.7
2008	3940.4	2019	4428.8
2009	3856.6	2020	4018.6

2010	3982.0	2021	4245.7
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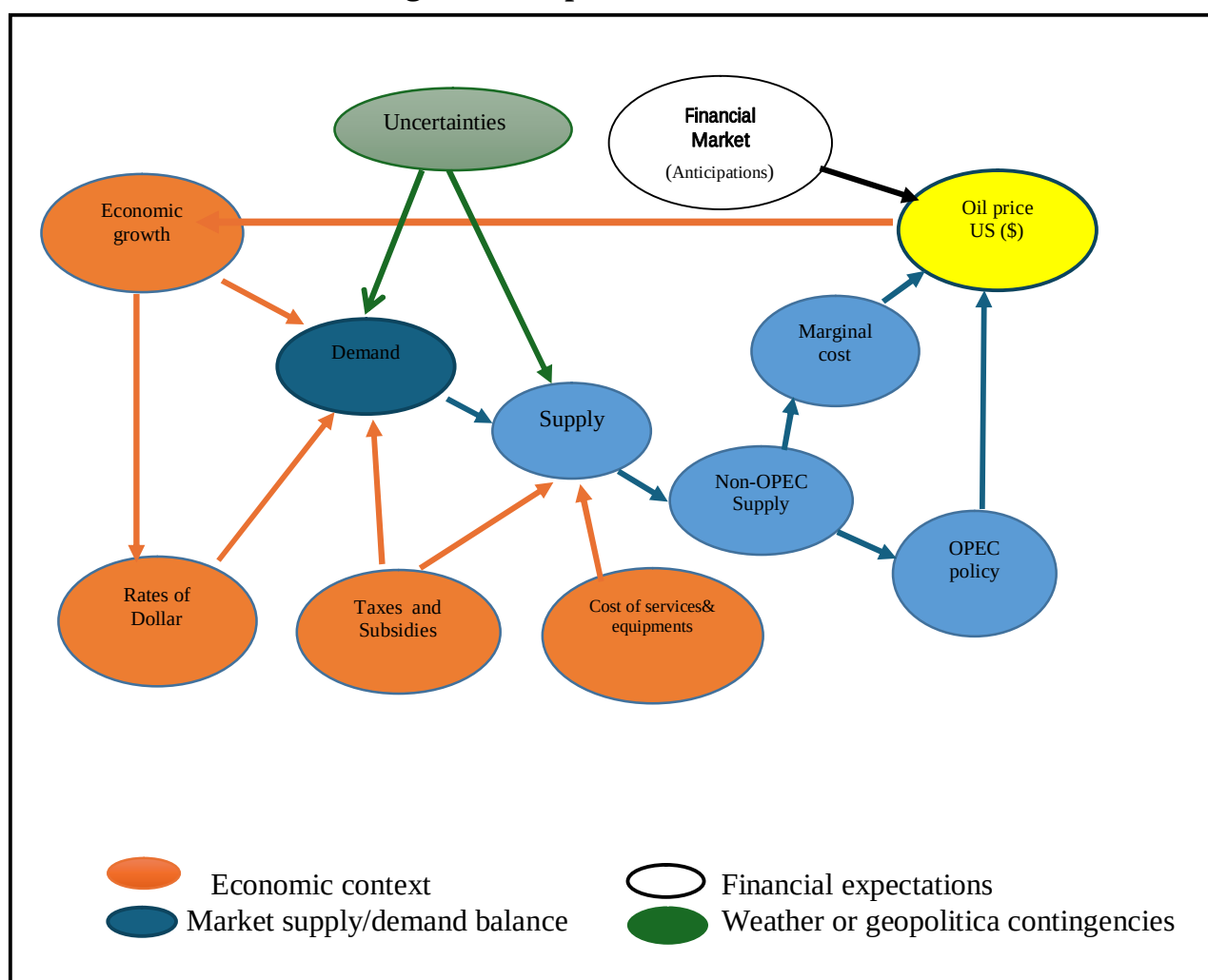
Source: BP Statistical Yearbook⁵

In the period (2000-2019), world oil consumption continued to rise due to economic growth, and in the year 2020. Consumption fell because of the covid19 pandemic, and immediately after covid19, in the year 2021 consumption rose sharply thanks to demand.

