Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 81 – 95
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4181

Creating a Responsible Renewable Energy Investment Model for the MENA Region's Low-Carbon Transition

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Abstract

Addressing climate change presents specific challenges for the countries of the Middle East and North Africa (MENA), particularly concerning oil production and water scarcity, but it also offers opportunities for new paths toward sustainability. The transition to low-carbon energy raises significant concerns for oil and gas producers in the MENA region, especially regarding their dependence on hydrocarbon revenues. Without proper adjustments, this transition could worsen macroeconomic imbalances and potentially threaten existing social contracts. Policymakers are working to promote various renewable energy sources and implementation strategies to mitigate the adverse effects of climate change. As a result, the development of an index capable of accurately measuring and benchmarking a country's overall sustainability and economic performance becomes essential. This index should provide a comprehensive assessment of both the current and future state of renewable energy. Additionally, it must highlight key environmental, social, governance (ESG), and economic factors within the renewable energy sector. This proposal aims to establish a composite index, referred to as the Renewable Energy Responsible Investment Index (RERII), covering 19 countries and utilizing 22 distinct metrics. The RERII trend is calculated from 2010 to 2019. The proposed index can serve as a screening tool, decision-making aid, benchmarking instrument, and guide for sustainable development.

Keywords: *Renewable Energy, Investment Model Teacher, MENA Region's Low-Carbon Transition.*

Introduction

Energy is critical in today's global economy. Each country on Earth has its unique energy resources that must be developed. The world's energy consumption has been increasing at a rapid rate, posing both challenges and possibilities. Carbon dioxide emissions are increasing as a result of increased power use and energy scarcity, posing a significant challenge to industrialised and developing countries alike. It demonstrates that a huge population results in a high electricity consumption and CO2 emissions per capita (IRENA, 2019). The Middle East and North Africa (MENA) are seeing an increase in global energy demand. This is mostly due to population increase, socioeconomic development, and urbanisation (IRENA, 2019; K. Malik et al., 2019; Petroleum, 2017). In this region, numerous countries rely entirely on natural gas and oil to generate energy. Due to this region reliance on fossil fuels, it is particularly vulnerable to climate change's consequences (Myrsalieva & Barghouth, 2015).

MENA nations must strike a balance between their objectives for rapid economic expansion and the imperative of low-carbon development in order to reduce energy use and make significant investments in renewable energy (RE) (IRENA, 2019). In light of the above, transitioning from a fossil fuel-based economy to a low-carbon economy system through stimulating investment in RE is critical for five reasons:

The first issue is that economic progress is unsustainable given the existing state of the MENA market, which is dominated by fossil fuel activities. That is, supply and demand, capital movement, and the production processes of other economic sectors (Al-Sarihi, 2018). The second issue is to maintain the power supply by increasing the proportion of RE in the energy mix as the demand for energy increases and the general population grows. In general, energy consumption in MENA is increasing (Menichetti, El Gharras, Duhamel, & Karbuz, 2019). Thirdly, the present energy regulatory framework is insecure, and the governments have only lately begun to build a RE industry (Diam, MOG, 2018). To realise the economic benefits of important RE technologies, the MENA region pricing systems must be reconsidered, and

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regional energy markets must be consolidated, in order to maximise the cost advantages that RE sources may provide (Brand & Blok, 2015; Diam, MOG, 2018).

The fourth issue addressed the consumption of fossil fuel energy and its subsequent discharge into the environment. The fast growth of the MENA region gross domestic product and population has resulted in a rise in energy consumption. The MENA region contributes just 7% of worldwide greenhouse gas emissions, with electricity and heat generation accounting for 38% of overall pollution in the area on average (Bayomi & E Fernandez, 2019). The fifth concern is that the implementation of mitigation measures would have an effect on the trading environment of hydrocarbon markets by increasing profitability for oil exporters while lowering profitability for purchasers. However, there is no planned legislation promoting the innovation and use of energy technologies (Christopher, 2019).

To achieve these RE output targets, MENA nations would need to overcome several obstacles. They would need to integrate international expertise into the initiative, implement supportive sustainable energy laws and regulations, and upgrade existing grid infrastructure. Additionally, solar and wind energy are irregular, and natural gas is essential during periods when electricity is not required. There are still challenges with sustainable energy sources such as wind, solar, waste-to-energy, and hydroelectric power failing to compete with oil, gas, and coal, despite the continued existence of fossil fuel subsidies (Hochstrasser, 2015). The purpose of this paper is to rectify industry's image on the E3 (Energy-Economy-Environment) by filling in the gaps associated with the shift (Mercure et al., 2019). Additionally, this paper will attract policymakers and governments in MENA to examine the study's findings in order to establish their sustainability of resources, economy, and governance in the face of potential barriers to RE deployment.

Renewable Energy in Middle East and North Africa Countries

Although the MENA region was formerly known for its oil production. However, several nations in the region have developed alternative energy sources in recent years in response to declining energy supply and growing energy demand. While the availability of RE supplies has increased in this region, they remain insignificant in comparison to non-RE resources. However, culture in MENA has begun to place a greater focus on RE. To ensure limited domestic fossil-fuel supplies, governments aim to limit the amount of oil and gas they repurpose for domestic use and limit the amount of energy they import, as their exports generate significant money and energy imports are extremely expensive. This demonstrates that a number of MENA countries are concerned about greenhouse gas emissions and are attempting to mitigate their influence on the global climate.

The MENA region is blessed with natural resources such as sunshine, strong winds, and rivers that may be utilised for RE generation. Several MENA nations undertook RE efforts in 2013, and a total of eighteen countries participated in RE promotion programmes. The fundamental objective of defining RE targets and policies in the majority of MENA countries is to reduce the country's reliance on fossil fuels and natural gas (Brand & Blok, 2015). According to World Bank estimates, around 22% – 26% of solar energy striking the earth reaches the field. According to this projection, solar energy will achieve a capacity similar to 1-2 million barrels of oil (IRENA, 2019).

The MENA region has various significant wind energy resources, most notably Egypt and Morocco, which each year provide about 2400 hours of maximum load hours for wind turbines (Nathaniel, Anyanwu, & Shah, 2020). Iran and Turkey are the top two producers of RE, they rely on hydropower to generate electricity (Bulut & Muratoglu, 2018). Countries in MENA are committed to increasing the percentage of RE in their energy mix, as seen in Table 1 below.

