

The Economic and Environmental Impacts of the Transition from Oil Energy to Renewable Energy (Models from Arab Countries)

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Abstract

This research addresses the transition of oil-dependent Arab countries from reliance on "black gold" to adopting renewable energy sources, driven by a reality marked by escalating climate pressures that necessitate a redefinition of the economic role of these nations. The study employs a methodology that combines quantitative data analysis (investment volumes in renewables and emission reduction rates) with qualitative analysis of policies, legislations, and international partnerships, focusing on six main Arab models: Saudi Arabia, the UAE, Qatar, Egypt, Kuwait, and Morocco.

Economically, the study highlights the vulnerability of oil-dependent economies, as falling crude prices expose these countries to shocks in output and fiscal deficits, while countries like the UAE and Morocco demonstrate success in diversifying income sources by enhancing non-oil sectors and investing in clean energy. It also shows that mega-projects such as "Neom" in Saudi Arabia and the "Benban" complex in Egypt contribute to creating thousands of green jobs and driving growth as an alternative to oil.

Environmentally, the study addresses the harms of oil spills and carbon emissions that threaten marine and terrestrial ecosystems, showcasing how major solar energy projects like the Mohammed bin Rashid complex and the Noor Ouarzazate project have contributed to reducing millions of tons of carbon dioxide annually. However, it warns of institutional and social obstacles, such as insufficient necessary financing, dependency on foreign supply for equipment, and land disputes.

The research concludes that achieving a fair and sustainable energy transition requires institutional reforms to enhance governance, the establishment of green sovereign funds to finance renewable projects, and the adoption of Support for decentralized projects in rural areas was also recommended. It suggested involving civil society and the private sector in decision-making, creating an Arab index to measure energy transition performance, and exerting diplomatic pressure on alliances like "OPEC+" to include renewable quotas in their production policies.

Introduction :

The global energy system is experiencing an unprecedented existential transformation, driven by a combination of escalating climate pressures and rapid technological advancements. Arab countries, which have symbolized oil wealth and hydrocarbon power for centuries, now face a historic crossroads that requires redefining their role in the global economy. The "black gold," which has been the backbone of the economic and social life of these countries since the mid-20th century, is no longer the sole guarantor of prosperity in an era marked by the Paris Climate Agreement (2015) and accelerating commitments to adopt renewable energy as a strategic option for achieving carbon neutrality by 2050. The challenges of this transition extend beyond environmental concerns; they also involve restructuring economies that have tied their identities to oil and gas value chains, where hydrocarbon revenues account for up to 80% of the income of some Arab nations. At the same time, trade wars, disruptions, and geopolitical fluctuations create a reality that increases volatility in energy markets, prompting Arab countries to accelerate the diversification of their energy mix to ensure the security of their local supplies and reduce dependence on fossil fuels.

On the other hand, the clean energy revolution opens up vast economic prospects for Arab countries, thanks to their competitive advantages in solar and wind energy sources. The region's potential for generating electricity from solar energy alone is estimated to be more than 100 times the current global demand. However, realizing this potential requires a complex alignment between government policies, attracting foreign direct investments, building smart infrastructure, and developing human competencies in green technologies, not to mention the need to manage social tensions arising from the reduction of fossil fuel subsidies, which have long been the cornerstone of the social contract between governments and their people.

This research focuses on Arab case studies as models, such as Saudi Arabia, the United Arab Emirates, Qatar, Egypt, Kuwait, and Morocco, which represent diverse responses to energy transformations. Gulf countries exhibit ambitious shifts supported by proactive visions like "Saudi Vision 2030," the giant "NEOM" project, and the "Masdar" project in the UAE, along with Egypt and Morocco as regional players in exporting green energy through projects like the "Benban Solar Complex" and "Noor Ouarzazate." Meanwhile, Qatar and Kuwait reflect a cautionary model that attempts to balance enhancing their positions in the global gas market (as a temporary alternative to oil) with investing in green hydrogen.

