

Research on the Implications of the Energy Transition in the Middle East

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Abstract: This paper critically examines the implications of the energy transition in the Middle East, a region historically reliant on fossil fuel revenues. The research explores the economic, technological, social, and geopolitical impacts of shifting from conventional energy sources to renewable alternatives. Through a detailed analysis, the study highlights the region's involvement in solar and wind energy projects, reflecting an emerging awareness of environmental sustainability. The regional objectives include reducing domestic fossil fuel consumption and curbing exports of oil and gas. While the transition offers significant potential for sustainable development, it also uncovers considerable challenges, particularly financial constraints, social acceptance issues, and political hurdles, as evidenced by comprehensive case studies. The paper advocates for a phased approach to achieving a greener energy sector, emphasizing the necessity of financial support, social initiatives, and political reforms. By situating the energy transition within a regional context, this study provides valuable insights for stakeholders and policymakers, offering a holistic perspective on the path toward sustainable growth.

Keywords: Middle East, Energy Transition, Renewable Energy, Sustainability, Energy Security.

1. Introduction

1.1. Research Background

The global energy transition is the shift from fossil fuels to renewable energy in order to reduce energy-related carbon emissions in response to the climate crisis [1]. It is a paradigm shift that involves the replacement of fixed assets, new technology, strategies and visions, social cooperation, and policy-making [2]. For this reason, it is a complex and long-term process that requires the analysis of both tangible and intangible changes [2]. In the Middle East, a region that relies on oil and gas revenues, this transition poses both challenges and opportunities. The International Renewable Energy Agency reports that the primary energy supply from renewables in the Middle East and North Africa regions could reach 26% by 2050 [3]. This renewable sector could employ up to 2 million workers and reduce up to 1.1 GT of carbon emission per year, making huge progress towards the UN SDG 7 [3]. These positive outlooks call for investment in the energy sector to make technological, infrastructural, and geopolitical changes.

The Middle East is a crucial stakeholder in the global energy market due to its role as a major supplier. Hence, understanding the implications of this transition in the Middle East would reveal future directions, environmental externalities, and potential changes in energy dynamics, economic stability, and geopolitical power. For the region itself, the introduction of renewables diversifies its energy sources, mitigates the volatility of oil prices, and fosters new industries and innovations. In society, the sector would increase employment opportunities, encourage education, and reduce health hazards caused by fossil fuel extraction. Internationally, it could alter relationships with other global powers by establishing new connections through green, sustainable energy.

1.2. Literature Review

Scholars have long since discussed various aspects of the energy transition, focusing both globally and in the Middle East. Henderson and Sen have pointed out the difficulties in implementing energy alternatives due to their opposition to market behaviour [4]. They examined how prior energy transitions were driven by the motivation to find more efficient sources of energy, while the current shift relies on government incentives to promote higher costs but greener energy [4]. This prompted the query about its feasibility in the Middle East, considering most countries in the region are still developing and require affordable energy sources. El-Katiri and Husain offered a contrasting view that the adoption of renewables would produce economic savings, taking Kuwait as an example [5]. They observed an opportunity cost for using oil to generate power domestically when priced below or at the long-run marginal cost of production [5]. Therefore, renewables for domestic use provide the advantage of allocating these lost revenues to funding with meaningful purposes. The study inspires a contemporary view to combine economic factors with social perspectives, aiming to discover hidden opportunities for individual Middle Eastern states. Islam and Ali discovered that Saudi Arabia's energy policy has a solid framework but requires future efforts to address social and environmental constrictions by means such as human capital investment and circular bio-economy [6]. Their analysis brings attention to a broader connection to the state, policy, and social bodies. These works all suggest that despite the potential for sustainable energy development in the Middle East, economic, technological, and political barriers must be first recognized and addressed.

Notable gaps in research still exist around this topic. In contrast to the focus on analysing the feasibility of energy transition or the economic aspects of solar and wind power generation, the literature is limited on foreseeable or current social/cultural implications during the process. This transition exhibits influences on labour markets, public consensus, and geopolitical possibilities.