Table 1: Renewable Energy Targets and Plans in the Middle East and North Africa (IRENA, 2019)

Countries	Renewable Energy Targets and Plans
Algeria	Solar photovoltaic (PV): 3 GW by 2020, 13.6 GW by 2030 Wind: 1 GW by 2020, 5 GW by 2030 Concentrating solar thermal power (CSP): 2 GW by 2020, 2 GW by 2030

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	Biomass: 0.4 GW by 2020, 2 GW by 2030 Geothermal: 15 MW by 2030
Bahrain	Solar PV: 0.3 GW by 2025 RE mix: 0.7 GW by 2030
Egypt	Solar PV: 0.2 GW by 2020, 0.7 GW by 2027 Wind: 7.2 GW by 2020 CSP: 1.1 GW by 2020, 2.8 GW by 2030 Hydropower: 2.8 GW by 2020
Iran	Solar and wind energy are prevalent: the capacity is not specified
Iraq	RE mix: the capacity is not specified
Israel	Solar PV and CSP: 63.4% of total generation by 2020 Wind: 29% of total generation by 2020 Biomass (including biogas): 7.6% of total generation by 2020
Jordan	Solar PV: 0.6–1 GW by 2020 Wind: 0.6–1 GW by 2020 Waste-to-energy: 30–50 MW by 2020
Kuwait	Solar and wind energy: the capacity is not specified
Lebanon	Solar PV, CSP and solar water heaters: 4.2% of total RE by 2020 Wind: 2.1% of the total RE by 2020 Hydropower: 3.2% of the total RE by 2020 Biomass: 2.5% of the total RE by 2020
Libya	Solar PV: 0.15 GW by 2020; 0.5 GW by 2025 Wind: 1.5 GW by 2020; 2 GW by 2025 CSP: 0.8 GW by 2020; 1.2 GW by 2025 Biomass: 0.3 GW by 2020; 0.6 GW by 2025
Morocco	Solar energy (PV and CSP): 2 GW by 2020 Wind: 2 GW by 2020 Hydropower: 2 GW by 2020
Oman	Solar and wind energy: the capacity is not specified
Qatar	Solar energy: 1.8 GW by 2020 (16% of total electricity generation) and 10 GW by 2030
Saudi Arabia	Solar PV is the dominant technology, with look at the other sources such as CSP and waste-to-energy
Palestine	Solar PV: 34.6% of the total RE by 2020 Wind: 33.8% of the total RE by 2020 CSP: 15.4% of the total RE by 2020
Syria	Solar PV: 0.25 GW by 2030 Wind: 1–1.5 GW by 2030 Biomass: 0.25 GW by 2030 Solar thermal energy: 11.6 TWh/annum by 2030
Tunisia	Solar PV: 1.5 GW by 2030 Wind: 1.7 GW by 2030 CSP: 0.5 GW by 2030 Biomass: 0.3 GW by 2030
United Arab Emirates (UAE)	Solar energy (PV and CSP) is the dominant technology, followed by wind energy and waste-to-energy
Yemen	Solar PV: 0.6% of the total RE by 2025 Wind: 56.3% of the total RE by 2025 Geothermal: 28.2% of the total RE by 2025 CSP: 14% of the total RE by 2025 Biomass: 0.8% of the total RE by 2025

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Conceptual Framework

Climate change and energy instability are two of the most serious concerns facing humanity. The costs of inaction are exceedingly significant. RE production has long been recognised as a means of addressing climate change and the depletion of traditional energy sources. Numerous nations have increased their focus on the production and market for RE.

In this changing environment, economy with low carbon emissions focused energy is committed to achieving global change via investments in sustainable energy. It is a new energy economy that fosters creativity, primarily by preventing or reducing pollution. Recent years have seen an increase in studies on the influence of economic development on energy use. However, different economists analyse different subsets of nations using a variety of different methodologies and at a variety of different periods. In Algeria, Bouznit and Pablo-Romero (2016); in Bahrain, Allali et al. (2015); in Iraq, Jafari et al. (2015); in Israel, Magazzino (2015); in Jordan, Spetan (2016) and Mugableh (2015); in Qatar, Charfeddine (2017); in Saudi Arabia, Alabdulrazag and Alrajhi (2016) and Alshehry and Belloumi (2015), examined the relationship between economic growth and carbon pollution.

Additionally, Bekhet et al. (2017) conducted study on six Gulf Cooperation Council (GCC) nations, while Magazzino (2016b) conducted research on 29 MENA countries. Magazzino (2016a, 2017, 2019), Fakhri et al. (2015), Omri et al. (2015), Hamrita and Mekdam (2016), Asif et al. (2015), Salahuddin et al. (2015), and Ben Jebli and Ben Youssef (2017b) were identified as panel data methodologies including MENA countries. To begin, various studies have demonstrated that carbon dioxide emissions may contribute to economic growth, implying that an increase in carbon dioxide emissions results in growth. Second, if the link between electricity and GDP and/or carbon emissions is positive, energy usage can grow, resulting in an increase in GDP and/or carbon emissions. According to empirical evidence, growing GDP was connected with increased energy use and carbon emissions.

Aggregating many variables to create a composite index is a popular and effective strategy. This method successfully condenses complicated indicators into a single number for the purpose of benchmarking country performance. The index-based technique has been widely implemented in a variety of contexts, including sustainability measurement, rural energy sustainability, quality of life, and air quality evaluation. At the moment, only a few indexes have been developed specifically for RE, including the FFSI, SEI, SIT, AESPI, RECAI, GCII, and EPI.

The purpose of this paper is to develop a composite index suited for ethical investors in RE in the MENA region. The composite index's purpose is not only to provide a single dominant investment platform, but also to facilitate a structured and transparent process for flexible inclusion of key indicators and assumptions, allowing the composite index to be revised and enriched to benefit all stakeholders in RE. The scope of this paper covers MENA countries, measuring three dimensions of RE responsible investment: economic instruments, environmental instruments, social instruments and governance instruments (Lee & Zhong, 2015).

The composite index's indicators (economic instruments, environmental instruments, social instruments, and governance instruments) should be identified. Eurostat and the International Monetary Fund (IMF) have created quality standards to standardise indicator selection methods. To measure data quality, the IMF uses the Data Quality Assessment Framework (DQAF), which consists of five dimensions: integrity, methodological soundness, accuracy and dependability, serviceability, and accessibility. Eurostat's framework, on the other hand, is based on six quality dimensions: relevance, accuracy, timeliness, and punctuality, accessibility and clarity, comparability, and coherence. In fact, researchers have generally used these fundamental ideas when developing processes for indicator selection. In total, 22 instruments are identified and listed in the table 2 below.