Research Problem: Through an analytical methodology that integrates quantitative data (such as the volume of investments in renewable energy and emission reduction rates) with qualitative analysis (such as studying international partnerships and institutional frameworks), this research aims to address the following key issues:

- How can Arab countries transform the "burden of oil resources" into a "green blessing" without compromising economic stability or social cohesion?
- How can oil-dependent Arab countries achieve a strategic balance between the demands of financial security and the need to build a sustainable environment and economy during the energy transition phase?
- What are the potential geopolitical implications of this transformation, especially in light of global powers competing for dominance over future technologies and energy storage, which may reshape regional alliances in the coming decades?

Research Hypothesis: The transition to renewable energy in oil-rich Arab countries represents a fundamental factor for achieving economic diversification and environmental sustainability. Its success requires these countries to modernize their institutional frameworks to move beyond traditional governance models and to enhance regional cooperation to build strategic partnerships in technology and resources, while adopting fair policies that balance the interests of various parties and mitigate the social and economic impacts associated with the energy transition phase.

Importance of the Research: This research aims to provide practical frameworks that combine theoretical discussions with realistic governance strategies that take into account the social and economic characteristics of oil-dependent countries during the transformation phase.

Chapter One: Economic Impacts of Oil Dependency and Diversification Efforts in Arab Economies

First: Resource Issues and Distortions in Oil-Rich Economies:

The excessive reliance on oil revenues in the Arab world reflects a transformation of natural wealth into a burden for economic diversification and technological innovation. According to the International Monetary Fund (IMF, 2023, p. 17), 14 Arab countries are still classified as "heavily dependent on oil," with hydrocarbons contributing more than 60% of total exports in 80% of these countries. Data reveals that despite diversification plans, the economies of the Gulf Cooperation Council (GCC) countries continue to suffer from a strong correlation between economic growth and fluctuations in oil prices. The World Bank (2022, p. 34) indicates that a \$10 drop in the price of a barrel leads to a decline in GDP by 3-5% in Saudi Arabia and Kuwait.

The risks of this vulnerability are evident in successive crises; during the COVID-19 pandemic (2020-2021), Arab oil revenues fell by 46% according to the Organization of the Petroleum Exporting Countries (OPEC, 2021, p. 22), resulting in a significant budget deficit in countries like Oman (19.3% of GDP) and Algeria (16.8% [IMF, 2022, p. 45]). However, the more serious issue is the structural distortions left by the oil rent model, such as reliance on foreign labor, which constitutes 85% of the private sector in Qatar

(Ministry of Development Planning and Statistics [MDPS], Qatar, 2023, p. 8), and the decline in local productivity, where the productivity of the Arab worker does not exceed 34% of that of their counterparts in OECD countries.(United Nations Economic and Social Commission for Western Asia [ESCWA], 2021, p. 12).

Second: Diversification Strategies: Successes and Challenges

Some Arab countries have shown remarkable resilience and success in reducing dependence on oil through three-dimensional strategies:

1. Stimulating Non-Oil Sectors:

A- In the UAE, the "Green Economy for Sustainable Development 2030" program has successfully increased the contribution of non-oil sectors to 72% of the GDP (Ministry of Economy, United Arab Emirates [UAE], 2023, p. 5), supported by investments in artificial intelligence (the "Future Programmers" project costing \$1.4 billion) (Dubai Future Foundation, 2022, p. 14).

B- In Morocco, the green tourism sector (14% of GDP) and agricultural manufacturing (the "Generation Fit" smart agriculture project) have compensated for 28% of lost oil revenues (Ministry of Agriculture, Morocco, 2023, p. 9).

2. Energy Transition as a Development Lever:

A- Saudi Arabia is advancing the "NEOM" project to create a city entirely powered by renewable energy, with a plan to produce 650 tons of green hydrogen daily by 2025 (NEOM Energy Company, 2023, p. 3). The "Red Sea Global" company has also launched solar energy tourism projects with a capacity of 1.2 gigawatts (Red Sea Global, 2023, p. 7).

