

The role of renewable energies to achieve energy security in Arab countries**HAOUARI Abdelkader ^{1♦}, HAOUARI Ameer ²**¹ University of setif, Algeria, Abdelkader.haouri@univ-setif.dz² University of Djelfa, Algeria, Ameer.haouari@univ-djelfa.dz**Received:** 15/03/2025**Accepted:** 20/05/2025**Published:** 25/05/2025**Abstract:**

Many Arab countries have large reserves of fossil energies, such as oil and gas, which makes them depend on these reserves to ensure their energy security, and provides them with financial revenues that help them finance their budgets as a result of exporting the surplus over their consumption needs, but the harm of these energies to the environment, and their near exhaustion due to exploitation. On the one hand, and on the other hand, the Arab countries have a large reserve of renewable energy sources, especially solar energy, due to their location in the Sun Belt region, which makes thinking about making these renewable energies an alternative to fossil energies a necessary matter, whether to achieve energy security or to obtain financial returns as a result of their export.

Keywords: Renewable energies, solar energy, sun belt, fossil energies, energy security**JEL Classification:** Q49 ,Q43

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1. INTRODUCTION

Since the Industrial Revolution, global energy demand has increased significantly. Initially, coal was the primary energy source, but over time, petroleum emerged as a cleaner and more efficient alternative, becoming the most sought-after energy commodity in international markets. Alongside this, natural gas exploitation expanded considerably, particularly in electricity generation, establishing it as a key energy source.

The Arab countries, endowed with vast reserves of oil and natural gas, have become major players in the global energy market. This has led many Arab nations, especially those rich in natural gas, to develop power generation facilities that have contributed to their energy security. Given the large reserves, these countries have also exported significant quantities to secure financial resources supporting their national budgets.

In recent years, international organizations have called for reducing greenhouse gas emissions resulting from fossil fuel use. Documented studies have further highlighted the depletion risks of fossil fuels, making the search for alternative energy sources both necessary and urgent. Consequently, many countries have turned to renewable energy technologies.

As one of the regions heavily reliant on fossil fuels for both energy security and financial revenues, Arab countries must also seriously consider renewable energy options, particularly given their abundant potential for renewable energy exploitation.

1.1 Study Problem and Research Questions

Given the challenges posed by fossil fuels—including environmental degradation, resource depletion, and sustainable development requirements—as well as the global shift toward renewable energies, this study seeks to address the following main research question: Can renewable energies achieve energy security in Arab countries?

This main question is complemented by several sub-questions:

What are renewable energies?

What is energy security, and how can it be achieved?

Can renewable energies replace fossil fuels in Arab countries to achieve energy security and generate financial revenues?

1.2 Study Hypotheses

To investigate the research problem and sub-questions, the following null hypothesis is proposed:

Renewable energies can achieve energy security in Arab countries.

1.3 Study Objectives

To define renewable and fossil energies.

To clarify the concept of energy security and ways to achieve it.

To assess the current status of renewable energy exploitation in Arab countries.

To evaluate the potential of renewable energies to achieve energy security in the Arab region.

1.4 Study Methodology

This study employs a descriptive and analytical approach to explore the theoretical dimensions of the study variables. For the case study on Arab countries, relevant data were analyzed and presented using appropriate statistical methods.

2. Fossil energies and Renewable energies

2.1. Fossil energies

Fossil energies, comprising coal, oil, and natural gas, have long been the cornerstone of global energy production. These non-renewable resources are derived from the remains of ancient plants and organisms, dating back millions of years. Despite their historical significance in powering industrialization and economic growth, the combustion of fossil

fuels releases carbon dioxide and other greenhouse gases, contributing to climate change and environmental degradation. The transition towards sustainable and renewable energy sources has gained momentum as societies recognize the urgent need to reduce carbon emissions. As a result, governments, businesses, and individuals are increasingly investing in cleaner alternatives such as wind, solar, and hydropower to mitigate the environmental impact associated with fossil fuel consumption.