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Table 2: Indicators with Units (Lee & Zhong, 2015)

Factors	Indicators	Units
Economic	GDP annual growth rate	Percent
	Debt to GDP ratio	Percent of GDP
	Currency Movement	Percent
	Interest rate	Percent
	Foreign direct investment annual growth rate, net inflows	Percent
	Unemployment rate	Percent of total labor force
	Fossil Fuel Subsidies	Percent
Environmental	Electricity production from fossil fuel	Percent of total
	Electricity production from renewable energy	Percent of total
	CO2 emissions from fossil fuel per population	Tones CO_2/capita
	Renewable Energy resources	Score between 0 and 1
	Climate Change Policies	Score between 0 and 1
Social	Electricity power transmission& distribution losses	Percent of generation
	Electricity consumption per population	Kilowatt hour/capita
	Availability of latest technologies	Score 1–7
	Affordability of financial services	Score 1–7
	Capacity for innovation	Score 1–7
Country Governance	Governance effectiveness	Score between 0 and 1
	Control of Corruption	Score between 0 and 1
	Regulatory quality	Score between 0 and 1
	Political stability and absence of violence	Score between 0 and 1
	Renewable energy policies	Score between 0 and 1

GDP Annual Growth Rate: It is defined as the sum of all final products and services prices generated for sale in a country's market over a specified period of time. If GDP growth is high enough, it indicates that the economy is expanding, more people will be employed as a result of increased employment, and individuals will spend and invest more as a result of increased disposable income (Callen, 2008). Both GDP growth and CO2 emissions appear to be increasing in lockstep, as a 5% increase in CO2 emissions is connected with a 1% increase in global GDP (UN, 2019). As a result, rapid GDP growth is a favourable indicator of a country's economic environment and investment climate.

Debt to GDP Ratio: Investors use this ratio to assess a government's economic potential and ability to repay its debt; debt includes both Treasury bills and state-issued bonds (Malik, 2017). If the ratio increases, the nation will enter a state of stagnation, putting an unjust financial strain on the economy. Additionally, RE subsidies have a detrimental effect on the climate for RE spending and contribute to the fiscal sustainability gap. On the other hand, a depressed economy can be negative to RE investment and sustainability.

Currency Movement: Exchange rates are highly unpredictable for the most of the time; if the RE project is supported with foreign funds, currency hedging is required to protect against currency risk devaluation. Unless foreign investors are willing to risk losing their revenues owing to currency depreciation. Obtaining longer-term currency hedges of three to five years, on the other hand, is difficult and can be costly. For example, in India, 7% or more for ten years, or until foreign finance becomes more expensive as local financing gets more expensive (Farooquee & Shrimali, 2016). As such, this metric will reflect both the present economic situation and the investor's financial well-being.

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Interest Rates: This examines the effect of interest rate fluctuations on RE. The Paris Climatic Accord cannot be implemented without a separate investment in RE that reduces CO2 emissions under all climate scenarios (Schmidt et al., 2019). Additionally, increasing the initial price of RE would make it less appealing, as it is more capital intensive than fossil fuels. With increased interest rates, it is not necessarily the case that the prices of RE would climb faster than the loan rates (Schmidt et al., 2019). As a result, the interest rate is used to assess whether citizens are eligible to participate in RE.

Foreign Direct Investment (FDI): Liu et al. (2016) provide evidence for one of their assumptions, namely that FDI into RE technology boosts economic production in the energy sector (Liu, Zhang, & Feng, 2019). Foreign direct investment, as defined by Lee and Zhong, is the amount of new capital invested by a firm on foreign soil. If foreign investment inflows are strong, this will boost the advancement of RE technology and the development of new markets. Several countries, on the other hand, are averse to receiving international investment, which may assist sustain prosperity. When a government enters into investment agreements, it is required to include provisions for health care, labour rights, environmental preservation, and safety. Countries that receive a significant amount of foreign direct investment appear to be more favourable to foreign investment (Lee & Zhong, 2015). There are several advantages to FDI real estate. For instance, diversify investment techniques, maintain a healthy mix of long-term financing, fund small businesses, boost small company growth, decrease unemployment, lower labour costs, and safeguard the environment (Amadeo, 2020).

Unemployment Rate: A measure of the unemployment, how many people are frantically seeking work. Generally, the proportion fluctuates according to demand and the state of the economy. If a country's economy is in poor health and work opportunities are few, unemployment will grow. If the economy grows and jobs become plentiful, unemployment will drop (Azhar & Murtaza, 2020). The RE economy produces jobs both explicitly and implicitly. However, it is not straightforward to weigh precisely and to collect the necessary data from reputable sources due to a capacity shortage of engineers and technicians across all RE industry segments, which in many countries stems from a shift away from engineering studies (civil, mechanical, and electrical) by students (Dvoák, Martinát, Van der Horst, Frantál, & Tureková, 2017). Unemployment should be kept at 2% regardless of the economy's level of employment.

Fossil Fuel Subsidies: Government incentives encourage the MENA Cooperation Council member nations to generate energy from natural gas, crude oil, diesel, and heavy fuel oil. Even yet, indirect incentives such as tax credits, fuel incentives, soft loans, and permits for environmental regulations contribute to the funding. For decades, generous electricity subsidies put clean energy at a disadvantage (PWC, 2018).

Carbon Dioxide Emission from Fossil Fuel Per Population: The MENA region contributes to the development of fossil fuels such as oil and gas by possessing a sizable portion of fossil fuel reserves and by producing energy-related carbon emissions (BP, 2019). The measures are used to determine the country's climate's sustainability, as well as the amount of CO2 emitted by burning oil, natural gas, and coal.

Electricity Production from Oil, Gas, and Coal Sources: The calculation includes the total quantity of power generated in a country using fossil fuels and the amount of greenhouse gases discharged by the country's energy industry (Lee & Zhong, 2015). Countries that generate a substantial quantity of energy from fossil fuels frequently release a high level of greenhouse gases.

Electricity Generation from Renewables: RE sources include the sun, waves, ocean, hydro, geothermal, and biological sources. In comparison to conventional energy sources, renewable resources are plentiful, frequently free, and have a negligible environmental impact (Lee & Zhong, 2015). Numerous countries have prioritised efficiency and environmental concerns while implementing energy policy. When a country relies on clean energy, economic growth is enhanced, and greenhouse gas and air pollution concerns are alleviated (Charfeddine, 2017).

Renewable Energy Resource: The nation with a greater supply of RE would profit more than those with fewer RE resources (Lee & Zhong, 2015). The RE resource base of a country will be studied and assessed, and the resulting data will be utilised to estimate the country's overall RE appropriateness and adequacy (Pranti, Iqubal, Saifullah, & Ahmmed, 2013).

Climate Change Policies: There are several mechanisms for reducing GHG emissions, including legislation and recommendations, energy and carbon taxes, voluntary agreements, subsidies and grants, and tradeable emissions permits (Gupta & Tirpak, 2007; OECD, 2007). The committee understands that the oil sector accounts for nearly two-thirds of global GHG emissions and advocates for a global transition away from fossil fuels toward RE and energy conservation (IPCC, 2018).

