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RESEARCH ON THE TOPIC OF (THE ROADMAP FOR TRANSFORMING TO CLEAN ENERGY TO DECREASE POLLUTION ARISING FROM OIL- RELATED ACTIVITIES)

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Abstract:

The strategy of transitioning to renewable energy has become of paramount importance to humanity because the amount of pollution resulting from oil activity has reached unprecedented levels and is negatively impacting human life. This pollution has led to environmental diseases, posing a significant threat to human life. These diseases could potentially kill a third of humanity due to illnesses caused by carbon emissions and toxic gases. Therefore, the need to transition to clean energy and create a new environment for human life has become urgent. Implementing this transition should become an international law imposed on all countries, guiding them towards alternative energy sources such as solar, wind, hydroelectric, geothermal, and bioenergy produced from organic materials like plants or agricultural waste. Other energy sources, such as tidal power, are also included. All of these energy sources reduce carbon emissions and air pollution, protect the environment, and play a vital role in combating climate change. Operating these energy sources will create numerous job opportunities in various sectors using clean energy and will also protect the marine environment from oil waste, which causes the death of marine life, birds, and animals. Liquid oil also contributes to Soil pollution contributes to the killing of living organisms and plants. After a period of time, millions of living organisms will become extinct, and as a result, humans will not be safe on the surface of the earth due to the pollution resulting from oil activity and toxic emissions resulting from harmful chemical reactions. The reason is due to the failure of countries to exploit alternative energies that replace oil, which is considered by some countries to be the main source of their global economy, providing them with a source of huge financial returns compared to other energies.

Keywords:

RESEARCH METHODOLOGY

First: Research Problem

1- Other environmentally friendly methods must be explored
2- It must be determined whether, or even if, the transition to renewable energy can contribute to reducing environmental pollution stemming from oil – related activity, and the scope of its impact.

Second: Research Objectives

1.To study and analyze the extent of environmental pollution resulting from oil waste, including pollution of the marine ecosystem, air, and soil, and its impact on humans and other living creatures.
2.To study oil pollution and its major linked sources.
3.To understand and study alternative energy sources and their potential applications, such as solar, wind, and hydroelectric power, to reduce emissions from oil-related activities.
4.To establish effective environmental regulations directed toward transitioning to renewable energy.
5.To examine and make clear the levels of environmental and economic impacts of transitioning to renewable energy.

Third: Research Significance

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1-The research is significant in promoting environmental cleanliness for humanity, supporting efforts to reduce carbon emissions that negatively impact climate change, and creating a high-quality, clean environment.
2-The principal goal of this study is to lessen oil dependency as a primary energy source and move towards clean energy sources, which promotes economic development.
3-The study makes a substantial contribution to an applied study of the relationship between the oil transition to alternative energy sources and their protection. For the environment.
4-One of the most important objectives of this research is to support new energy policies and guide decision-makers in aligning with global trends towards renewable energy.

Fourth: Research Hypotheses

1-First Hypothesis: There is a relationship between reliance on alternative energy and pollution levels resulting from oil activity.
2-Second Hypothesis: The strategy of transitioning to renewable energy in the oil sector increases environmental improvement without negatively impacting the global economy.
3-Third Hypothesis: The absence of supportive laws, regulations, and economic incentives will constitute a major obstacle to the transition to renewable energy.
4-Fourth Hypothesis: Investment projects generate significant growth, contributing to the creation of new job opportunities and enhancing economic development.

INTRODUCTION:

The burning of oil leads to the emission of many of the most dangerous gases, including toxic compounds harmful to human health. A large number of gases are produced during oil combustion, which are toxic and harmful to human health, all forms of life, and the environment. These include carbon monoxide, carbon dioxide, sulfur dioxide, nitrogen oxides, hydrogen sulfide, hydrocarbon compounds, and a high percentage of soot (20-25%), as well as the burning of salts such as sodium chloride and calcium and potassium salts. The effects of oil pollution on public health: The dense smoke from burning oil carries hydrocarbons, aromatics, and soot, which have a significant and harmful impact on public health, causing respiratory and digestive system diseases and cancers. It also causes premature birth, miscarriage, birth defects in newborns, and illnesses such as skin rashes, memory problems, headaches, lethargy, and weakened immunity.