2.1.1. petroleum

Petroleum, commonly known as crude oil, stands as a critical component in the global energy landscape, serving as the primary raw material for the production of various fuels and petrochemical products. Formed over geological epochs from the decayed remains of marine organisms, petroleum has played a pivotal role in powering transportation, industries, and households. Its refining process yields a spectrum of products, including gasoline, diesel, jet fuel, and lubricant (Marius and Vassiliou, 2011). However, the extraction, refining, and combustion of petroleum contribute significantly to environmental challenges, such as air pollution and climate change, due to the release of greenhouse gases. In response to these concerns, efforts are underway to explore cleaner and more sustainable alternatives, emphasizing a transition towards renewable energy sources and advancements in technology to reduce the environmental impact associated with petroleum use (U.S. Energy Information Administration, 2021).

2.1.2. Natural gas

Natural gas, composed mainly of methane, has emerged as a pivotal energy source in the global energy mix. Extracted from underground reservoirs, natural gas is a versatile fuel used for electricity generation, heating, and as a feedstock in various industrial processes. It is considered a cleaner-burning fossil fuel compared to coal and oil, emitting lower levels of greenhouse gases and pollutants during combustion. The increasing availability of natural gas, often accessed through advanced extraction techniques like hydraulic fracturing, has transformed energy markets and influenced geopolitical dynamics. While natural gas is seen as a transitional fuel in the journey towards a low-carbon future, concerns persist regarding methane leakage during production and transportation, as methane is a potent greenhouse gas. As societies navigate the energy transition, a balanced approach involving increased efficiency, renewable energy integration, and stringent environmental safeguards is crucial for the responsible utilization of natural gas (Raf Chomsky, 2023).

2.1.3. Coal

Coal, a sedimentary rock formed from the remains of plants that lived and died millions of years ago, has historically been a primary source of energy worldwide. Mined extensively for electricity generation and industrial processes, coal's high carbon content releases substantial amounts of carbon dioxide and other pollutants when burned, contributing significantly to air pollution and climate change. Despite advancements in cleaner technologies, including carbon capture and storage, coal remains a major environmental concern due to its environmental impact. The mining process itself can lead to habitat destruction, water pollution, and health issues for nearby communities. As global efforts intensify to reduce reliance on high-emission fossil fuels, including coal, a transition towards cleaner energy sources is imperative for a sustainable and low-carbon future (National Geographic Education, 2023).

2.2. Renewable energies

Renewable energies, encompassing solar, wind, hydro, and geothermal power, play a crucial role in the worldwide shift towards sustainable and eco-friendly energy sources. These sources leverage natural processes to generate electricity with minimal environmental impact,

contributing significantly to endeavors aimed at addressing climate change. Photovoltaic cells capture sunlight for solar power, wind energy taps into the kinetic energy of the wind, hydropower harnesses the energy of flowing water, and geothermal power exploits the Earth's internal heat. The growth of renewable energy is driven by technological advancements, decreasing costs, and a heightened awareness of the imperative to reduce dependence on fossil fuels. The transition to renewables aligns with global objectives for a low-carbon future and bolsters energy security. With nations and industries prioritizing cleaner energy solutions, the renewable energy sector continues its expansion, molding a more sustainable energy landscape (Rajini K R Karduri, 2018).

2.2.1. solar energy

Solar energy, a key player in the renewable energy landscape, harnesses the abundant power of sunlight to generate electricity through photovoltaic (PV) technology. This sustainable energy source involves the conversion of sunlight into electrical power using solar cells, typically composed of semiconductor materials. The photovoltaic process releases no greenhouse gases, making solar power an environmentally friendly alternative to traditional fossil fuels. Advancements in solar technology, coupled with decreasing costs of PV installations, have spurred widespread adoption of solar energy systems across residential, commercial, and industrial sectors. Solar power contributes not only to reducing carbon footprints but also to enhancing energy independence and resilience. As innovations in solar energy continue to evolve, including breakthroughs in energy storage and efficiency, the solar sector remains a vital component in the global transition towards cleaner and more sustainable energy solutions (Vinicius Cardoso, 2023).