The Electricity Power Transmission and Distribution Losses: The performance of the power system is determined by the ratio of transmission and distribution losses to total output. If the transmission loss is significant, it will result in a slew of social problems and an increase in greenhouse gas emissions as citizens consume more food to meet the same demand norm. Additionally, it may result in transmission gridlock, a failure of the security mechanism, and blackouts, all of which would have a detrimental effect on the power system's production and quality (Madrigal & Stoft, 2012). Additionally, the reach of RE projects is limited if transmission lines transport electricity inefficiently, and if practicable, RE sites are located far from energy demand and existing transmission lines, limiting expansion (Lee & Zhong, 2015). As such, this statistic provides information on the energy system's performance and efficacy, as well as how the energy system maintains its utility to society.

Electricity Consumption Per Capita: Electricity is critical in ensuring the continuation of health insurance, education, water, food, and other basic wants and desires. Providing affordable and dependable electricity is critical for economic and social prosperity. The consumption figures show the total quantity of energy consumed by each individual and their connection to the electric grid. If power can be generated at a reasonable price, demand will increase. As a result, it highlighted the world's low cost of energy and the social sustainability of expansion (Lee & Zhong, 2015).

Availability of Latest Technologies: The other upbeat aspect in RE energy expenditures was ascribed to tax reduction. Due to the fact that both invention and R&D investment have increased over time, the potential for innovation and corporate R&D spending were the indicators that supported this expansion.

Affordability of Financial Services: Collaboration between science and creativity, as well as financial services affordability.

Capacity for Innovation: The other upbeat aspect in RE expenditures was ascribed to tax reduction. (Cîrstea, Moldovan-Teselios, Cîrstea, Turcu, & Darab, 2018).

Governmental Effectiveness: This assesses public perceptions of government programmes, policy formation and implementation, and the government's commitment to public policies. For example, governmental effectiveness relates to the standard of bureaucracy; satisfaction with public transportation, roadways, or education; supply of basic health services; the electricity grid; clean water and sanitation; and trash disposal, among other things. Individuals that have positions within the global political framework (Bisogno & Cuadrado-Ballesteros, 2019).

Regulatory Quality: Term used to describe a country's ability to develop and implement policies that promote private sector growth. Price barriers, punitive levies and taxes, uneven competitive conduct, political pressure, the degree of local rivalry, the ease with which new businesses may be started, anti-trust rules, investment and financial independence, and so on are examples (Bisogno & Cuadrado-Ballesteros, 2019).

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Control of Corruption: The institutional framework of the country and how it functions via public administration, civic involvement, and the public and parliamentary systems. It is about the coming together of several public, non-profit, and global enterprises in order to create a bright future (Glass & Newig, 2019).

Political Stability & Absence of Violence: Concerns the long-term viability of the social system as a whole (Javed, Waseem, Shabbir, & Mushtaq, 2018).

Renewable Energy Policies: The effectiveness of a sustainable energy programme is contingent upon the balance of incentives and the program's planning. To enable RE investment, policies that support, endorse, and promote it must exist. Complete implementation of a RE strategy would help stimulate investor demand and accelerate the deployment of RE technology (Abdmouleh, Alammari, & Gastli, 2015).

Figure 1 shows a typical conceptual framework based on economic instruments, environmental instruments, social instruments and governance instruments. According to Bryman and Bell (2015), framework is a specified technique for data collecting and analysis, with the goal of making research issues researchable by structuring the research phase in the most efficient manner possible (Bryman & Bell, 2015). The purpose of developing a conceptual framework is to introduce the country's performance evaluation system in order to determine the multidimensional factors that will be used to compute and articulate the structure of the Renewable Energy Responsible Investment Index (RERII) as a platform for investors and other stakeholders (Lee & Zhong, 2014). It will rely on the MENA region (Algeria, Bahrain, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates, and Yemen).