Section One

(Pollution Resulting from Oil Activity)

Oil, as a primary energy source and one of the most important natural resources upon which the world depends, has significantly contributed to driving economic and industrial development since the beginning of the twentieth century. However, this economic importance comes at a high environmental cost. The extraction, transportation, refining, and consumption of oil lead to numerous forms of pollution, and pollution resulting from oil activity is considered among the most dangerous types of environmental pollution, threatening both ecosystems and human health. This includes air, water, and soil pollution, in addition to major environmental disasters such as oil spills in seas and oceans, which leave long-term effects on marine life and the coastal environment. Furthermore, combustion processes in oil refineries and power plants release large quantities of toxic and greenhouse gases, which also contribute to cancer.
The concept of pollution resulting from oil activity: Pollution resulting from oil activity is the release or emission of pollutants from oil extraction, transportation, refining, and storage processes, such as gaseous, liquid, or solid waste, affecting the air, water, and soil, causing a deterioration in environmental quality and the health of humans and living organisms. (1)
The basic elements of the concept of pollution (2) :
1.Pollution is any change that occurs to the physical, chemical, or biological properties of the environment in which humans live, negatively affecting their health directly or indirectly.
2.Environmental pollution is also defined as undesirable changes that occur in the environment through direct and indirect influences on the form of energy, radiation levels, and the chemical and physical environment of living organisms, which directly affect their lives.
3.Environmental pollution is also defined as any quantitative or qualitative change in the components of the living (biological) and non-living (chemical and physical) environment that negatively affects human life.
4.Pollution is the degradation of environmental components, where these components are transformed from beneficial elements into harmful ones, thus losing much of their role in sustaining life. The elements of any ecosystem become pollutants if their quantity (increase or decrease) or properties change in a way that makes them harmful to the environment. The Importance and Effects of Oil Pollution

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Environmental pollution has become an international problem. Pollutants from one country do not stop at its political borders but travel thousands of miles, affecting the environment and well-being of other peoples, both present and future generations. Winds, clouds, and water currents contribute to transporting pollutants from one country to another. Therefore, environmental pollution is considered one of the most serious problems facing humanity and other life forms on our planet. Many people see air, water, and soil pollution (and images) as forms of pollution similar to those previously discussed. However, each part of the environment (air and water) is different. Soil and other elements depend on each other, as well as on the plants and animals that live within that environment. The relationships between all living and non-living things in a particular environment form a system called an ecosystem. All ecosystems are interconnected. Thus, a pollutant that appears to affect only one part of the environment may also affect other parts. Smoke, for example, may seem to affect only the atmosphere, but rain can carry away some of the harmful substances present in the smoke and deposit them on the ground or in waterways. Rain can wash away fuel, oil, and salts from roads and parking areas and carry them into the wells that supply us with drinking water.

The effects include (3
Environmental impacts: Marine life loss (fish, birds, crustaceans), plant damage, disruption of food chains, and degradation of coral reefs and sensitive areas such as wetlands.

- Human health impacts: Exposure to toxic substances can lead to respiratory illnesses, skin problems, liver and kidney damage, and carcinogenic effects, particularly from compounds such as PAHs.
- Economic and social impacts: Disruption of fisheries, losses in tourism, cleanup and rescue costs, contamination of drinking water, and decline in agricultural quality if soil or groundwater is contaminated.

The methods used to combat oil pollution are as follows :

- Water pollution treatment units within the equipment.
- Primary oil separation units.
- Secondary pollution treatment units.
- Tertiary and advanced treatment units.