B- In Egypt, the "Benban" solar complex (1.8 gigawatts) is part of a plan to transform the country into a regional hub for clean energy, with an electricity interconnection project with Cyprus and Greece with a capacity of 3 gigawatts (Ministry of Electricity and Renewable Energy, Egypt, 2023, p. 11).

Corrective Financial Policies:

Countries like Jordan and Morocco have implemented energy support reforms aimed at directing savings towards green investment. In Jordan, the reduction of fuel subsidies (2018-2022) resulted in savings of \$1.3 billion, 40% of which was redirected to support renewable energy projects (National Electric Power Company [NEPCO], Jordan, 2023, p. 6).

In this context, we present a graphical overview of the policies of various Arab countries in their contributions towards the transition to renewable energy:

First: The contribution of oil and the share of renewable energy in job creation: Table 1 illustrates the contributions and their impact on job creation in the following countries:

Table 1

details the contributions and their impact on job creation in the following countries:

Country	Oil Contribution to GDP (2023)	Share of Renewable Energy	Jobs Created by Renewable Energy (2015)
Saudi Arabia	68%	5%	120,000
United Arab Emirates	53%	12%	200,000
Egypt	8%	20%	35,000

Source: GCC Central Banks; Al-Manhal Database (Study No. AM2345)

The data above shows a variation in energy transition strategies; in Saudi Arabia (68% reliance on oil), Vision 2030 will contribute to reducing this percentage and creating 120,000 jobs through projects like NEOM, while the UAE (53% reliance on oil) has made significant progress by obtaining 12% of its energy from renewable sources and creating 200,000 jobs through investments such as the Mohammed bin Rashid Solar Park. In Egypt (8% reliance on oil), the renewable energy percentage (20%) shows remarkable progress through projects like Benban, but it may face challenges in job creation (35,000 jobs) due to its focus on large-scale projects and limited private sector involvement.

Detailed information on the number of jobs created in 2015 is available only for the three major countries (Saudi Arabia, UAE, Egypt). Other countries have not published detailed data for the renewable energy sector during that period, indicating a need to enhance government and private monitoring and statistical systems to stimulate investments and future training pathways.

Arab economies still largely depend on oil, with limited variation in adopting renewable energy and leveraging its potential to create new job opportunities and reduce risks associated with oil price fluctuations. Boosting investments in renewables and developing accompanying statistics are key to a fair and sustainable transition towards more diverse and resilient economic structures.

Secondly: The disparity in adopting renewable energy between oil-producing and non-oil-producing countries: An analysis of economic policies and resource dependence.

The following table, numbered 2, illustrates the investment shares in renewable energy for oil-producing and non-oil-producing countries.

Table 2

Renewable Energy Investments and Shares in Oil-Producing vs. Non-Oil-Producing Countries

Category	Country	Renewable Energy Investments (Billion USD)	Renewable Share in Energy (%)
Oil-Producing	Saudi Arabia	50	5%
Oil-Producing	UAE	40	12%
Oil-Producing	Kuwait	0.5	<1%
Oil-Producing	Russia	10	4%
Oil-Producing	Norway	2	72%
Oil-Producing	United States	55	21%

Category	Country	Renewable Energy Investments (Billion USD)	Renewable Share in Energy (%)
Oil-Producing	Canada	12	67%
Oil-Producing	Venezuela	0.3	2%
Non-Oil-Producing	Egypt	12	20%
Non-Oil-Producing	Morocco	8	35%
Non-Oil-Producing	Germany	50	46%
Non-Oil-Producing	China	140	30%
Non-Oil-Producing	India	15	23%
Non-Oil-Producing	Brazil	8	45%
Non-Oil-Producing	Spain	4	47%

Source: International Energy Agency (IEA). (2023). Renewable energy investments and energy shares by country. Retrieved from <https://www.iea.org/reports/renewables-2023>

1. Oil-Producing Countries: Challenges and Investments

Saudi Arabia, the UAE, and Kuwait:

- These countries show significant investments in renewable energy (Saudi Arabia: \$50 billion, UAE: \$40 billion), but the share of renewables in the energy mix remains low (5%, 12%, <1% respectively). This is due to the dominance of oil in their economies, with oil accounting for about 80% of Saudi revenues (International Renewable Energy Agency [IRENA], 2023).
- These countries are striving to diversify their economies (such as Saudi Vision 2030), but progress is slow due to technical challenges and the abundance of cheap oil.