1.3. Research Framework

In response to the gap, this study hopes to provide a comprehensive view of the implications of the energy transition in the Middle East by integrating economic, technological, social, and geopolitical perspectives. To begin, the study would establish the general background for the economics of renewable energy in the region with geographical considerations and expand towards technological connections, using prior studies as knowledge foundations. Societal and geopolitical impacts would then be navigated through the exploration of regional power dynamics. This approach is ideal as it has a wide scope that could provide insights for various actors, such as policymakers and business owners, during the process and highlighting the importance of not disregarding intangible implications during the transition.

2. Case Description

The Middle East has shown interest in renewable energy, notably solar and wind, and other green projects [5]. Solar photovoltaic (PV) is expected to be the predominant source of renewable

production when the region aims to replace fossil-generated energy with green energy by 2040 [7]. Regionally speaking, the transition manifests in reducing domestic consumption of oil and gas to enlarge export revenue or diminish fossil fuel import reliance and subsidy costs [8].

Countries part of the Gulf Cooperation Council (GCC) are worried about the exponential growth of domestic oil consumption, and even Saudi Arabia, the world's largest oil exporter, may be depleted of supplies and forced to import oil by 2030 [7]. Based on the geographical landscapes, all GCC countries have the capacity for solar PV; Kuwait, UAE, and Bahrain have the capacity to harness onshore wind; UAE and Qatar have the capacity for biogas; UAE has the capacity for Concentrated Solar Power (CSP) [7]. For non-GCC countries, renewable capacity and initiatives have proceeded. Jordan has planned solar PV, hydropower, onshore wind, and bioenergy projects and is also constructing renewable and nuclear pipelines; Egypt has explored its non-hydrogen carbon options such as hydropower dams; Morocco, with the solid infrastructural foundation for renewable technology, continues to diversify its energy profile and plans to power 52% of total electricity supply using renewable sources by 2030 [7]. Each state is at a different stage of the transition depending on the individual economic, social, and geopolitical makeup.

Overall, progress has been made in the Middle East as energy alternatives exhibit more cost advantages compared to oil-fired power generation [8]. Renewable energy generation has the advantage of lower operation and maintenance costs due to its ability to utilise replenishable natural resources. Solar technology such as PV has decreased in costs over time, and overall, renewable energy is recognized as the cheapest power generation in 2021 [9].

3. Analysis on the Problem

3.1. Influence Analysis

3.1.1. Influence 1: Implications on Sustainable Long-Term Growth

Fattouh et al. have proposed two types of energy transition: fast and slow [2]. Understanding the speed of the transition is crucial to the Middle East. Suppose the global transition happens at a fast speed. In that case, Middle Eastern countries will be required to respond to this change through methods such as developing new business models and adjusting to short- and long-term demand using their revenue base [2]. This would be an unideal situation for states similar to Egypt, which are reliant on external capital to extract high-cost reserves [8]. A rapid transition complicates their international relations and strains their revenue base, which must be carefully managed to fund domestic renewable energy projects while gradually reducing foreign involvement. Other states such as Saudi Arabia, UAE, and Qatar, which are regional leaders of petrostates, are more likely to respond resiliently to a fast transition. With a stable production of fossil fuels and sufficient sovereign funding, they have the ability to align themselves with the objectives of the transition [8]. Conversely, a slow energy transition would be preferable to most Middle Eastern states to gradually increase infrastructure, improve performance, decommission fossil-burning energy plants, and decarbonize [2].

3.1.2. Influence 2: Implications on Local Communities and Energy Security

Attaining energy security is a key step to achieving long-term sustainable growth through the energy transition. This involves increasing interconnectedness between countries and altering their relationships by entering the new market of renewable energy [10]. Some Middle Eastern states face disadvantages if policies or economic incentives are proven ineffective. In Egypt, subsidies on fossil fuels prior to 2014 caused regional disparities, as 20% of the population enjoys 48% of subsidy benefits [11]. This was difficult for fiscal spending and could have been instead invested into social programs. The subsidy reform in 2014 addressed this issue and raised fossil fuel prices to disincentive

consumption and market share [11]. However, critiques still exist regarding the alignment of objectives between the public and the state [11]. Lower and middle-income groups experienced income setbacks from the less affordable energy supplies despite social relief attempts, therefore questioning the legitimacy of the reform [11]. In this scenario, the negative implication of the transition is shown by the state being 'pushed' by the global transition. Acceleration of the process could cause the query of the relationship between renewable energy and sustainable economic development. Thus, it is preferable to take on an active role by initiating changes.