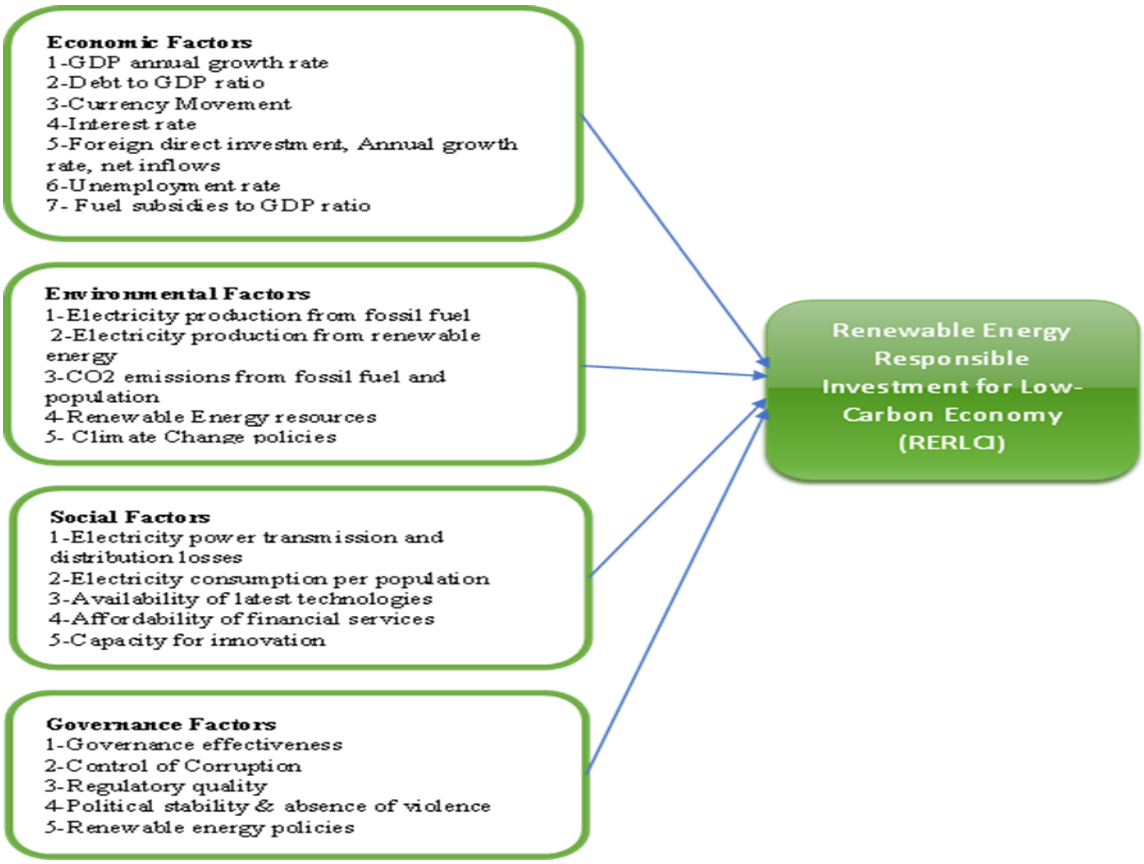

Figure 1: Conceptual Framework

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Data Processing Procedure

The primary data was collected from a number of databases such as the IMF, IEA, TE, UNCTAD, IRENA, OPEC, BP, World Bank, ESCWA, and REN21 from 2010 through 2019 in this paper. The data extraction, calculation, and imputation of missing data are the first steps in the data processing technique. Extraction of data is the process of obtaining information from samples of indicators. The ease with which indications may be accessed is the primary determinant of the process's speed. Following the extraction of data, data computation and missing data imputation are often performed. The primary objective is to improve indicator comparability, accuracy, and dependability. The procedure might be as straightforward as fundamental mathematical processes or as complicated as explicit mathematical models, such as likelihood-based and regression-based approaches. After assembling a comprehensive database of indicators, a multivariate analysis is conducted. The research is meant to conduct a preliminary assessment of the database's structure and weighting and aggregation methodology choices. Given that the technique for indicator selection, data processing, and weighting and aggregation is dependent on a number of assumptions and judgements, the robustness of the newly produced composite index should be evaluated. Sensitivity analysis is one of the approaches for assessing robustness; it is a procedure for determining the output variation owing to various sources of uncertainty in the inputs. Sensitivity analysis illustrates the effect of a change in a single input on the composite index.

Construction of Renewable Energy Responsible Investment Index (RERII)

Each country's total RERII score is calculated using 17 separate indicators (see Table 2) culled from a variety of data sources. RERII indicators may be classified into four broad categories based on their relationship to the economic, environmental, social, and country governance pillars. Selecting indicators that offer a comprehensive picture is difficult since there are a large number of possible indications and each signal is only an abstraction intended to reflect a portion of the tale. RERII indicators are expressed in a variety of units. Prior to weighing and aggregation, the indicators must be converted to dimensionless values. To avoid outliers, indicator units must be carefully chosen. This is because outliers or excessive numbers might skew the normalisation process. Lee and Zhong (2015) discover that min–max normalisation is advantageous for specimen construction (Lee & Zhong, 2015). The indicators will be standardised for each product using formulae. If the indicators have a positive influence on economic instruments, environmental instruments, social instruments, and governance instruments, they are normalised using the following equation:

$$\text{Eq (1): Indicator}^{+ve} = \frac{Xqc}{Xmax} - \frac{\text{Xmin}}{Xmin}$$

$$\text{Eq (2): } Indicator^{-ve} = \frac{Xmax}{Xmax} - \frac{Xqc}{Xmin}$$

Indicator^{+ve}: Indicator with positive impact on RERLCI for country c

$Indicator^{-ve}$: Indicator with negative impact on RERLCI for country c

Xqc : Value of indicator q for country c

Xmin Minimum value of indicator q for country c

$Xmax$: Maximum value of indicator q for country c

RERLCI: Renewable Energy Responsible Low Carbon Investment

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From each nation's RERII yearly values, a comparison study may be conducted to determine the overall performance in terms of economic, environmental, social, and country governance. The RERII findings are described in Tables 3. From 2010 to 2019, Table 3 displays the RERII ratings and rankings of nations based on their overall performance.

Table 3: RERLCI Rankings and Scores from 2010 to 2019

Rank	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	SYR (83)	KWT (76)	KWT (72)	BHR (76)	JOR (65)	ALG (63)	IRN (65)	IRN (62)	UAE (59)	EGY (60)
2	LBY (82)	ISR (67)	LBY (64)	YMN (67)	QTR (62)	MOR (58)	EGY (58)	UAE (55)	MOR (56)	ALG (55)
3	LBN (73)	LBY (66)	JOR (63)	LBY (58)	OMN (60)	UAE (57)	ISR (51)	MOR (52)	EGY (54)	UAE (53)
4	KWT (71)	LBN (66)	BHR (62)	OMN (57)	YMN (59)	SAU (54)	UAE (51)	TUN (51)	ALG (53)	OMN (52)
5	MLT (66)	MLT (59)	SYR (60)	JOR (57)	UAE (59)	YMN (53)	IRQ (51)	EGY (50)	TUN (52)	TUN (51)
6	ISR (66)	BHR (57)	QTR (60)	QTR (56)	IRN (58)	IRN (52)	QTR (50)	ISR (49)	IRN (51)	MOR (49)
7	YMN (65)	SYR (56)	SAU (59)	KWT (53)	IRQ (56)	TUN (51)	SAU (48)	OMN (48)	SAU (48)	IRN (45)
8	QTR (57)	YMN (55)	OMN (58)	UAE (52)	MOR (56)	IRQ (51)	TUN (47)	IRQ (48)	OMN (47)	IRQ (44)
9	BHR (56)	JOR (54)	ISR (57)	IRQ (51)	BHR (55)	QTR (51)	ALG (46)	MLT (47)	MLT (46)	SAU (43)
10	EGY (54)	OMN (53)	MAT (56)	TUN (51)	LBN (54)	BHR (49)	LBN (45)	ALG (47)	IRQ (45)	KWT (43)
11	JOR (51)	IRQ (52)	YMN (52)	MOR (50)	TUN (54)	LBN (47)	MLT (45)	SAU (45)	LBY (41)	QAT (41)
12	SAU (49)	QTR (51)	TUN (48)	LBN (50)	EGY (46)	SYR (47)	MOR (45)	JOR (43)	KWT (40)	ISR (40)
13	ALG (47)	SAU (42)	MOR (47)	IRN (49)	SYR (45)	EGY (46)	OMN (44)	YMN (42)	ISR (40)	BHR (40)
14	OMN (43)	ALG (41)	UAE (45)	SAU (49)	SAU (45)	OMN (40)	JOR (43)	QTR (41)	YMN (39)	LBY (38)
15	TUN (41)	EGY (40)	IRQ (42)	SYR (48)	ALG (44)	LBY (37)	BHR (40)	LBY (40)	SYR (37)	SYR (37)
16	IRQ (40)	MOR (39)	ALG (42)	MLT (47)	MLT (43)	MLT (34)	LBY (40)	BHR (39)	JOR (37)	MLT (36)
17	MOR (30)	IRN (38)	LBN (41)	ALG (43)	KWT (42)	ISR (34)	YMN (38)	LBN (38)	QTR (37)	YEM (36)
18	IRN (23)	TUN (37)	IRN (39)	ISR (38)	LBY (40)	JOR (34)	SYR (34)	KWT (36)	LBN (35)	JOR (35)
19	UAE (19)	UAE (32)	EGY (37)	EGY (37)	ISR (39)	KWT (32)	KWT (33)	SYR (35)	BHR (34)	EGY (32)

Table 4 records the breakdown of RERII in 2019, which is resulted from the aggregation of the intermediate composite indicators. So, PCA/FA can be applied to assign weights to the indicators and construct the composite index. The values of RERII are scaled up by multiplying 100 for better illustration only. In the past decade, there is a notable divide in RERII in terms of the degree of economic development. Only few developing countries ranked in the top half of the index. However, most of developing countries ranked in the bottom half. This demonstrates that there is a correlation between the status of economic development and RERII.