2.2.2. Wind Energy

Wind energy, a crucial component in the realm of renewable resources, captures the kinetic energy of the wind to generate electricity through the use of wind turbines. This sustainable energy source involves converting the motion of the wind into electrical power as turbine blades rotate and connect to a generator. Distinguished by its lack of direct emissions or pollutants during operation, wind power stands out as a clean and environmentally friendly alternative to traditional energy sources. The expansion of wind energy on a global scale is driven by technological advancements, economies of scale, and a growing public consciousness. Wind farms, both onshore and offshore, have become prominent symbols in the pursuit of sustainable power generation. As the wind energy sector matures, ongoing innovations in turbine design and grid integration contribute significantly to its role as a major player in the transition toward greener and more sustainable energy solutions (Energy efficiency and renewable energy, 2023).

2.2.3. Hydropower

Hydropower, a significant player in the domain of renewable energy, captures the energy from flowing water to generate electricity through turbines. This sustainable energy source involves converting the kinetic energy derived from rivers or waterfalls into electrical power as the water propels turbine blades connected to a generator. Hydropower is recognized for its effectiveness, dependability, and minimal greenhouse gas emissions during its operational phase. The technology encompasses various forms, including traditional hydroelectric dams, run-of-river projects, and tidal or wave energy systems. As a clean and dependable energy choice, hydropower makes a substantial contribution to global electricity production. Ongoing progress in hydropower technology, environmental impact management, and the integration of inventive storage solutions further cement its role as a crucial element in the transition towards cleaner and more sustainable energy alternatives (National geographic education.op cit).

2.2.4. Other renewable energies

Geothermal energy, a significant participant in the field of renewable resources, harnesses the Earth's internal heat for electricity generation or direct heating. This sustainable energy source involves tapping into the heat stored beneath the Earth's surface, typically in volcanic regions or areas with elevated subterranean temperatures. Geothermal power plants leverage steam or hot water from underground reservoirs to rotate turbines linked to generators, converting thermal energy into electricity. Recognized for its dependability and minimal environmental impact, geothermal energy provides a continuous and stable power source. Biomass energy, derived from organic materials like plants and waste, also adds to the mix of renewable energy sources. Biomass finds application in electricity generation, heating, and biofuel production. By utilizing organic matter, biomass energy contributes to reducing dependence on fossil fuels and effective waste management. These varied renewable energy sources, encompassing geothermal and biomass, collectively play a role in the global shift towards cleaner and more sustainable energy solutions, fostering a greener and environmentally friendly future.

3. Energy security in Arab countries

There are a number of important aspects that may affect energy security in Arab countries, the most important of which are

3.1. The reality of energy security in Arab countries

The Arab countries depend heavily on fossil energies, especially oil and gas, so they are considered among the most important producing and exporting countries,

Arab countries have an important position in the global oil and gas markets now and in the future, as they possess 54.3% of the world's proven reserves of crude oil, 29.3% of global oil production, and a 30.2% share of total global oil exports.

It is also expected that the contribution of Arab countries to global oil supplies will increase to 38.1% in 2050, as Arab countries own a 26.3% share of proven global reserves of natural gas, a 15.5% share of its production, and a 15.7% share of the total global exported quantities of natural gas. It is also expected that the contribution of Arab countries to global gas supplies will increase to reach 19.8% in 2050(OAPEC,2021).

3.1.1. Oil in Arab countries

Oil is considered one of the most important sources of energy in the Arab countries, as a group of Arab countries make it an essential resource for financing their budgets. A group of Arab countries possess huge oil reserves. Arab oil is distinguished from other countries of the world by several advantages, the most important of which are(Kaabi,2017):

- The thickness of the oil-bearing layers. It is known geologically that the more these layers increase, the greater the amount of reserves. Therefore, the Arab world controls about 56.7% of the world's total oil reserves.

- The small number of dry wells, when compared to what exists in some regions of the world, does not exceed 5% in the Arab world, while it reaches 15% in the United States of America.