6. The oil market:

Over the last forty years, the oil market has become the world's largest raw materials market, due to its importance in various sectors (industry - transport - construction, etc.). It has evolved from a physical trading market into a sophisticated financial market, with trading horizons now stretching over twenty years. In the course of this evolution, it has attracted other economic players (participants) such as traditional oil companies, majors and independents, and physical oil traders (Vitol- Glencore- Trafigura) have been joined by investment banks (Goldman Sachs, Morgan Stanley), insurance companies (AIG) and hedge funds (Citadel, Tudor Jones).

Figure 2: Oil price determinants.



Source: IFP (Institute of French Petroleum)2009⁶

6.1 Factors influencing oil prices:

There are several factors that influence the determination of oil prices⁷.

6.1.1 The balance between oil supply and demand:

Like all other goods and services, the price of oil is determined by the confrontation of supply and demand. This equilibrium price is then influenced by other factors.

Supply and demand are the most important determinants of oil prices. There is a relationship between the three elements, so if there is an increase in demand, the price will rise, and if there is an increase in supply the price will fall.

6.1.1.1 Oil demand:

According to the definition of the International Energy Agency: "Oil demand: are deliveries from refineries and/or primary stocks, through the direct combustion of crude or non-conventional oil, as well as changes in inventories by final consumers and distributors".

The evolution of world oil demand is essentially due to:

- World economic growth:

This is the most important factor affecting oil demand, and is closely linked to it in a direct relationship. As humanity reaches advanced stages of economic and social development, notably with the emergence of the industrial sector as the leader in all economic activities. This has had a real impact on development "and the increase in demand for oil, particularly petroleum.

Currently, the increase in world demand for black gold is driven by the growth and economic needs of European countries and the United States, in addition to the major military operations carried out by the United States outside its geographical borders, which increase their demand for oil. There are also new markets represented by the emerging capitalism of Asian countries and China, which are experiencing rising growth rates and increasing demand for oil.

- Geographic concentration of demand:

Around 69% of global demand is concentrated in the following countries: USA, China, Japan, India, Russia, Germany, South Korea, Canada, Saudi Arabia, Brazil, France, Italy, Spain, UK and Iran, all of which consume huge quantities of oil.

Geographical concentration refers to the tendency of activities, companies and/or populations to cluster in specific geographical areas. There is therefore a direct relationship between geographical concentration and oil demand in terms of the elements of geographical concentration, because as the population increases, the economic activities in a country become important, and therefore the demand for oil increases.

The following table shows world oil consumption for the year 2022.

Table 2: World oil consumption for the year 2022 in TWh (terawatt-hours) and by continent.

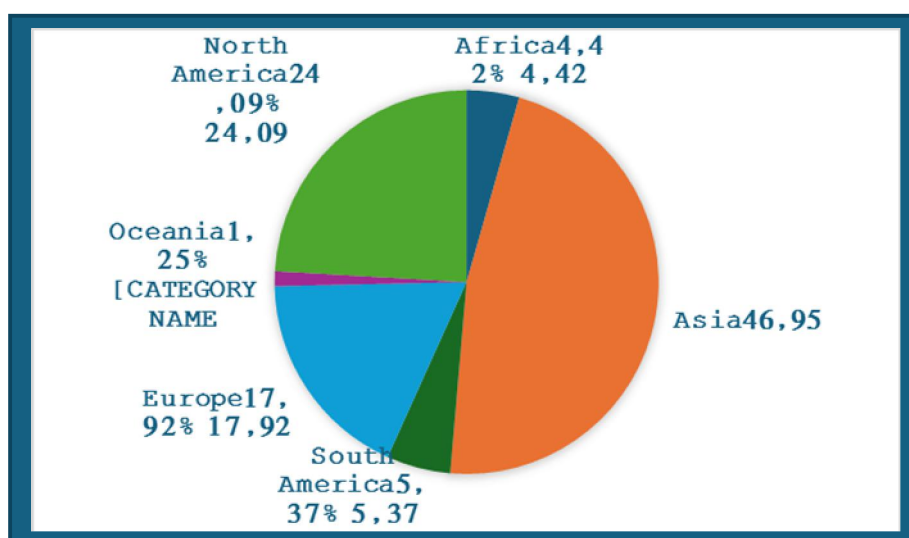
Continent	Consumption TWh (terawatt-hour)
Africa	2 329,61

Asia	24 734,36
Europe	9 440,40
North America	12 689,96
Oceania	657,77
South America	2 828,62

Source: Knowledge of Energy⁸

The following figure shows global oil consumption for the year 2022 in percentage.