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Volume: 3, No: 7, pp. 81 – 95
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4181

Table 4. RERLCI Scores and Rankings in 2019

Rank	Country	Year	Econ.	Env.	Soc.	Gov.	Renewable Energy Responsible Investment Index (RERLCI)
1	Egypt	2019	17.08	12.75	16.13	14.29	60.26
2	Algeria	2019	15.48	17.35	11.21	11.01	55.05
3	United Arab Emirates	2019	5.27	18.46	15.13	14.43	53.29
4	Oman	2019	3.55	15.88	15.46	16.87	51.77
5	Tunisia	2019	8.41	18.34	15.92	8.13	50.80
6	Morocco	2019	4.38	16.32	14.78	13.22	48.69
7	Iran, Islamic Rep.	2019	6.54	17.41	14.28	7.00	45.24
8	Iraq	2019	12.81	11.52	14.83	5.65	44.81
9	Saudi Arabia	2019	0.82	17.10	10.45	15.25	43.61
10	Kuwait	2019	6.28	15.12	9.19	12.72	43.31
11	Qatar	2019	4.20	17.16	15.44	4.47	41.27
12	Israel	2019	6.96	9.82	11.34	12.56	40.68
13	Bahrain	2019	8.12	17.46	8.44	6.53	40.55
14	Libya	2019	6.72	17.13	8.87	5.35	38.07
15	Syrian Arab Republic	2019	7.14	13.03	12.14	4.62	36.93
16	Malta	2019	6.48	10.09	16.12	3.78	36.46
17	Yemen, Rep.	2019	4.17	16.26	13.50	2.10	36.02
18	Jordan	2019	0.73	11.92	10.31	12.88	35.83
19	Lebanon	2019	0.68	17.98	9.47	3.60	31.73

Hypothesis Testing

The four hypotheses were derived from conceptual framework (Figure1). The hypotheses as follows:

Hypothesis 1: The performance of economic indicators effects significantly the renewable energy investment for low-carbon economy. Below table 5 provides the results of regression equation.

Eq. (3): $$RERLCI_{it} = \alpha + \beta_1 GDP.G_{it} + \beta_2 I.R_{it} + \beta_3 Unemployment_{it} + \beta_4 FDI.G_{it} + \beta_5 Curr.Mov_{it} + \beta_6 Debt\ to\ GDP_{it} + \beta_7 Fossil.F.S_{it} + country_{it} + \varepsilon_{it}.$$

The dependent variable is the renewable energy investment for low-carbon economy for country i at time t ($RERLCI_{it}$). On the right-hand side of the equation, independent variables include GDP growth, Interest rate, unemployment, FDI growth, currency movement, debt to GDP ratio and fossil fuel subsidies

Table 5: Economic Indicators Panel Regression

Parameters	Variable	Coefficient	Std. error	t-statistics	Probability
α	Constant	0.5933***	0.1066	5.56	0.000
β_1	GDP growth	0.0412	0.0875	0.47	0.637
β_2	Interest rate	-0.0891	0.1098	-0.81	0.417
β_3	Unemployment	-0.1227	0.1638	-0.75	0.454

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Volume: 3, No: 7, pp. 81 – 95
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https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4181

β_4	FDI growth	-0.0933	0.1041	-0.90	0.370
β_5	Currency Mov.	0.0621	0.1025	0.61	0.544
β_6	Debt to GDP	0.0015	0.0064	0.24	0.812
β_7	Fossil Fuel sub.	0.0219	0.0814	0.27	0.787
Adjusted R^2	0.3310				
Wald Chi^2	6.43				0.3766

Hypothesis 2: The performance of environmental indicators effects significantly the renewable energy investment for low-carbon economy. Below table 6 provides the results of regression equation.

$$\text{Eq. (4): } RERLCI_{it} = \alpha + \beta_1 CO2Emm._{it} + \beta_2 Elect.FF_{it} + \beta_3 Elect.RE_{it} + country_{it} + \varepsilon_{it}.$$

The dependent variable is the renewable energy investment for low-carbon economy for country i at time t ($RERLCI_{it}$). On the right-hand side of the equation, independent variables include CO2 emissions, electricity production from fossil fuels, and electricity production from renewable energy sources.

Table 6: Environmental Indicators Panel Regression

Parameters	Variable	Coefficient	Std. error	t-statistics	Probability
α	Constant	0.3843***	0.0161	23.85	0.000
β_1	CO_2 emissions	0.1687***	0.0263	6.40	0.000
β_2	Electricity prod. from FF	0.0229	0.0190	1.21	0.228
β_3	Electricity prod. from RE	0.0087	0.0223	0.39	0.697
Adjusted R^2	0.271				
Wald Chi^2	62.17				0.000

Hypothesis 3: The performance of social indicators effects significantly the renewable energy investment for low-carbon economy. Below table 7 provides the results of regression equation.

$$\text{Eq. (5): } RERLCI_{it} = \alpha + \beta_1 Afford.F.S_{it} + \beta_2 Avail.Tech_{it} + \beta_3 Cap.Inn_{it} + \beta_4 Elec.Cons_{it} + \beta_5 Elec.Tran\&Dist_{it} + \varepsilon_{it}.$$

The dependent variable is the Renewable energy investment for low-carbon economy for country i at time t ($RERLCI_{it}$). On the right-hand side of the equation, independent variables include affordability of financial services, availability of latest technology, capacity for innovation, electricity consumption per capita, electricity transmission and distribution.