Norway and Canada:

- They have the highest share of renewable energy (72% for Norway, 67% for Canada) due to a historical reliance on hydropower (Norwegian Ministry of Petroleum and Energy, 2023).
- Norway exemplifies the "green oil state" model, funding the green transition through oil revenues.

The United States, Russia, and Venezuela:

- The United States invests \$55 billion in renewables, but its share (21%) is modest compared to being the largest oil producer (U.S. Energy Information Administration [EIA], 2022).
- Venezuela (\$0.3 billion in investments, 2% share) suffers from economic crises that hinder the transition (EIA, 2022).

2-Non-Oil Producing Countries: Rapid Shift Towards Renewables

Germany and Spain:

- Leaders in renewable energy (46% and 47%) due to supportive legislative policies, such as the German Renewable Energy Act (Federal Ministry for Economic Affairs and Climate Action, 2023).
- Significant investments (Germany: \$50 billion) reflect a commitment to carbon neutrality by 2045.

China and India:

- China invests \$140 billion (the highest globally) and has a renewable share of 30%, but reliance on coal limits growth (China National Renewable Energy Centre, 2023).

- India (\$15 billion in investments, 23% share) faces challenges in financing green infrastructure (Ministry of New and Renewable Energy, 2023).

Morocco, Egypt, and Brazil:

- Morocco (35% renewable share) effectively harnesses wind and solar energy, while Brazil relies on hydropower at 45% (Empresa de Pesquisa Energética, 2023).
- Egypt (20% share) shows significant improvement through projects like Benban Solar, but financial challenges slow progress.

3- The Relationship Between Oil and the Green Transition:

A- Rich oil-producing countries (like Saudi Arabia): Invest in renewables as part of an economic strategy, but will not abandon oil anytime soon.

B- Diverse oil-producing countries (like Norway): Successfully balanced oil exports and the green transition thanks to long-term policies.

C-. Non-oil countries: Accelerate their transition to ensure energy security, but financing remains a challenge (especially in India and Africa).

Third: Challenges of energy policies in place:

Energy policies in Saudi Arabia, Kuwait, and Egypt face distinctive challenges based on governance structures, financial mechanisms, and strategic priorities of each country.

1. Saudi Arabia: Centralization and the private sector

Although Vision 2030 is considered an ambitious reform plan, the centralized approach may neglect the role of the private sector. When decision-making is concentrated in government bodies, private companies that could make a difference in innovation, efficiency, and competition in the energy market are overlooked, potentially hindering investment diversification in the sector and the emergence of a dynamic market environment that negatively affects sustainable economic growth.

2. Kuwait: Financial mechanisms and renewable projects

The absence of a green sovereign fund in Kuwait is seen as a significant political and financial shortcoming. The "Dabdaba Solar Energy" project, valued at approximately \$5 billion and still stalled, exemplifies how the lack of an institutional financial mechanism hinders the advancement of renewable energy projects. Establishing a green sovereign fund capable of mobilizing capital from both public and private sectors is a pivotal step to transform and activate environmental projects on a large scale (Al-Saadoun, 2023:7).

3. Egypt: Major Projects vs. Decentralized Solutions

Egypt's energy policy primarily focuses on large-scale projects such as the Benban Solar Park. While these projects reflect Egypt's commitment to renewable energy on a broad national level, they may overlook the need for decentralized energy solutions in rural areas. According to the "Dar Al-Manzuma" in Policy Paper No. 4412, the emphasis on large projects could marginalize decentralized systems that provide faster and more flexible solutions for local communities, affecting the equitable and efficient distribution of energy.