- The majority of the Arab oil fields are characterized by an excellent geographical location, as these fields are located at the meeting point of the three continents (Asia, Europe, and Africa). This has helped distribute Arab oil with relatively low transportation costs when compared to the Americas, for example.

- Most of the Arab oil fields are located close to the sea coasts, which facilitates cheap sea transportation

- Arab oil has another advantage that makes it preferred by importing countries, which is that it is of good quality and has an excellent specific density that is suitable for various industrial purposes.

- The average depths of oil wells are less than in most countries of the world, as they average between 7,000 and 14,000 feet, while in most wells in America they reach 15,000 and 30,000 feet, and this of course reduces drilling expenses.

- Arab fields are characterized by the advantage of self-pumping, as about 90% of them produce oil by pumping, that is, compared to 90% of American wells from which oil is produced by injecting water or gas, and this of course increases production expenses.

- The average labor wages in the Arab oil industry are low if measured by the average wages prevailing in other oil countries, especially in the Western world, where wages are about six times what they are in the Arab countries.

The Arab countries have huge oil reserves, which makes them one of the most important players in their international markets, as we can see from table N° 1, which shows the reserves of the member countries of the Organization of Arab Petroleum Exporting Countries OAPEC.

Table N° 01: Proven crude oil reserve in OAPEC members 2017-2021
(Billion barrels-at end of the year)

	2017	2018	2019	2020	2021
Algeria	12.2	12.2	12.2	12.2	12.2
Bahrain	0.1	0.1	0.1	0.1	0.1
Egypt	3.3	3.2	3.1	3.1	3.0
Iraq	147.2	148.4	148.4	148.4	144.0
Kuwait	101.5	101.5	101.5	101.5	101.5
Libya	48.4	48.4	48.4	48.4	48.4
Qatar	25.2	25.2	25.2	25.2	25.2
S.Arabia	266.3	267.0	258.6	267.1	267.2
Syria	2.5	2.5	2.5	2.5	2.5
Tunisia	0.4	0.4	0.4	0.4	0.4
UAE	97.8	97.8	97.8	107.0	111.0
OAPEC	704.9	706.7	698.3	715.9	715.5
Rest of the world	564.1	569.3	573.7	601.1	588.5
Total World	1269.0	1276.0	1272.0	1317.0	1304.0

* Excluding unconventional oil.

Source: OAPEC, annual statistical report, 2022, p14.

From the table we note that the Kingdom of Saudi Arabia is in first place in terms of oil reserves with about 266 billion barrels, followed by Iraq and then the United Arab Emirates. We also note that OPEC's oil reserves are larger than the reserves of the rest of the world.

3.1.2. Natural gas in Arab countries

The proven natural gas reserves in the Arab countries are estimated at about one-third of the world's natural gas reserves, which are estimated at about 196.7 trillion cubic meters, as the Arab reserves represent about 30% of the world, and are estimated at 54.93 trillion cubic meters and are distributed in varying proportions among the Arab countries.

We note in the table N°02 the proven gas reserves of the Arab countries that are members of OAPEC, which also shows the reserves of the rest of the world's countries.

Table N° 02: Proven natural gas reserve in OAPEC members 2017-2021
(Billion Quebec meters-at end of the year)

	2017	2018	2019	2020	2021
Algeria	4505	4505	4504	4504	4504
Bahrain	210	193	81	68	68
Egypt	2221	2221	2209	2209	2209
Iraq	3744	3820	3820	3820	3714
Kuwait	1784	1784	1784	1784	1784
Libya	1505	1505	1505	1505	1505
Qatar	23861	23846	23831	23831	23831
S.Arabia	8720	9074	9423	9234	9319
Syria	269	269	269	269	269
Tunisia*	64	64	64	64	64
UAE	6091	6091	6091	7730	8200
OAPEC	52973	53371	53580	55018	55466
Rest of the world	144223	148280	151442	152179	151161
Total World	197196	201651	205022	207197	206627

* Year 2021 estimated.