The optimal method for treating oil pollution in coastal and marine environments varies from region to region and from month to month, depending on many complex factors. In some cases, more than one method or technique may be used to combat oil pollution in coastal or marine areas. There are many methods for dealing with oil spills and slicks, which include leaving them as they are if they occur at sea, or containing, removing, dispersing, or burning them.
The following outlines the most important methods and techniques used in combating oil pollution: (4
1.The method of erecting floating barriers on the water's surface using specialized equipment, along with dredgers and sweepers, to contain floating oil slicks and prevent their spread. This helps increase the thickness of the oil layer and reduces the area it covers, thus allowing for its gradual absorption and pumping by means of pumps to tanks on the shore or on ships, where the oil is then separated from the water. This technique is time-consuming, during which the oil slicks are exposed to weather conditions and sea currents, causing them to disperse and break down under the light, which increases the difficulty of the cleanup operation.
2.The method of burning the oil layer with a flame after containing it and setting it alight. Although this method is not suitable in all circumstances and is not recommended due to its danger to the environment, as it pollutes the air and causes significant harm to many living organisms.
3- The chemical method involves spraying specific types of solvents, industrial detergents, and high-density powders, or fine sand, onto the surface of oil slicks in polluted seas. The goal is for these substances to adhere to the oil, breaking it down into an emulsion-like substance that then spreads and dissolves in the water, or sinks to the seabed due to its high density. This is considered a superficial solution to the problem, as it requires large quantities of detergents and solvents, sometimes equal to the amount of oil being removed. Furthermore, the large amount of industrial detergents used significantly increases the overall pollution of the seawater and the environment. The arrival of the cleaning materials and the oil particles after their disintegration on the seabed causes the death of fish, worms, and sand snails that live there. Therefore, this method exacerbates the pollution problem rather than providing a permanent solution.
4.Spraying absorbent materials onto oil slicks until they become saturated with oil, then recovering the oil from them.
5- Natural (Biological) Treatment Method: This method utilizes types of bacteria capable of extracting pollutants that have become attached to soil or water and cannot be washed away or separated. These bacteria can also convert harmful chemicals into harmless or even beneficial substances. Bacteria capable of breaking down many pollutants are found in soil and water, and they perform this breakdown through what is called biological treatment. In the field of combating oil pollution, bacteria break down hydrocarbons from oil waste into smaller, less hazardous molecules that are more easily dissolved in water. This transforms them from highly dangerous substances into less hazardous, less polluting, soluble materials. However, their naturally small numbers make them less efficient at treating pollution.

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6.The necessity of obtaining special permits for the disposal of oil waste, with the obligation to inform the United Nations Environment Programme of all such permits. Technological developments in the oil industry have led to the emergence of modern methods for treating onshore drilling waste, especially sludge, by collecting the waste and mixing it with materials that chemically and physically stabilize it, thus reducing its impact.
7.Strict monitoring of ships visiting ports, and harsh treatment of ships that do not meet safety standards, and prohibiting ships older than 15 years from entering oil export ports to protect the marine environment. Scientific research conducted since the late 1960s has now confirmed a link between these chemicals and the depletion of the ozone layer, and that the ozone layer has begun to show signs of depletion and erosion. For the past ten years, we have been sounding the alarm and raising awareness, especially since all studies have agreed that if the ozone layer decreases by 1%, this will increase ultraviolet radiation by 2%, and this percentage leads to a 4% increase in the rate of skin cancer.

Estimates added that if the production of these substances continues at the same rate and they continue to rise in the atmosphere to altitudes ranging between 30-40 km, they will not be destroyed, but will remain for several centuries and accumulate with the same chemical composition to cause the destruction of the ozone layer. (5)
Section Two (The Renewable Energy Transition Strategy as a Solution to Pollution Reduction)
Energy is a fundamental driver of economic and social development, but it is also one of the most significant causes of environmental pollution due to greenhouse gas emissions resulting from the combustion of fossil fuels. Reports from the Intergovernmental Panel on Climate Change (IPCC) indicate that the energy sector is responsible for approximately 73% of total global carbon dioxide emissions (6).
Therefore, the need has arisen for a comprehensive strategy to transition to renewable energy to reduce pollution and ensure sustainable development.
Strategy Objectives (7)
1.Reduce carbon dioxide emissions and air pollutants by at least 40% by 2035.
2.Increase renewable energy to more than 50% by 2040.
3.Find alternative energy sources by diversifying energy sources, reducing dependence on oil and gas, and moving towards clean energy.
4.Create new and diverse job opportunities and stimulate technological innovation in the renewable energy sector.
Components of the Transformation Strategy (8)
1.Political and Legislative Aspects
•Enacting binding laws that define the targeted percentages of renewable energy.

•Providing substantial financial incentives for investment in renewable energy projects, such as tax exemptions and concessional loans.