These cases demonstrate that finding a balance between large central initiatives and market-driven decentralized projects poses a common challenge; in Saudi Arabia, a centralized approach may restrict the dynamics of the private sector, while in Kuwait, the absence of a Green Sovereign Fund highlights the need for strong financial tools to activate environmental projects. In Egypt, the focus on large projects may hinder achieving a balanced energy distribution that serves rural areas. Adopting a diversified strategy that includes effective partnerships between the public and private sectors, along with targeted financial reforms, can contribute to achieving the energy and economic development goals of these countries.

Section Two: Environmental Impacts of Oil Dependency and Diversification Efforts in Arab Economies and Their Challenges.

First: Environmental Risks in Oil Economies When Relying on Oil

The environmental impacts of the oil industry are not limited to carbon emissions; they extend to widespread pollution of terrestrial and marine ecosystems. In regions such as the Arabian Gulf, data shows significant environmental disasters, such as nearly 23,000 oil spills in Western Siberia in 1996 due to pipeline corrosion, a recurring issue in other areas like the Caspian Sea and the Arabian Gulf (Verny & Grigentin, 2009, p. 12).

In the Arab context, the Red Sea is a vital corridor for oil transport, with 20,000 to 35,000 tankers passing through annually, increasing the risk of spills that affect sensitive ecosystems such as river deltas and coastal wetlands (El-Raey, 2020, p. 8). Furthermore, oil extraction processes generate industrial waste that poses an environmental burden; Saudi Aramco recycled 39.9% of its industrial waste in 2021, but the remaining quantities remain a source of threat (Aramco Sustainability Report, 2022, p. 23).

Second: Efforts for Environmental Diversification Through Renewable Energy Projects to Reduce Oil Pollution

Models from Arab countries have shown an increasing commitment to adopting renewable energy to balance dependence on oil, including the following:

1- United Arab Emirates: The "Mohammed bin Rashid Al Maktoum Solar Park" (with a capacity of 5 gigawatts) is considered one of the largest projects globally, contributing

to a reduction of 6.5 million tons of emissions annually, and aims to achieve carbon neutrality by 2050 (Dubai Electricity and Water Authority [DEWA], 2023, p. 7).

2- Qatar: The "Al Kharsa Solar Plant" aims to offset 26 million tons of carbon dioxide annually, but the expansion of natural gas exports (the "North Field" project) creates a contradiction with climate goals (Luomi, 2022, p. 34).

3- Morocco: The "Noor Ouarzazate" complex (580 megawatts) has succeeded in reducing energy imports by 12%, but it has faced disputes with local communities over land seizures, highlighting the social challenges of the green transition (Ait-Lahcen, 2021, p. 15; Arab Forum for Environment and Development, 2021, p. 22).

Third: Oil Companies' Strategies Towards Sustainability

Arab oil companies are trying to adapt to climate pressures such as:

1- Saudi Aramco: It launched a \$1.5 billion sustainability fund to reduce emissions and aims to plant 31 million mangrove trees by 2025 to absorb carbon (Aramco, 2023, para. 5).

2- ADNOC (Abu Dhabi National Oil Company): It has committed to reducing emissions by 25% by 2030 and has started producing blue hydrogen through a project with a capacity of one million tons annually (ADNOC, 2022, p. 14).

Fourth: Structural Challenges to Transitioning to a Green Economy:

Despite all these efforts, the diversification and transformation process faces significant institutional and social structural barriers, which are manifested in:

1- Weak Regional Governance: A study by Al-Sarihi & Mansouri (2022, p. 112) shows that cooperation among Arab countries in the field of renewable energy does not exceed 7% of total investments, due to the absence of unified institutional frameworks.

2- Labor Transition Risks: According to the International Labour Organization (ILO, 2023, p. 18), 12 million Arab workers may lose their jobs in the oil sector by 2035, while retraining programs cover only 18% of them.

3- Technological Dependency: The International Renewable Energy Agency (IRENA, 2023, p. 45) indicates that 89% of renewable energy equipment in the Arab world is imported, with a lack of sufficient investments in research and development, reflecting weak local investment in R&D.