Source: OAPEC, op cit, 2022, p17.

From the table we notice the stability of the reserves and their slight change. We also note that the State of Qatar is in first place with reserves estimated at about 23831 cubic meter, followed by Saudi Arabia, the United Arab Emirates and Algeria in order, while we find that the Arab countries represent a quarter of the global reserves of natural gas.

3.1.3. Renewable energies in Arab countries

Algeria has what it can to become a leader in solar energy in the world. Solar energy represents ten times the annual reserves of a gas field the size of Hassi R'Mel, estimated at about 4,000 billion cubic metres, with the reserve equivalent to 40,000 billion cubic metres. These capabilities enable Algeria to generate 170 terawatts of electricity annually. Morocco has one of the highest radiation rates in the world, as most of the country is exposed to more than 3,000 hours per year, and it may reach 3,600 hours in the desert. As for Egypt, it is exposed to more than 4,000 hours of sunlight annually. Jordan is located within the high solar energy belt, and its radiation rate is 5 To 7 kilowatt hours per square meter, and the Kingdom of Saudi Arabia and the rest of the Gulf countries have the capabilities and capabilities that qualify them to achieve huge achievements in this field.

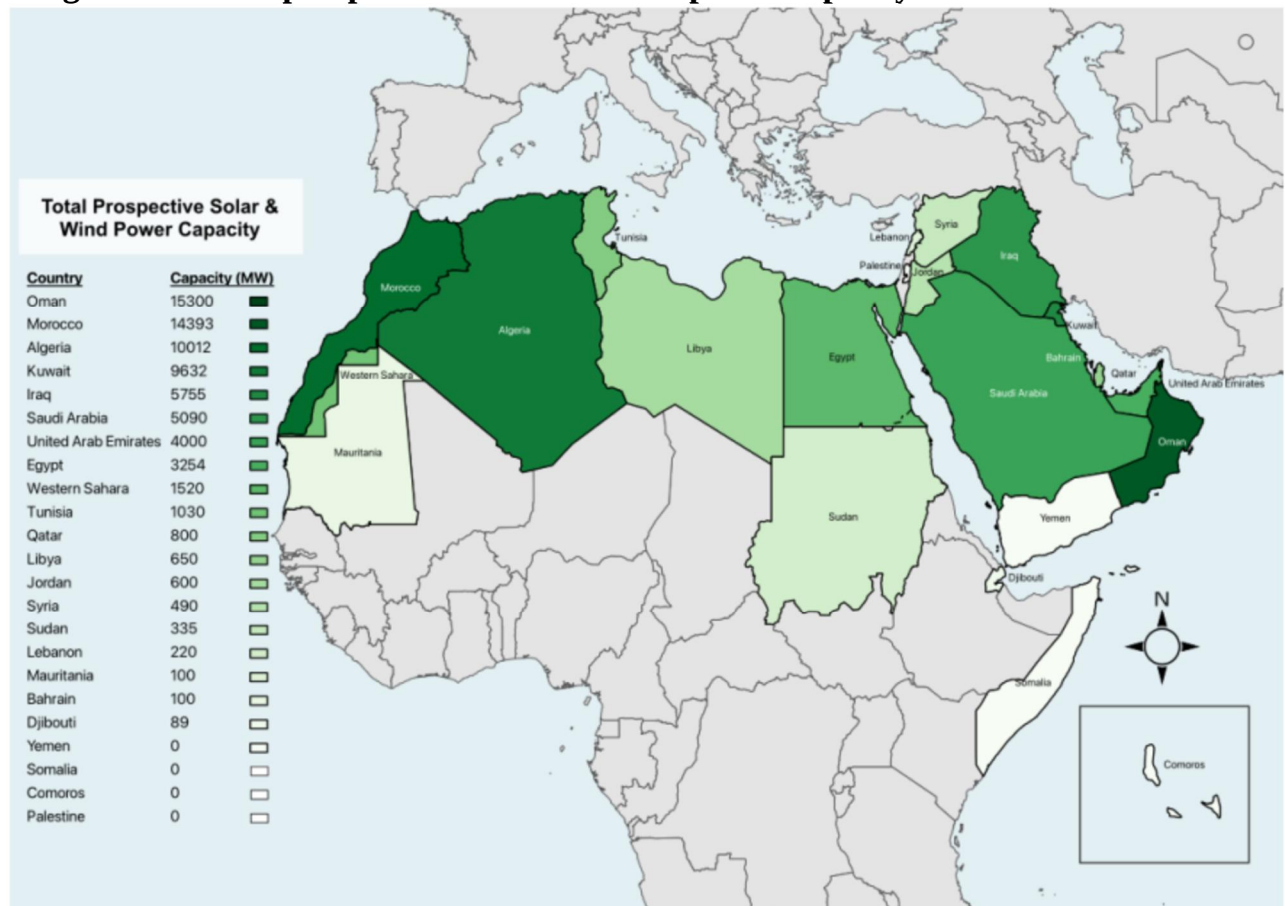
A World Bank report issued in 2009 on investment in solar energy stated that the regions of North Africa and the Middle East are two promising regions for investment in the field of solar energy, because they enjoy a high rate of brightness throughout the year, especially in the solar belt in which Egypt, the United Arab Emirates and the Kingdom are located. Saudi Arabia, where the radiation rate reaches 8.60 kWh per square meter. This belt ranks second in the world after the Atacama Desert in Chile in terms of the percentage of sunlight throughout the year.