The availability of affordable energy to sustain power generation for economical, industrial, and demographic needs ensures a smooth transition. Although the implications of the transition process could create financial challenges to foster new infrastructure, human capital, and assets, the final result would be a more sustainable economy with lower energy generation costs. A diversified energy portfolio protects the states from the volatile gas and oil market prices and increases its self-reliance.

3.2. Problem Identified

3.2.1. Problem 1: Financial Challenges

Financial challenges are a significant obstacle to the energy transition in the Middle East. While wealthier petrostates like the UAE, Qatar, and Saudi Arabia have the financial resources to invest in renewable energy, other countries like Iraq lack the necessary financial reserves. Iraq may require foreign green energy funding to support its transition, but securing such funding requires improvements in political stability, government transparency, and social cohesion [12]. For Egypt and other states reliant on external capital to extract high-cost reserves, the transition could complicate their circumstances by requiring them to balance maintaining production levels with reducing foreign involvement [13]. In 2023, the Middle East produced around 30.4 million barrels of oil per day, increasing roughly 34% compared to 1998 [14,15]. This highlights the increasing global demand for energy, which has driven increased output. Therefore, its transformation is not solely reliant on regional incentives but also global market transition to progress at around the same pace.

3.2.2. Problem 2: Social Acceptance

Social acceptance is a critical factor in the success of the energy transition. In some Middle Eastern countries, there is resistance to change due to concerns about energy security and the economic implications of transitioning away from fossil fuels. The transition to renewable energy can be perceived as a threat to traditional industries and jobs, leading to social unrest and resistance. Energy consumers may be reluctant to shift away from traditional fuels as they are perceived as more reliable [4]. It is ambiguous how the public would react to new renewable products as it would require changes to current lifestyles and processes [4]. It requires them to use a long-term vision to project renewables as long-term welfare [4]. This may be challenging as the Middle East has substantial regional divides and disparities, which makes education less accessible [16].

3.2.3. Problem 3: Political Obstacles

The Middle East is an unstable political region. Several states still face ethnic divides that fuel tension and rebellion. Religion, race, and ethnicity are at the heart of this conflict [12]. Middle Eastern countries are struggling to become national states. For example, Iraq and Iran have several nations fighting for power within their borders. Hence, the region is deeply influenced by terrorist groups such as the Islamic State (IS). Domestic power rivalry between racial or religious communities creates tension, a lack of long-term planning, and a loss of skilled labor [13]. The instability can disrupt supply chains, deter foreign investment, and form an unclear regulatory environment.

Regarding the energy transition, the use of hydropower has been augmented. However, the construction of dams upstream creates power rivalry for water. The Grand Ethiopian Renaissance Dam (GERD), built on the Blue Nile in Ethiopia, aimed to produce 6000 megawatts of electricity when constructed [14]. However, political tension hindered the development as it would take 5-15 years to completely fill the reservoir and greatly decrease water supplies downstream to Egypt and other countries [14]. Renewable projects can be complicated by grabbing natural resources to ensure fair distribution between countries.

4. Suggestions

4.1. Green Economy

A green economy comes hand in hand with the energy transition. It aims to improve “human well-being and social equity while significantly reducing environmental risks and ecological scarcities” [17]. This aligns with the sustainable outlook of the energy transition. In North America, two of the five sectors making up the green economy work with energy. Thus, adopting a green economy is beneficial in completely orienting states towards overall sustainability. By studying challenges faced in North America, Middle Eastern states should adopt robust policies to update utility-business models and attract foreign investment while utilizing local resources [17]. Increasing transparency, improving credit rating, and establishing a stable political party are necessary steps for countries like Iraq to improve their international reputation and trustworthiness in order to attract capital.

Public funding is crucial in the process. However, public-private partnerships can alleviate the partial economic burden and increase the feasibility of deploying sustainable energy infrastructure [18]. Regional leaders, such as the UAE, Qatar, and Saudi Arabia, should act to create a sovereign fund, contributing to regional change that fosters interrelated progress. Funds can be attributed to less economically secure states to support renewable energy programs. Furthermore, subsidies for non-sustainable industries should be reduced, and environmentally driven subsidies should be promoted. This should be encouraged internationally and regionally, as demand calls for the continuation of operating environmentally harmful industries.