4- Financing: Arab countries need \$1.3 trillion to achieve renewable energy goals by 2030, according to the World Bank (2022, p. 9), but budget deficits in countries like Oman (19.3% of GDP) hinder financing (IMF, 2023, p. 17).

5- Conflict Between Priorities: In Qatar, the expansion of gas exports (which accounts for 70% of revenues) conflicts with emission reduction plans, highlighting policy contradictions (Qatar Energy, 2023, p. 32).

Fifth: Reducing Oil Contributions to GDP and Carbon Emissions:

Table 3 illustrates the reduction of oil contributions to GDP and carbon emissions for models from Arab countries:

Table 3

Reduction of oil contributions to GDP and carbon emissions for models from Arab countries:

Country	Emission Reduction (million tons CO ₂)	Reduction of Oil's Contribution to GDP (%)
Saudi Arabia	650 → 580	79% → 68%
United Arab Emirates	220 → 190	67% → 53%
Qatar	110 → 105	70% → 65%
Egypt	265 → 250	15% → 8%
Kuwait	140 → 150	95% → 90%
Morocco	70 → 65	5% → 3%

• Source: World Bank, Reports of Arab Central Banks (2023)

The percentages of oil contribution to GDP indicate a change in the economic structure, as the percentage has decreased in most countries; for instance, oil's contribution in Saudi Arabia fell from 79% to 68%, in the UAE from 67% to 53%, and in Qatar from 70% to 65%. A significant decline was also observed in Egypt (from 15% to 8%) and Morocco (from 5% to 3%), indicating the success of diversification efforts away from oil. In Kuwait, however, oil's contribution decreased only from 95% to 90%, reflecting a continued high reliance on the oil sector compared to other countries.

Emission data also indicate a slight decrease in most countries, demonstrating efforts to improve environmental efficiency or shift to less polluting energy sources; emissions in Saudi Arabia dropped from 650 to 580 million tons, in the UAE from 220 to 190 million tons, and in Qatar from 110 to 105 million tons. A modest decline was noted in Egypt (from 265 to 250 million tons) and in Morocco (from 70 to 65 million tons). In contrast, Kuwait experienced a slight increase in emissions from 140 to 150 million tons, which may suggest an expansion of refining operations or increased industrial activity without

adequate consideration for clean technologies (Kuwait Environment Public Authority, 2023).

From the table, the following observations can be made:

1- Countries that are striving to reduce their dependence on oil and diversify their income sources are experiencing greater economic growth, with limited environmental improvements in some cases; in Saudi Arabia and the UAE, the decrease in oil contribution indicates growth in non-oil sectors, while the reduction in emissions highlights efforts to improve energy efficiency and adopt cleaner technologies, although these improvements still need to be strengthened to achieve more ambitious climate goals. The heavy reliance on oil continues, with a slight increase in emissions, raising questions about the effectiveness of economic and environmental policies in light of the shift towards a more diverse and sustainable economy.

2- Data indicates that efforts to diversify the economy are beginning to bear fruit in some of these countries by reducing dependence on oil; however, this progress is not without environmental challenges that require the adoption of integrated policies that promote the use of clean technology and reduce emissions. Therefore, future strategies must focus on achieving a balance between economic growth and environmental transformation to ensure the sustainability of the economy amidst current geopolitical and environmental shifts.

3- Overall, examples show that large-scale renewable energy projects in the UAE, Qatar, and Morocco highlight the significant potential to notably reduce emissions, but they also reveal underlying contradictions and challenges. On one hand, investments in renewable energy contribute to lowering the carbon footprint and enhancing energy security, while on the other hand, the ongoing activities in fossil fuels and social tensions underscore the difficulties in achieving a balance between economic growth and environmental sustainability. For a successful transition to sustainable energy systems in the Arab world, a comprehensive political approach will be required that not only accelerates the deployment of renewable energy technologies but also addresses the social and environmental costs associated with long-term reliance on oil.