There are many Arab countries that contain water resources that allow them to exploit hydroelectric energy, such as Egypt, Iraq, and Morocco. Indeed, these countries have installed a group of energy capabilities to exploit hydroelectric energy in them. Hydroelectric energy is considered a major source of energy production at the global level, as its production has currently reached About 3000 terawatt hours (TWh), and therefore it constitutes about 18% of the world's electricity production, and its growth in recent years has been slightly higher than the growth rate of global energy demand. There are very extensive sources in the world to increase the exploitation of hydropower, but its costs Its distance from sources of consumption prevents it from investment.

Hydropower constitutes a limited source of energy in the Arab countries due to the limited water and rivers in the region. The production of Arab hydropower is estimated at about 30 thousand gigawatt hours (GWh), and it constitutes only 12% of electricity production in the Arab world, a percentage that is declining as a result of increasing production from energy sources Fossil.

In Figure No 01., we see the prospective production capabilities of wind and solar energy in the Arab countries. The figure shows in detail these capabilities according to each country.

Fig No 01: Total prospective solar and wind power capacity in arab countries



Source: <https://enterprise.press/greeneconomys/biggest-wind-solar-power-region-changing/>

From the figure, we notice that the Arab countries have great capabilities in wind and solar energy, which allows them to exploit them well and helps them achieve financial income, in addition to working to achieve energy security. For example, Oman, Morocco, and Algeria have capacities exceeding ten thousand gigawatts in these energies, which is a number that allows it to be one of the leading countries in this important sector.

3.2. The future of energy security in Arab countries

Energy security remains a critical challenge for Arab countries due to their heavy reliance on fossil fuels, fluctuating global oil prices, and increasing domestic energy demand. Achieving sustainable energy security necessitates adopting a comprehensive set of clear and coherent policies targeting multiple dimensions of the energy sector. The following are the key strategic pillars that Arab nations must prioritize to enhance their energy security:

3.2.1. Diversification of Energy Sources

One of the most fundamental steps toward energy security is the diversification of energy sources. Arab countries, traditionally dependent on oil and natural gas, need to expand their energy mix by incorporating renewable energy technologies. Solar and wind energies

are the most promising alternatives, given the region's vast solar irradiance and favorable wind conditions. The adoption of policies and incentives to encourage investments in these sectors can reduce reliance on fossil fuels and mitigate risks associated with supply disruptions and price volatility (IRENA, 2020). For instance, countries like the United Arab Emirates and Morocco have made significant strides in solar power projects, demonstrating the feasibility of renewables in the region (World Bank, 2021).