Figure 3: World oil consumption by percentage (%) for the year 2022



Source: PC (personal contribution)

Asia dominates world oil consumption with 46.95%, almost half of global consumption. It is followed by North America with 24.09% and Europe with 17.92%, while the following continents consume much smaller quantities: Africa 4.42%, South America 5.37% and Oceania 1.25%.

- Climate or seasonality:

The variation in oil demand varies with the change in climate during the seasons), so energy consumption is higher in countries in winter (the cold season), and summer (the hot season) than in temperate climates. The demand for oil is determined by other characteristics, the most important being that it is a derived demand, i.e. independent of the demand for oil products, in addition to its political and security characteristics which distinguish it from most traded commodities and international trade, it shares with other energy alternatives the fiasco that it is an alternative demand, which means that it cannot be studied independently of the study of the demand for alternative energy sources.

6.1.1.2 Oil supply:

Oil supply is determined by the member countries of the Organization of the Petroleum Exporting Countries (OPEC), with the participation of other countries outside this organization. OPEC's aim is to coordinate oil policies for its member countries.

6.1.2 The economic context:

Other factors can have a direct or indirect impact on the price of black gold:

6.1.2.1 Economic growth:

In general, there is a direct relationship between economic activity, demand for oil and price. If economic activity is going well, demand for oil will automatically increase, leading to higher prices. Conversely, if the economy is doing badly, prices tend to grow less rapidly. Economic growth is one of the main factors influencing demand for petroleum products, and therefore for crude oil. This growth translates into an increase in overall energy demand, particularly for transporting goods between producers and consumers. The transport sector relies almost entirely on petroleum products such as petrol, diesel and LPG.

The building sector also relies on petroleum-derived fuels for heating, cooking and electricity generation (e.g. generator sets).

6.1.2.2 Taxes:

Carbon tax: this is a tax on petroleum products that emit CO₂. As it represents a cost for producing countries and refineries alike, this tax aims to limit oil emissions. These taxes are added to the selling price of the refined products sold.

6.1.2.3 The euro/dollar exchange rate:

The US dollar is the reference currency on the oil market. Insofar as oil prices are denominated in dollars, these two variables are closely linked.

6.1.2.4 Meteorological or geopolitical hazards:

- Geopolitical tensions Conflicts between the interests of oil-exporting and oil-importing countries, and the desire of developed countries to be energy independent are the main causes of political instability in oil-producing countries, which has a direct impact on production and subsequently on oil prices.
- Natural phenomena: Natural or climatic hazards threaten oil production and refining, as many deposits are difficult to exploit, such as salt deposits and deep oil fields.

6.2 Oil price trends:

The price of oil has fluctuated on the world oil market, and has also been affected by a series of shocks since the 1970s, distributed as follows.

- 1973 oil shock: during this period, OPEC decided to raise the price of oil from \$3 to \$12/barrel.⁹

- The 1979 oil shock: prices rose again in 1979 after the Iran-Iraq war (first Gulf War), increasing three times from \$13 to \$32 a barrel¹⁰.

- 1986 oil crisis: the 1986 oil crisis is considered to be the first crisis in which oil prices fell and the interests of oil-producing countries were affected, so it was called the reverse oil crisis, and the price of oil reached 8.63 dollars/barrel due to changes in the world oil market, because of the heterogeneity of OPEC oil-exporting countries and differences in their economic, political and social conditions.

- The 1998 oil shock: In early 1998, the effects of the financial crisis in Southeast Asia began to affect the economies of all the world's countries, and the oil market in particular, as

the price of oil plummeted to a record low of \$3/barrel.

- Oil shock1998: In early 1998, the effects of the financial crisis in Southeast Asia began to be felt in the economies of all the world's countries, and in the oil market in particular, as the price of oil collapsed to its lowest level, reaching \$3/barrel.

- Oil shock2004: in this year, the price of oil continued to rise, reaching record levels never seen before, with the annual average price of the OPEC basket reaching \$36/barrel.