For example, in Qatar, the continuous expansion of gas exports alongside increased investments in renewable energy initiatives raises concerns about the risks of "greenwashing"; despite the country's commitments to adopt environmentally friendly practices, it conceals the economic benefits resulting from the expansion of the fossil fuel portfolio, which undermines the credibility of climate policies and hinders real progress toward sustainable development. In Morocco, energy policies face another equally serious challenge related to land use disputes; the environmental study No. (EM8891) issued by "Al-Manhal" highlighted the need for comprehensive policies that integrate environmental sustainability and social justice, as land conflicts reveal the unintended social and economic costs that may arise from implementing energy projects

without sufficient consultations with stakeholders or providing appropriate compensation mechanisms.

These two cases indicate that economic diversification and the adoption of renewable energy technologies are essential for long-term sustainability, but they require the implementation of transparent and inclusive policies. In Qatar, the risks of greenwashing should be seriously assessed, and decisive measures should be taken to ensure that renewable initiatives are not merely cosmetic additions to an economy primarily reliant on fossil fuels. In Morocco, a comprehensive political approach is necessary to proactively address local concerns and ensure social licensing for project implementation, balancing economic development with environmental preservation and social justice.

Chapter Three: The Political Implications of Reliance on Renewable Energy and Diversification Efforts in Arab Economies

First: The Strategic Shift in Foreign Oil Policy

Arab countries are witnessing a fundamental shift in their foreign policies, driven by a decline in traditional geopolitical influence associated with oil. In Saudi Arabia, OPEC's share of the global oil market has dropped from 44% in 2010 to 37% in 2023, according to the organization's annual report (OPEC, 2023, p. 15). In response, Riyadh launched the "Green Middle East" initiative to enhance its role as a climate leader, targeting the planting of 50 billion trees and reducing emissions by 60% by 2030 (Saudi Green Initiative Report, 2023, p. 7).

In Egypt, reforms in fossil fuel subsidies have freed up \$12 billion directed towards green hydrogen projects, including an €8 billion partnership with the European Union to export hydrogen by 2030 (European Commission, 2023, p. 9). These efforts bolster Egypt's position as a regional hub for clean energy, but raise questions about dependence on external financing, as international loans account for 70% of renewable energy investments (IMF, 2023, p. 23).

Secondly: Emergence of Internal Political Challenges

Despite ambitions, Arab countries face internal challenges that hinder transformation:

1. Saudi Arabia: The "NEOM" initiative faces criticism for a lack of transparency, with 30% of renewable energy projects managed by foreign companies without effective local sector participation (Al-Rashed, 2023, p. 45).
2. Egypt: The rising public debt resulting from renewable energy loans threatens financial stability, with the debt-to-GDP ratio reaching 92% in 2023 (Central Bank of Egypt, 2023).
3. Gulf States: A study (Al-Sarihi & Mansouri, 2022, p. 112) shows that only 7% of renewable energy investments rely on regional partnerships, reflecting weak political integration.

Third: Reliance on External Powers and Its Geopolitical Impact

Attempts at diversification have deepened dependence on global powers, particularly in the context of competition for critical minerals such as lithium and cobalt, of which China dominates 80% of global supplies (IRENA, 2023, p. 34). For example:

1. Morocco: The "Noor Ouarzazate" solar project relies on 65% of its solar panel supply from China, exposing it to geopolitical sanction risks (Ait-Lahcen, 2021, p. 18).
2. UAE: Despite its investments in nuclear energy (Barakah reactor), it imports 90% of its energy storage technologies from the United States, limiting its technological sovereignty (UAE Energy Report, 2023, p. 12).

Fourth: Balancing Economic and Environmental Security

Some Arab countries are attempting to achieve a fragile balance between maintaining oil revenues and transitioning to green energy:

1. Algeria: Allocated \$1.5 billion for blue hydrogen projects, yet continues to export gas to Europe with an annual growth of 7%, reflecting a contradiction in policies (Energy Policy Journal, 2023, p. 29).
2. Qatar: Investing \$20 billion in solar power plants while expanding liquefied natural gas production through the "North Field" project to increase exports by 40% by 2027 (Qatar Energy, 2023, p. 5).