3.2.2. Enhancing Energy Efficiency

Improving energy efficiency is a vital complementary measure to diversification. This can be achieved through upgrading infrastructure such as power grids and integrating smart grid technologies that optimize energy distribution and reduce losses (IEA, 2019). Additionally, societal awareness and behavioral changes are necessary to encourage sustainable consumption patterns, including the adoption of energy-efficient appliances and buildings. Investing in research and development for new technologies and promoting regulations that set minimum efficiency standards can further accelerate this transition (UNDP, 2022). Enhancing efficiency not only reduces energy demand but also contributes to lowering carbon emissions and operational costs.

3.2.3. Achieving Environmental Sustainability

Sustainability considerations must be embedded in energy security strategies. Arab countries are increasingly recognizing the importance of environmental policies that limit carbon emissions and promote clean energy use. This includes enacting legislation that supports renewable energy deployment and the optimal use of environmental resources in alignment with local climatic and geographic conditions (Al-Saidi & Elagib, 2017). The transition to low-carbon energy systems helps address global climate change concerns and ensures that energy development is compatible with ecological preservation and human health goals.

3.2.4. Improving Energy Security through Independence and Regional Cooperation

Diversification and efficiency contribute to greater energy independence by reducing the vulnerability to oil price shocks and external supply disruptions (Saghir & Al-Awadi, 2018). Achieving a stable and self-sufficient energy supply bolsters economic stability and energy affordability. Moreover, regional cooperation among Arab countries can enhance collective energy security. By sharing renewable energy technologies, exchanging best practices, and developing cross-border energy infrastructure, countries can build a more resilient and integrated energy system (Nassar et al., 2020). Such collaboration fosters political stability and sustainable development across the region.

In conclusion, energy security in Arab countries hinges on a multi-faceted approach involving diversification of energy sources, enhancement of energy efficiency, commitment to environmental sustainability, and strengthening of energy independence through regional collaboration. These strategic steps are essential for supporting long-term sustainable development, economic resilience, and environmental protection in the Arab world.

4. The Role of Renewable Energies in Achieving Energy Security in Arab Countries

Investments in renewable energy constitute a cornerstone in the strategic reconfiguration of energy systems across Arab countries, aiming to reinforce long-term energy security in an increasingly volatile global context. The deliberate shift towards a diversified energy portfolio—anchored in solar, wind, and other renewable sources—marks a structural transformation that moves beyond mere substitution of fossil fuels. It represents a paradigmatic shift in how Arab nations conceptualize and operationalize energy sovereignty

(IEA, 2022). This realignment is not only a response to historical overreliance on hydrocarbons such as oil and natural gas, but also a forward-looking strategy to buffer national economies against global energy market disruptions, including sharp price fluctuations and supply chain vulnerabilities (El-Katiri, 2014).

The adoption of renewables aligns with the dual imperative of ensuring energy availability and safeguarding environmental sustainability. As signatories to international climate agreements such as the Paris Accord, Arab countries are increasingly compelled to meet emissions reduction targets. The integration of renewable sources thus serves as a tangible mechanism to decrease greenhouse gas emissions, while simultaneously reducing the ecological footprint of energy production (REN21, 2023). In this context, the deployment of renewables transcends its technical dimension to become a political and moral commitment to sustainable development and intergenerational equity (Sdrilevich et al., 2014).

Moreover, the localization of energy production through renewables—especially solar power, given the region’s high solar irradiance—plays a critical role in enhancing energy autonomy. By minimizing dependence on imported fuels and external energy technologies, Arab countries can reduce exposure to geopolitical risks that often threaten fuel transport routes and international energy trade (Krarti & Ihm, 2016). Local energy generation fosters national resilience, especially in countries that are either politically fragile or have historically been affected by regional conflicts and external economic pressures.