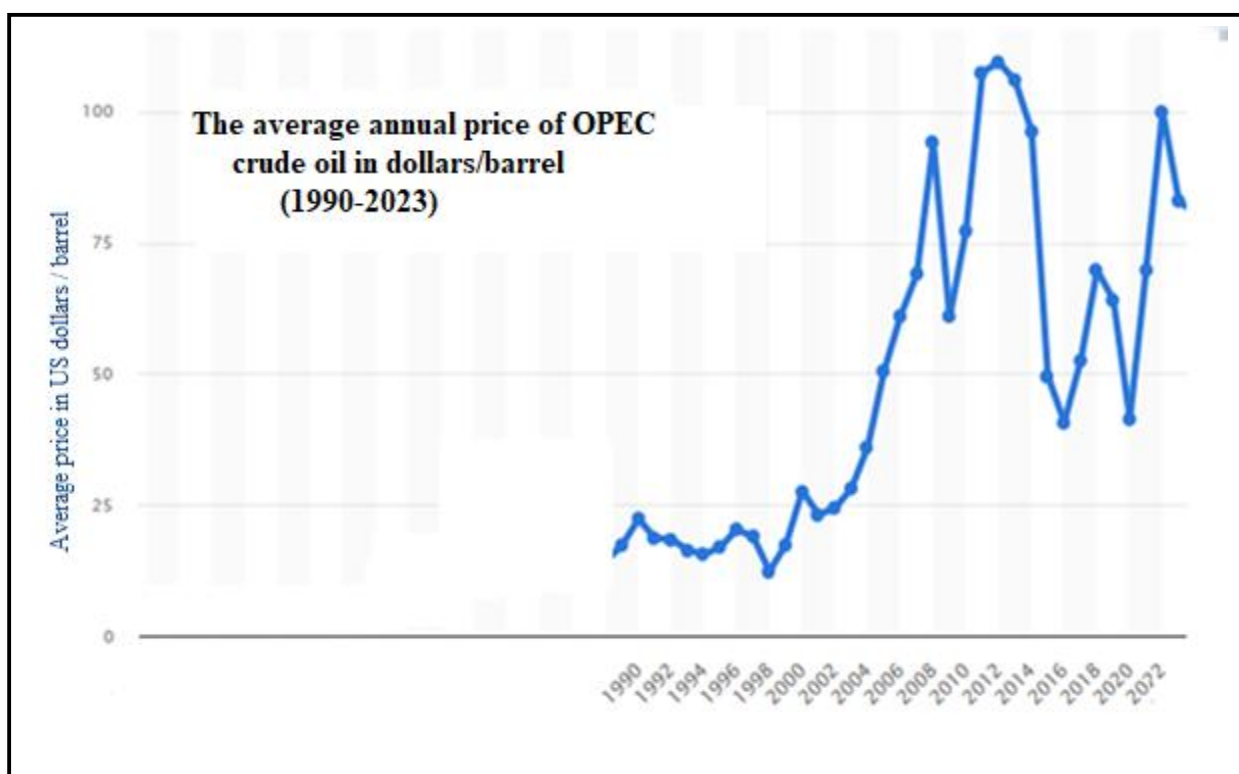
- The2008 oil shock: 2008 was a year marked by fluctuations in oil prices, which reached \$150/barrel in July 2008, leading to an increase in the inflation rate, a rise in raw material prices and a fall in the rate of consumption, which in turn led to a recession in the global economy. At the beginning of October 2008, the price of oil fell to \$80/barrel, by the end of the same month it had reached \$60/barrel, and in December 2008 it was recorded at \$40/barrel, despite OPEC's efforts to reduce production.

The evolution of crude oil prices has varied over the period (1990-2023). The following graph and table show the average OPEC crude oil price over the period (1990-2023). The price of oil began to fall in 2019 due to the Covid-19 health crisis, and continued to fall in 2020 due to the paralysis of all activities in various sectors. In 2021, oil prices began to rise again as the world returned to normal operations.

The preliminary OPEC oil price for 2023 was US\$82.95 per barrel in February 2023. This price is lower than the average for 2022, which stood at US\$100.08.

The following figure and table show global oil consumption for the year 2022 in percentage.