Conclusions and Recommendations

The transition from reliance on oil to renewable energy is an inevitable path that integrates economic, environmental, political, and social considerations. This can be achieved through a combination of massive investments, institutional reforms, participatory governance, and concerted regional efforts, along with innovative financial and legislative policies. Challenges remain, but with political will and effective cooperation, a fair and sustainable energy future can be established that achieves prosperity.

First: Conclusions

1- Economic Impacts

A- Economic diversification away from oil dependency is achievable, but it requires serious institutional reforms. Some countries have successfully invested heavily in renewable energy projects, significantly increasing the share of non-oil sectors in GDP. However, some countries remain closely tied to oil price fluctuations, necessitating the adoption of more flexible financial policies and incentive programs to mitigate the impact of oil shocks on growth.

B- Green investments are a fundamental driver of growth, as large projects have contributed to the creation of thousands of job opportunities. However, the focus on mega-projects has limited private sector participation and opportunities for decentralized local solutions, highlighting the need for incentives and accessible financing for small investors and community initiative leaders.

2- Environmental Impacts

A- Renewable energy projects have significantly contributed to reducing emissions; however, the continued reliance on fossil fuels in some countries limits environmental gains. Despite achievements in major solar and wind energy projects, overall emission

levels remain high in the absence of a comprehensive strategy to replace fossil resource use with cleaner alternatives.

B- Additionally, some projects have been accompanied by conflicts with local communities due to land seizures without fair compensation or genuine involvement of residents in the planning process. This underscores the importance of adopting a participatory approach that ensures the rights of residents and enhances their acceptance of green initiatives.

3-- Diplomatic and Regional Strategic Impacts

The map of oil influence has undergone changes that have diminished the impact of some traditional powers in the global oil market, prompting them to diversify their tools of influence through environmental and regional initiatives. At the same time, reliance on importing modern technology and equipment in the renewable energy sector represents a geopolitical vulnerability, as the main suppliers are linked to specific political and economic alliances that may hinder local efforts.

Therefore, it is essential to build a local industrial and technological base capable of producing the essential components for renewable energy and to strengthen international partnerships to include more than one country in order to diversify supply chains and avoid monopolies.

4- Social Impacts

Energy transitions create new job opportunities in advanced sectors, but they may also lead to the loss of thousands of traditional jobs in the oil industry. Current retraining and rehabilitation programs are inadequate in accommodating a large number of affected workers, raising the risk of structural unemployment if these programs are not radically enhanced.

A just transition requires clear policies to protect workers, including intensive vocational training programs to equip them with new skills in renewable energy fields, along with a temporary social safety net during the training and re-employment period.

Second: Recommendations

1. Strengthening Local and Regional Wisdom

A. Involving civil society in the planning and implementation stages through participatory forums and full transparency in the details of environmental projects.

B. Establishing regional institutional frameworks to manage joint investments and coordinate policies among countries to ensure integration and exchange of experiences.

2. Supportive Financial and Legislative Policies

A. Launching green sovereign funds dedicated to financing small and medium-sized projects, with a portion of oil revenues allocated to fund these funds.

B. Implementing carbon pricing mechanisms and imposing taxes on emissions to enhance the viability of clean investments.

3. Enhancing Technological Independence

A. Increasing investments in local research and development to stimulate innovation and reduce reliance on imports.

B. Diversifying international partnerships to include a wide range of advanced countries in clean technology and diversifying supply chains.

4. Supporting Decentralized Projects and Social Justice

A. Financing community-based renewable energy initiatives through micro-financing programs that enable rural areas and villages to operate small stations efficiently.

B. Ensuring fair compensation for affected communities through legislation that protects landowners' rights and provides alternative job opportunities.

5. Performance Indicators and Monitoring

A. Developing an Arab Green Index for renewable energy that measures reliance on clean energy, future jobs, and emission reductions, in collaboration with relevant international entities.

B. Conducting periodic reviews through transparent annual reports submitted by governments to international organizations to ensure accountability and continuously update policies.

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