Table 7: Social Indicators Panel Regression

Parameters	Variable	Coefficient	Std. error	t-statistics	Probability
A	Constant	0.3758***	0.0404	9.29	0.000
β_1	Afford of Fin Ser	0.0379	0.0395	0.96	0.351
β_2	Avail of Tech	0.0459***	0.0144	3.17	0.006
β_3	Cap for Inn	-0.0712*	0.0352	-2.02	0.060
β_4	Elec Cons	0.1721***	0.0380	4.52	0.000
β_5	Elec Trans & Dist.	0.0489***	0.0280	1.75	0.100
Adjusted R^2	0.226				
Wald Chi^2	10.25				0.0002

Journal of Ecohumanism
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Volume: 3, No: 7, pp. 81 – 95
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
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DOI: https://doi.org/10.62754/joe.v3i7.4181

Hypothesis 4: The performance of country governance indicators effects significantly the renewable energy investment for low-carbon economy. Below table 8 provides the results of regression equation.

$$\text{Eq. (6): } RERLCI_{it} = \alpha + \beta_1 Ctrl.Corr_{it} + \beta_2 Gov.Eff_{it} + \beta_3 Pol.Stab_{it} + \beta_4 Reg.Qlty_{it} + \beta_5 Rule.Law_{it} + \beta_6 Voice.Acc_{it} + country_{it} + \varepsilon_{it}.$$

The dependent variable is the renewable energy investment for low-carbon economy for country i at time t ($RERLCI_{it}$). On the right-hand side of the equation, independent variables include control of corruption, governance effectiveness, political stability, regulatory quality, rule of law, and voice and accountability.

Table 8: Governance Indicators Panel Regression

Parameters	Variable	Coefficient	Std. error	t-statistics	Probability
α	Constant	0.3659***	0.0187	19.47	0.000
β_1	Ctrl of Corruption	0.0325	0.0315	1.03	0.303
β_2	Gov Effectiveness	0.0730 *	0.0382	1.91	0.056
β_3	Political Stability	0.0052	0.0280	0.19	0.851
β_4	Regulatory Quality	0.0698**	0.0320	2.18	0.029
β_5	Rule of Law	0.0762 *	0.0413	1.85	0.065
β_6	Voice & Accountability	-0.0037	0.0220	-0.17	0.867
Adjusted R^2	0.372				
Wald Chi^2	106.53				0.0000

Conclusion

The results show that in terms of the positive or negative effects of the regression on renewable energy investment for low-carbon economy. In the following discussion, highlight economic instruments, environmental instruments, social instruments, and governance instruments effects the renewable energy investment for low-carbon economy.

For economic instruments, GDP annual growth rate, currency movement, debt to GDP ratio, and fossil fuel subsidies have positive relationship with renewable energy investment for low-carbon economy, while interest rate, foreign direct investment annual growth rate, net inflows, and unemployment rate have negative relationship with renewable energy investment for low-carbon economy. However, none of the indicators are significant. For environmental instruments, electricity production from fossil fuel, electricity production from renewable energy, and CO2 emissions from fossil fuel per population have positive relationship with renewable energy investment for low-carbon economy, while out of three indicators, only CO2 emissions from fossil fuel per population has significant relationship with renewable energy investment for low-carbon economy.

For social instruments, electricity power transmission& distribution losses, electricity consumption per population, availability of latest technologies, and affordability of financial services have positive relationship with renewable energy investment for low-carbon economy, while out four positive indicators, only affordability of financial services is not significant with renewable energy investment for low-carbon economy. On other hand, capacity for innovation has negative and significant relationship with renewable energy investment for low-carbon economy. For governance instruments, governance effectiveness, control of corruption, regulatory quality, political stability and absence of violence, and rule of law have positive relationship with renewable energy investment for low-carbon economy, while out five positive indicators, control of corruption and political stability are not significant with renewable energy investment for low-carbon economy. On other hand, voice and accountability has negative relationship with renewable energy investment for low-carbon economy.

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DOI: https://doi.org/10.62754/joe.v3i7.4181

After reviewing the situation and making recommendations, it is clear that there are several impediments that might prevent MENA states from attaining their objectives. Nonetheless, the long-term policies and legislative framework they have established will enable them to accomplish their objectives, provided they adhere to them and do not deviate from the route they have described. The empirical findings indicate that developing a responsible investment index for renewable energy has a favourable effect on renewable energy investment for a low-carbon economy in MENA nations. RERII can be utilised as a screening and decision-making tool for investments. It greatly decreases the time required for conscientious investors to conduct screening. It is an excellent tool for investment decision makers, academics, and other interested parties. Future research may include the energy use of certain sectors, such as the residential sector, the industrial sector, and the service sector, to gain a better understanding. Examining individual sectors may aid decision makers in their comprehension.