Figure 4: Average annual OPEC crude oil price (1990-2023)



Source: BP Statistical Yearbook.2024¹¹

Table 3: Average annual OPEC crude oil price (between (1990-2023))

Year	1990	1991	1992	1993	1994	1995	1996
Average annual oil price/barrel (\$/ barrel)	22.26	18.62	18.44	16.33	15.53	16.86	20.29
Year	1997	1998	1999	2000	2001	2002	2003
Average annual oil price/barrel (\$/ barrel)	18.86	12.28	17.44	27.60	23.12	24.36	28.10
Year	2004	2005	2006	2007	2008	2009	2010
Average annual oil price/barrel (\$/ barrel)	36.05	50.59	61	69.04	94.10	60.86	77.38
Year	2011	2012	2013	2014	2015	2016	2017
Average annual oil price/barrel (\$/ barrel)	107.46	109.45	105.87	96.29	49.49	40.76	52.51
Year	2018	2019	2020	2021	2022	2023	
Average annual oil price/barrel (\$/ barrel)	69.78	64.04	41.47	69.86	100.08	82.95	

Source: BP Statistical Yearbook.2024¹²

7. The effects of oil price fluctuations :

Fluctuations in the price of oil have many repercussions, including economic, social and political ones.

7.1 Economic impacts:

Fluctuations in oil prices affect the economies of oil-producing countries, particularly those that depend on oil revenues for their national income. This has a positive impact if the oil price is high, leading to a balance of payments surplus (if exports exceed imports). However, if the oil price falls, this could have a negative impact on exports, leading to a balance of payments deficit and also on the country's national income.

7.2 Social impacts:

The social effects of lower oil prices include:

- Higher prices for goods and services.
- Forcing the government to withdraw support for various goods.
- The spread of inflation, leading to a drop in citizens' purchasing power and a decline in individual incomes.

7.3 Political impact:

The political effects of falling oil prices include the following:

- The appearance of demonstrations that affect a country's situation and place governments in a real crisis.
- Rising unemployment leads to increased migration, putting further pressure on governments.

8. Oil reserves:

8.1 Definition:

There are several definitions of reserves. Firstly, it should be noted that the term reserves refers to a concept of a technical-economic rather than geological nature. Generally speaking, we speak of:

- **Reserves**, for fossil energies, e.g. hydrocarbons that are, or will be, recoverable.

- **Resources**, for the quantities of hydrocarbons in place in the deposit, without

In 1972 Mr Kalvery, and in 1973 Brobst and Pratt defined fossil energy reserves as the identified accumulations that can be extracted profitably with today's techniques and under current economic conditions. Thus, the often-used term "recoverable reserves" is a pleonasm, since the hydrocarbons identified as "reserves" are (with a few nuances) destined to be produced and economically profitable. Reference to constraints of accessibility and/or cost price.¹³

8.2 First Subtitle:

Also widely used are the three values 1P,2P,3P, also derived from the above, which provide a probabilistic assessment of a field's reserve potential.

These values correspond to P x, which vary from company to company and from author to author:

- 1P is generally equal to P90 or P95.
- 2P is always equal to P50.
- 3P is generally equal to P10 or P5.

8.3 Types of reserves:

There are three types of reserves: "proven", "probable" and "possible" correspond - most often, but with many exceptions - to the respective values 1P, (2P-1P) and (3P-2P-1P). Inverting the system, this means:

The **1P** = **proven**.

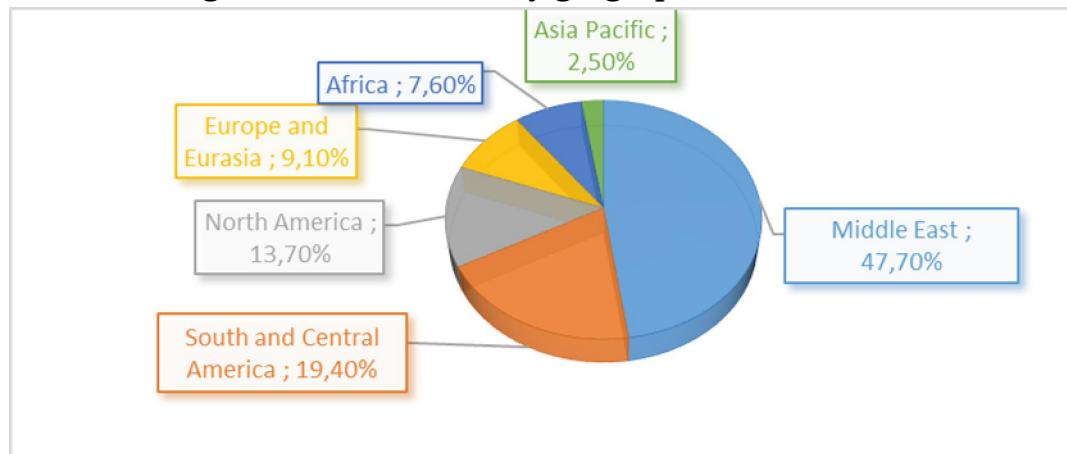
The **2P** = **proven** + **probable**.