This transition also bears significant socioeconomic dividends. The expansion of the renewable energy sector acts as a catalyst for job creation across multiple skill levels, ranging from construction and installation to operations and maintenance, and even advanced research and development. In turn, this stimulates local economies and strengthens human capital, particularly among youth populations facing high unemployment rates (IRENA, 2021). Additionally, renewable energy projects often require infrastructure development—such as smart grids, storage systems, and transmission networks—which in turn generates demand in complementary industries and attracts foreign direct investment (World Bank, 2020).

From an economic standpoint, the reduction in fossil fuel imports associated with increased use of domestic renewable energy has direct implications for national trade balances. Countries that historically allocated substantial fiscal resources to subsidize fuel imports can reallocate these funds toward education, healthcare, or digital infrastructure. This budgetary flexibility enhances macroeconomic stability and enables more strategic long-term planning (IMF, 2019). Furthermore, by reducing exposure to global fuel price volatility, governments can craft more predictable and resilient fiscal and development policies.

In sum, the strategic embrace of renewable energy by Arab countries is not a mere response to environmental imperatives or energy diversification goals; it is a comprehensive framework for enhancing national resilience across economic, environmental, and geopolitical dimensions. It positions these nations as active participants in the global energy transition, not only as adopters but potentially as innovators and exporters of renewable technologies and expertise. Through this multifaceted transformation, Arab countries stand to redefine their role in the international energy order while safeguarding the well-being of future generations

5. Conclusion

This study reveals that the Arab countries' continued heavy reliance on fossil fuels—both for meeting domestic energy demands and as a primary source of public revenue—poses a significant threat to long-term energy security. This vulnerability is exacerbated by the volatility of global oil and gas markets and increasing international pressure to transition toward clean energy. Therefore, it is imperative for Arab countries to reconsider their energy policies by adopting a strategic path centered on diversifying energy sources, especially through investment in renewables.

The findings underscore that the Arab region possesses substantial potential in solar and wind energy, positioning it to play a leading role in the global renewable energy market. However, the underutilization of this potential stems largely from technological and financial constraints, which calls for well-structured strategies to foster international cooperation and mobilize investments.

The shift toward renewable energy is not merely an environmental or economic imperative, but also a strategic necessity for enhancing energy sovereignty, economic resilience, and sustainable development in the region.

5.1. Findings

The study produced several key findings:

1. Arab countries possess immense potential in renewable energy, particularly solar power, making them strong candidates for global leadership in clean energy.
2. Overdependence on fossil fuels exposes Arab economies to high risks due to price fluctuations in global energy markets.
3. There is a growing global momentum toward renewable energy investment, compelling Arab countries to accelerate their energy transition efforts.
4. The slow adoption of renewable energy projects in some Arab countries is primarily due to funding shortages and technical limitations.
5. Renewable energy presents a real opportunity for economic diversification and strengthening energy security in the Arab world.

5.2. Testing the Hypotheses

The study tested the main hypothesis (H0) proposed in the introduction:

Renewable energies can achieve energy security in Arab countries.

Based on the findings:

- The hypothesis is **supported** as the evidence shows that renewable energies possess significant potential to contribute substantially to energy security in Arab countries, particularly due to the region's abundant solar and wind resources.
- However, the realization of this potential depends on overcoming existing technological, financial, and regulatory challenges.
- The sub-questions were also addressed: renewable energies are clearly defined and understood, energy security is achievable through diversification and sustainable practices, and renewable sources can indeed replace fossil fuels to a large extent in the Arab context—thus providing both energy security and financial benefits.

5.3. Recommendations

Based on the findings and hypothesis testing, the study proposes the following recommendations:

1. Adopt a comprehensive national energy transition strategy that integrates renewable energy development with broader sustainable development goals.
2. Promote international partnerships with leading countries and technology providers in clean energy to overcome funding and technological gaps.

3. Reform legal and regulatory frameworks to attract private sector investment in the renewable energy sector by providing a stable investment environment.
4. Strengthen research and development (R&D) in renewable energy through support to universities and specialized research institutions.
5. Implement national awareness and education programs to foster a culture of sustainability and support behavioral shifts in energy consumption.
6. Diversify energy sources to reduce vulnerability to external shocks and enhance long-term energy resilience

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