4.2. Educative Campaigns and Social Assistance

The government or local governing bodies should campaign for the advantages of the energy transition to communities in order to improve social acceptance. Governments or organizations should provide basic education to raise awareness about the energy transition and the ‘greening’ vision of the region. Encouraging citizens to take ownership of the transition helps to create a sense of security. Direct positive societal influences should be emphasized, such as reducing pollution and related health hazards with greener energy.

Pinderhughes introduced the concept of green-collar jobs, which are “blue-collar jobs workforce opportunities created by firms and organizations where the aim is to improve environmental quality” [19]. Jobs offered in this sector range from bicycle repair to green building to public transit [19]. These jobs are more appealing than sweat-shop jobs, where it is both damaging to the environment and the employee’s health. They appear as replacements for lost jobs in the fossil fuel industry. Policymakers should ensure that emerging green-collar jobs will be available to those lower-income groups and fund training programs. Involving local communities and stakeholders during the transition can make the process more cohesive and reliable.

4.3. Regional Cooperation to Secure Sustainable Development

It is impossible to propose an inclusive solution to solve the domestic political instability in the whole Middle East due to the complexity of its political history. It is arguably better to approach the issue from a macro level through regional cooperation. Although the author recognizes that individual states cannot achieve cooperation when civil conflicts still occur, the discussion would then center around the religion and ethnicity divide, which escapes the focus of this paper.

Due to the contrasting ideologies and national identities of Middle Eastern states, the author urges to foster inter-regional communication and establish mutualistic relationships. The fragmented nature of the Middle East prompts scholars to view the region systematically through memberships [20]. The occurrence identifies a lack of common goals and alliances. Climate change is an issue for humanity, and the energy transition is recognized as one of its solutions. The transition presents itself as an opportunity for the region to overcome its nationalist differences. It transcends opposing ideologies with the pursuit of a common goal: to grow sustainably. It is a fundamental basis for countering the onset of climate change, which can tremendously impact the development of a country. The urgency of the transition should be promulgated regionally to drive cooperation. Gause explains that foreign policies have the power to influence continental stability, highlighting that drastic policy changes within a single state can induce a ripple effect [20]. Hence, it is crucial that the member states coordinate with each other when pursuing the energy transition. This underlines the importance of effective communication. The establishment of a forum or union facilitates an ongoing strategic vision and addresses regional multipolarity to create a centralized and coordinated approach. Mutualistic relationships will be encouraged by this cooperative body, which will encourage the establishment of transnational, large-scale renewable energy projects. National projects such as the GERD will also be better supported by neighboring countries when a consensus is reached.

5. Conclusion

5.1. Key Findings

In conclusion, the paper reveals that the energy transition currently impacts the Middle East by bringing focus to long-term sustainable growth and challenging national energy security. Financial obstacles lie in difficulties in removing dependence on fossil fuel revenues, thus requiring gradual but firm strategic changes in business operation and policy making. Social acceptance is an additional critical aspect to address as the transition intimately affects the livelihoods of local communities. Industry or skill-focused education and awareness-focused education, along with the opening of new occupations in the green industry, help to decrease social resistance. Political hindrances due to inconsistency and tensions threaten the progress of the energy transition. Regional cooperation with aligned goals and international support provides improvements and future directions.

5.2. Research Significance

This research is of value to policymakers, green and traditional energy companies, and international bodies involved in the Middle East. By offering a holistic approach by examining the economic, social, and political angles of the energy transition, this paper comments on the necessity of approaching sustainability with multiple considerations. The objective of the study contextualizes the regional progress and current socio-political and financial framework. Overall, it contributes to a deeper understanding of the energy transition for businesses, governments, and interested individuals.

5.3. Limitations

While this paper offers a comprehensive analysis of the energy transition in the Middle East, primary data is absent from the study. Thereby, it lacks perspectives that reflect local realities. Future studies could improve on this by conducting local surveys to understand social dynamics and conducting in-depth industrial data collection to validate its reported progress in shifting towards renewables. Expanding the scope of research in history and religion would provide more extensive suggestions for the problems mentioned. It should also be considered that the suggestions given are very idealistic. Future studies could include an evaluation of the degree of success if suggestions are realized.

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