The **3P** = **proven** + **probable** + **possible**.

- **Proven reserves (p1)** : are resources with a probability of recovery greater than or equal to 90%, given current economic and technical conditions.
- **Probable reserves (2P or P50 reserves)** : are resources with a probability of production greater than 50%, given current technical and economic conditions. For oil, **2P or P50 reserves** therefore correspond to both probable and proven reserves.
- **Possible reserves**: these are the quantities of oil produced with a probability of 5%, i.e. the quantities of hydrocarbons likely to be discovered from as yet unknown reservoirs, and extracted under technical and economic conditions that can be envisaged for the coming years. For oil, **3P or P5 reserves** therefore correspond to possible reserves.

8.4 Oil reserves worldwide:

The following figure shows oil reserves by geographic zone in 2014.

Figure 5 : Oil reserves by geographic zone in 2014.

Source : www.connaissancesdesenergies.org.¹⁴

In 2014, the world's proven oil reserves were estimated at approximately 1,700.1 billion barrels.

Oil reserves are unevenly distributed across the globe: more than 47.7%, or nearly half, of the world's oil reserves are located in the Middle East, while the smallest share is found in Asia, with 2.50%.¹⁵

8.5 Characteristics of hydrocarbon reserves:

Depending on the degree of complexity of their exploitation, hydrocarbons are subdivided into "conventional" and "unconventional" types.¹⁶

8.5.1 Conventional hydrocarbons:

Oil and gas reserves (or resources) that can be easily exploited with current technological and financial resources. Today, they account for around 90% of the hydrocarbon reserves we consume.

Unconventional hydrocarbons fall into two categories:

- Mother-rock hydrocarbons (not expelled by the mother rock and still trapped there): CBM, shale gas, shale oil and oil shale.
- Reservoir hydrocarbons (expelled from the source rock into the reservoir, where they are trapped): Tight gas sand, Tight oil, tar sands, heavy and extra-heavy oil.

8.5.2 Unconventional hydrocarbons:

Oil and gas reserves whose existence has been demonstrated but which, for technological and/or economic reasons, have not been exploited. subtitle, Enter here the text of first subtitle.

9. The impact of oil resources on the environment:

Oil is an important source of energy, and the international demand for this energy is growing, and to meet this demand, the oil processing cycle comprises five stages: exploitation, production, transport, refining and distribution but, unfortunately, it can become harmful, dangerous and contaminating for our environmental ecosystems due to the pollution resulting from oil refining and the use of different petroleum products resulting from this operation, and therefore we distinguish several effects related to oil, which are the following:

9.1 Pollution of marine waters and oceans:

The pollution of marine waters and oceans caused by petroleum products carried by the ocean is twofold: the enormous tonnage of ships sunk during the last world war, and the cleaning up of oil tankers and ships, the second cause being constantly renewed and increasing with the constant growth of the oil fleet. It is assumed that an oil tanker of 31 000 tons (t) deadweight, on each voyage, dumps 310 tons (t) of oil into the sea, and the oil unloads its cargo, then introduces ballast water into its tanks, which discharges into the sea, in principle at a distance from the coast; this is followed by cleaning, the residues of which are in turn discharged into the sea; it is not advisable to carry out this operation in port, because the stay in port is very costly. Then, of course, there are the accidents: sunken ships, overflows during filling and unloading, etc... And let's not forget the bunkers of all oil-walled ships, where overflows and cleaning residues are produced. The products eliminated are not only liquids, which form on the surface of oil slicks; they are also solid products which swim for a long time between two waters: the latter are the main cause of the well-known pollution of beaches.

9.2 Air pollution and greenhouse gas (GHG) emissions:

Human activities such as industry (refining, production of petroleum-based products, etc.), agriculture, road and off-road transport (the use of various hydrocarbons such as petrol, diesel, LPG, kerosene, oils, etc.) are all responsible for greenhouse gas emissions.) the housing or residential sector (e.g. use of heating in particular, use of gas natural or butane gas) These various activities are responsible for the emission of various gases into the atmosphere. The influence of human activities on the climate is therefore unambiguous.