References

Abdmouleh, Z., Alammari, R. A., & Gastli, A. J. R. S. E. R. (2015). Recommendations on renewable energy policies for the GCC countries. 50, 1181-1191.
Alabdulrazag, B., & Alrajhi, A. J. I. R. o. M. B. R. (2016). The validity of environmental kuznets curve hypotheis in the kingdom of saudi arabia: ARDL bounds testing approach to cointegration. 5(4), 1450.
Allali, M., Tamali, M., & Rahli, M. J. E. P. (2015). The impact of CO2 emission on output in Algeria. 74, 234-242.
Alshehry, A. S., & Belloumi, M. J. R. S. E. R. (2015). Energy consumption, carbon dioxide emissions and economic growth: The case of Saudi Arabia. 41, 237-247.
Amadeo, K. (2020). How to Do a Full Property Market Analysis in Commercial Real Estate Hurstville.
Asif, M., Sharma, R. B., & Adow, A. H. E. J. A. S. S. (2015). An empirical investigation of the relationship between economic growth, urbanization, energy consumption, and CO2 emission in GCC countries: a panel data analysis. 11(21), 270.
Azhar, K. M. D. M. M., & Murtaza, Z. (2020). Impact of Agitational Politics on Inflation: A Case Study of Pakistan.
Bayomi, N., & E Fernandez, J. J. E. (2019). Towards sustainable energy trends in the Middle East: A study of four major emitters. 12(9), 1615.
Bekhet, H. A., Matar, A., & Yasmin, T. J. R. S. E. R. (2017). CO2 emissions, energy consumption, economic growth, and financial development in GCC countries: Dynamic simultaneous equation models. 70, 117-132.
Bisogno, M., & Cuadrado-Ballesteros, B. (2019). The Role of Public Sector Accounting on Financial Sustainability and Governmental Effectiveness. In Financial Sustainability of Public Sector Entities (pp. 123-144): Springer.
Bouznit, M., & Pablo-Romero, M. d. P. J. E. P. (2016). CO2 emission and economic growth in Algeria. 96, 93-104.
Brand, B., & Blok, K. J. E. S. R. (2015). Renewable energy perspectives for the North African electricity systems: A comparative analysis of model-based scenario studies. 6, 1-11.
Bryman, A., & Bell, E. (2015). Business research methods: Oxford University Press, USA.
Bulut, U., & Muratoglu, G. J. E. P. (2018). Renewable energy in Turkey: Great potential, low but increasing utilization, and an empirical analysis on renewable energy-growth nexus. 123, 240-250.
Charfeddine, L. J. E. E. (2017). The impact of energy consumption and economic development on Ecological Footprint and CO2 emissions: Evidence from a Markov Switching Equilibrium Correction Model. 65, 355-374.
Cîrstea, S. D., Moldovan-Teselios, C., Cîrstea, A., Turcu, A. C., & Darab, C. P. J. S. (2018). Evaluating renewable energy sustainability by composite index. 10(3), 811.
Fakhri, I., Hassen, T., & Wassim, T. (2015). Effects of CO2 emissions on economic growth, urbanization and welfare: application to mena countries.
Farooquee, A. A., & Shrimali, G. (2016). Driving Foreign Investment to Renewable Energy in India: A Payment Security Mechanism to Address Off-Taker Risk.
Glass, L.-M., & Newig, J. J. E. S. G. (2019). Governance for achieving the Sustainable Development Goals: How important are participation, policy coherence, reflexivity, adaptation and democratic institutions? , 2, 100031.
Gupta, S., & Tirpak, D. (2007). Policies, instruments and co-operative arrangements" i B. Metz, OR Davidson, PR Bosch, R. Dave, LA Meyer (red.) Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. In: Cambridge University Press, Cambridge.
Hamrita, M. E., & Mekdam, M. (2016). Energy consumption, CO2 emissions and economic growth nexus: Evidence from panel Granger causality test.
Hochstrasser, A. (2015). Challenges and opportunities in Middle East and North Africa. In: Elsevier.
IPCC. (2018). Global Warming of 1.5 C,. Intergovernmental Panel on Climate Change.
IRENA. (2016). Renewable Energy Market Analysis: the GCC Region. Abu Dhabi.
IRENA. (2019). Renewable Energy Market Analysis: GCC countries. International Renewable Agency.
Jafari, Y., Ismail, M. A., Othman, J., Mawar, M. Y. J. C. J. o. P. R., & Environment. (2015). Energy consumption, emissions and economic growth in Bahrain. 13(4), 297-308.
Javed, Z. H., Waseem, L. A., Shabbir, M., & Mushtaq, A. Q. J. J. o. H. C. A. R. (2018). Political Stability in Absence of Violence and Economic Growth in Pakistan. 7(5), 367-377.
Lee, C. W., & Zhong, J. J. R. E. (2014). Top down strategy for renewable energy investment: Conceptual framework and implementation. 68, 761-773.

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DOI: https://doi.org/10.62754/joe.v3i7.4181

Lee, C. W., & Zhong, J. J. R. S. E. R. (2015). Construction of a responsible investment composite index for renewable energy industry. 51, 288-303.

Liu, W., Zhang, X., & Feng, S. J. R. E. (2019). Does renewable energy policy work? Evidence from a panel data analysis. 135, 635-642.

Madrigal, M., & Stoft, S. (2012). Transmission expansion for renewable energy scale-up: emerging lessons and recommendations: The World Bank.

Magazzino, C., & Cerulli, G. J. I. J. o. S. D. W. E. (2019). The determinants of CO2 emissions in MENA countries: a responsiveness scores approach. 26(6), 522-534.

Magazzino, C. J. E. S., Part B: Economics, Planning,, & Policy. (2016). CO2 emissions, economic growth, and energy use in the Middle East countries: A panel VAR approach. 11(10), 960-968.

Magazzino, C. J. E. S. D. (2017). The relationship among economic growth, CO 2 emissions, and energy use in the APEC countries: A panel VAR approach. 37(3), 353-366.

Magazzino, C. J. I. J. o. S. D. W. E. (2015). Economic growth, CO2 emissions and energy use in Israel. 22(1), 89-97.

Magazzino, C. J. I. J. o. S. E. (2016). The relationship between CO2 emissions, energy consumption and economic growth in Italy. 35(9), 844-857.

Malik, K., Rahman, S. M., Khondaker, A. N., Abubakar, I. R., Aina, Y. A., & Hasan, M. A. J. E. S. P. R. (2019). Renewable energy utilization to promote sustainability in GCC countries: policies, drivers, and barriers. 26(20), 20798-20814.

Menichetti, E., El Gharras, A., Duhamel, B., & Karbuz, S. J. M. (2019). The MENA Region in the Global Energy Markets. 75.

Mercure, J.-F., Knobloch, F., Pollitt, H., Paroussos, L., Scrieciu, S. S., & Lewney, R. J. C. P. (2019). Modelling innovation and the macroeconomics of low-carbon transitions: theory, perspectives and practical use. 19(8), 1019-1037.

Mugableh, M. I. J. I. J. o. E., & Finance. (2015). Economic growth, CO2 emissions, and financial development in Jordan: Equilibrium and dynamic causality analysis. 7(7), 98-105.

Myrsalieva, N., & Barghouth, A. (2015). Arab Future Energy Index™(AFEX) energy efficiency 2015. In: Cairo: RCREEE.

Nathaniel, S., Anyanwu, O., & Shah, M. J. E. S. P. R. (2020). Renewable energy, urbanization, and ecological footprint in the Middle East and North Africa region. 1-13.

OECD. (2007). OECD territorial reviews: competitive cities: a new entrepreneurial paradigm in spatial development: Publications de l'OCDE.

Omri, A., Daly, S., Rault, C., & Chaibi, A. J. E. E. (2015). Financial development, environmental quality, trade and economic growth: What causes what in MENA countries. 48, 242-252.

Petroleum, B. J. B. P. (2017). BP statistical review of world energy 2017. 66, 1-52.

Pranti, A. S., Iqubal, M. S., Saifullah, A., & Ahmmed, M. K. J. I. J. S. T. R. (2013). Current energy situation and comparative solar power possibility analysis for obtaining sustainable energy security in South Asia. 2, 1-10.

Salahuddin, M., Gow, J., & Ozturk, I. J. R. S. E. R. (2015). Is the long-run relationship between economic growth, electricity consumption, carbon dioxide emissions and financial development in Gulf Cooperation Council Countries robust? , 51, 317-326.

Schmidt, T. S., Steffen, B., Egli, F., Pahle, M., Tietjen, O., & Edenhofer, O. J. N. S. (2019). Adverse effects of rising interest rates on sustainable energy transitions. 2(9), 879-885.

Spetan, K. J. I. J. o. B. E. R. (2016). Renewable energy consumption, CO2 emissions and economic growth: a case of Jordan. 5(6), 217-226.