•Implementing a pricing mechanism for carbon emissions and encouraging clean alternatives. (9)

2.Infrastructure and Technology Framework
•Developing smart grids to integrate intermittent alternative energy sources such as wind and solar.

•Investing in clean energy storage systems (batteries, pumped hydro).

•Encouraging research into green hydrogen and geothermal technologies. (10)

3.Financing and Partnerships
•Attracting private investment through long-term sovereign guarantees.

•International and regional cooperation in technology transfer, capacity building, and skills development projects. (11)

4.Social and Institutional Dimension
•Training the workforce in skills.

•Ensuring social equity in the distribution of the gains from the energy transition.
• Engaging civil society in planning and implementation. (12)
Phase Implementation Plan) (13) (
Phase Duration Main Objectives

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Phase One (2025–2030) Establishing legal and institutional frameworks, launching small-scale solar and profit-generating projects.

Phase Two (2030–2035) Expanding production, upgrading electricity grids, enhancing energy storage.

Phase Three (2035–2040) Achieving 50% renewable energy and reducing pollution by more than 40%.

Challenges and Proposed Solutions [14]
Challenging Proposed Solution Reference Page
High initial investment costs
Providing government support and credit guarantees for investors. [15]
Weak infrastructure
Developing advanced transmission and distribution networks and smart grids. [16]

Resistance to change from some sectors
Promoting environmental awareness and stakeholder engagement. [17] Lack of technical expertise and national training programs in renewable energy technologies [18]
Conclusion [19]
We conclude that the shift towards renewable energy has become a major necessity due to its low and simple costs, as it is environmentally friendly and reduces the percentage of emissions in the air and soil, and reduces diseases resulting from the move towards a clean environment and to reduce pollution resulting from oil activity.

CONCLUSIONS AND RECOMMENDATIONS

First conclusions

1.We conclude that the transition to renewable energy is no longer an environmental option but has become an economic and international necessity in the near term.
2.The decreasing costs of producing solar, wind, and hydroelectric power have made them genuine competitors to oil, making investment in them economically viable.
3.We conclude that oil activity represents a source of environmental pollution and toxic emissions that harm human life.
4.Oil extraction and combustion processes cause significant emissions of harmful gases (CO_2, SO_2, NOx) that pollute the air, water, and soil.
5.Improving public health will be linked to the transition to renewable energy in order to reduce expenditures allocated for public health purposes.
6.A decrease in toxic emissions means a reduction in respiratory and cardiovascular diseases, leading to improved public health and increased economic productivity.
7. A sudden halt to oil production without readily available alternatives in the oil sector could lead to unemployment and significant disruption to state revenues. Therefore, alternatives must be prepared, and very precise timeline planning is essential.
8.Expanding investment in solar and wind energy can create new job opportunities, support economic diversification, and provide employment in various fields.
9.International cooperation is a crucial factor in the success of the transition process.

Second: Recommendations

1.Develop comprehensive and well-considered plans for the transition to renewable energy.
These plans should include clear targets for increasing the share of renewable energy (e.g., 25–50% by 2050).
2.To achieve a clean energy transition, incentive-based economic policies must be implemented.
For example:
- Imposing taxes on toxic gas emissions to reduce pollution.
- Providing tax exemptions for renewable energy projects and incentivizing investment projects.
- Supporting this sector by granting loans for the establishment and implementation of these investment projects.

3.Retraining and developing the workforce in the oil sector.
Establishing national training programs to transfer the skills of oil workers to the fields of renewable energy, electrical maintenance, and environmental engineering.
4.Encouraging public and private sector institutions to partner with each other to expand investment and establish joint ventures for renewable energy production.

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6.Developing future plans to support the improvement of energy infrastructure and the development of electricity grids to integrate with intermittent sources such as solar and wind power.
7.Supporting universities and research centers and promoting local scientific research and technologies.
In developing solutions for energy storage and water desalination using renewable energy.
8.Launching awareness programs about the benefits of the renewable energy transition and raising public awareness to encourage community acceptance of the new policies.
9.Establishing specialized teams to regularly monitor the transition to clean energy.
10.Encouraging regional and international cooperation in the short and long term.
To benefit from the transfer of technological expertise and the exchange of skills and modern practices in clean

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