Current global concentrations of greenhouse gases (GHGs) far exceed pre-industrial values, determined from ice cores spanning several thousand years. Between the end of THE 18th CENTURY and today, the concentration of carbon dioxide (CO₂) in the atmosphere has risen by 40%. Although carbon dioxide is the main gas emitted (76% of total emissions), it is not the only one. Methane (CH₄) , nitrous oxide (N₂O) and fluorinated gases also have a significant warming effect, accounting for 16%, 6% and 2% of emissions respectively. The increase of these gases in the atmosphere causes an additional greenhouse effect: GHGs allow solar radiation to reach the Earth, but trap infrared radiation emitted by the surface, thus increasing atmospheric warming.

These emissions are directly linked to industrial development, which has led to the growing use of fossil fuels (coal, oil and gas) by various human activities, and, to a lesser extent, to changes in land use (deforestation). Between 1970 and 2004, man-made GHG emissions rose by 70%.

Emissions are largely attributable to Western countries. Although their contribution is proportionally declining, the quantities emitted continue to grow. Wealthy countries are now being overtaken by emerging economies such as China, India and Brazil. China has even overtaken the United States to take first place in terms of CO₂ emissions, with 9,973 million tonnes (Mt) emitted in 2013 compared with 5,233 Mt for the United States, i.e. almost double. The poorest countries lag far behind (figure 06). The gap in per capita emissions between the lowest and highest emitting countries is a factor of 50, according to the 5th IPCC

report.¹⁷

Figure 6: CO2 emissions from fossil fuels (2013). Emission levels vary widely across



Source : BODEN *et al.*, 2013.¹⁸

9.3 The impact of oil on living beings:

9.3.1 Negative effects on human health:

All operations related to oil processing (exploration, extraction, *production*, *transport*, *refining* and *distribution*) have effects and impacts on the health of human beings or the population living near oil refining fields or pre oil fields, they are summarized in the following:

- Health problems resulting from geophysical survey operations, including noise caused by explosives, noise from vibrating trucks and air pollution caused by machine traffic. Health consequences include sleep disturbance, hearing problems throughout the period of operations, respiratory problems in the form of nasal irritation and respiratory discomfort such as asthma, sleep apnea and occupational lung disease.
- The health effects and problems associated with drilling activities are diverse and vary according to the type of contaminant and the route of exposure. For example, contamination of groundwater or surface water intended for daily human consumption is likely to cause health problems.
- Other effects on the health of the population associated with drilling operations are manifold and vary according to the types of contaminants and exposure routes. For example, contamination of groundwater or surface water intended for human consumption on a daily basis is likely to cause health problems, depending on the type

of contaminant and the route of exposure. For example: contamination of groundwater or surface water intended for daily human consumption is likely to cause health problems (biochemical, cellular, genotoxic, enzymatic, mutagenic or carcinogenic disruption, skin and mucous membrane damage, neurological damage, etc.).

In Canada, the Centers for Disease Control and Prevention determined that "during the period 2003-2013, the number of work-related fatalities in the oil and gas extraction industry increased by 27.6%, with a total of 1189 fatalities".

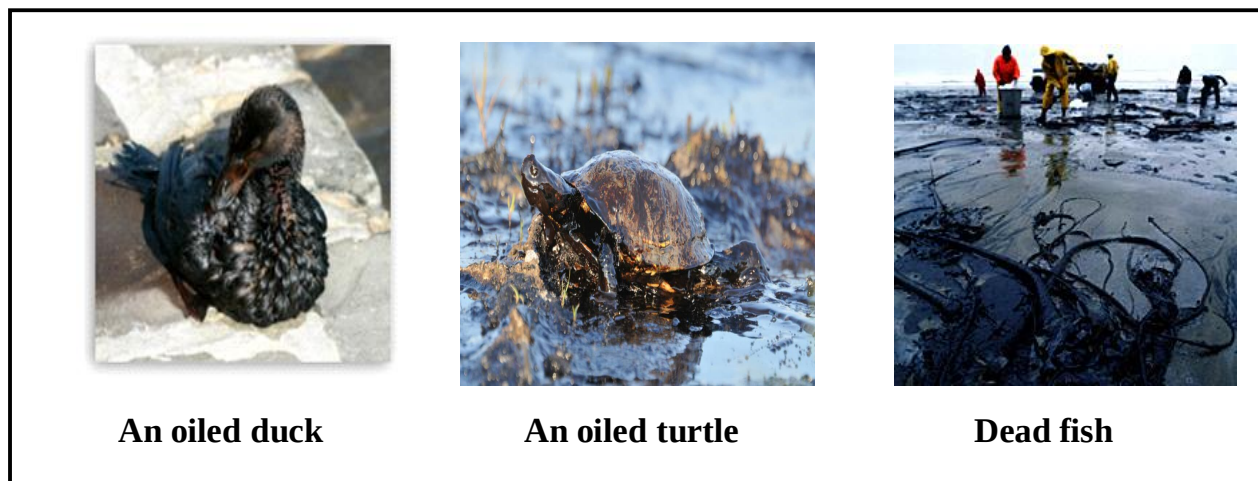
9.3.2 On wildlife:

Oil spills or the various petroleum products spilled by industrial oil activities or their transport, whether in the oceans or by land, have led to the death of fish, birds and mammals due to the toxic composition of the petroleum materials spilled, so oil spills have immense ecological consequences, particularly on marine fauna and birds.

For examples:

- Fuel oil is a petroleum product that affects the health of these animals, completely disrupting their organisms, immune systems and fertility. It only takes a few drops on a bird's plumage to damage it. Dirt on plumage can affect buoyancy.
- On November 11, 2007, a storm sank several boats. One of these was a tanker whose toxic cargo spilled into the Kerch Strait, between the Black Sea and the Sea of Azov (between Russia and Ukraine). Some 2,000 tons of heavy oil killed thousands of birds, fish and other marine organisms.

Figure 6: Consequences of oil spills on marine fauna, fish and birds



Source : PC (Personal contribution)

9.3.3 On flora :

Spills of hydrocarbons or petroleum products into the oceans have serious consequences for flora. Unicellular phytoplankton algae are affected. Oil causes a significant drop in the production of these algae, preventing photosynthesis. What's more, petroleum products can also contaminate zooplankton.

And let's not forget that plankton is at the base of the food chain? So any mammals or fish that feed on them will also be affected by this pollution, leading to their death and affecting the balance of the ecosystem in nature.

10. Conclusion :

Clearly, there is no sustainable alternative to oil, because all the alternatives have technical and/or economic drawbacks. As a result, no single energy source will be able to claim to be the dominant one, like coal in the 19th century and oil in the 20th. Admittedly, technologically speaking, alternatives to oil already exist for road transport, their generation will depend on the cost to the consumer, and therefore in part on the fiscal policies put in place to encourage (or not) the transition to an oil-free economic model. The current trend, especially for private cars, is towards electrification, as in most other energy-consuming sectors.

Oil is responsible for the degradation of the environment through pollution, resulting from the use of this exhaustible resource (oil) in various fields such as industry and transport.

In any case, the central variable remains price: for manufacturers to commit to a sector, it must offer sufficient profitability. But the prices on which profitability calculations are based are biased, as the pollution costs associated with each energy source are still taken into account only to a very limited extent, which favors the most polluting energies such as coal and oil. By setting a price per ton of CO₂ (the main greenhouse gas) in the form of a carbon tax, "inter-energy" trade-offs can be made on a basis that takes partial account of the negative externalities represented by pollution, thus favoring renewable energies as a solution for reducing the negative and harmful effects and impacts caused by the use of petroleum products, and also for preserving our planet.

All sectors of the economy - industry, agriculture, urban planning, transport, etc. - are therefore involved in the effort to preserve the environment by reducing greenhouse gas emissions. To have any chance of staying below the 2°C warming limit by 2100, according to the IPCC scenarios, global emissions would have to be reduced by 40% to 70% by 2050, compared with 2010 levels, and reach near-zero emissions by the end of the century. The goal of reducing global emissions has thus become the leitmotif of international climate policies implemented under the auspices of the United Nations. But this focus on a global volume of emissions has now reached its limits, as it has failed to provide a political response to the climate crisis.

Energy choices are therefore not just technological; they are above all political, since the reduction of greenhouse gas emissions is a key issue. It is probably the scale of the impact of global warming on the planet and its ecosystems that will determine political will. The earth's energy future will ultimately be shaped by political choices that will direct investment towards a particular sector, through the setting of standards and taxes that penalize (or not) the pollution generated by the various energy sources. Added to this is the need to invest in renewable energies, considered environmentally friendly, such as solar energy, wind energy and green hydrogen.

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