

The policy of transitioning to renewable energy and its role in achieving sustainable development in Arab countries

A Case Study of Algeria

Boulmelh mounira*¹, Laib sihem²

1-MCB. Mohammed Seddik Ben Yahia University - Jijel, Algeria. Faculty of Economic Sciences, Management, and Commercial Sciences, Department of Commercial Sciences. mounira.boulmelh@univ-jijel.dz

2- MCA. Mohammed Seddik Ben Yahia University - Jijel, Algeria. Faculty of Economic Sciences, Management, and Commercial Sciences, Department of economic Sciences. laib.siham@univ-jijel.dz

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Abstract:

In the context of ongoing global efforts to eliminate carbon emissions and meet the growing demand for energy worldwide, Algeria, like other countries, has embarked on the path of energy transition towards the exploitation of renewable energy sources. This is aimed at reducing dependency on oil and diversifying energy resources. Algeria has sought to develop and enhance its abundant resources and available potentials in renewable energy sources and to seize all economic opportunities to encourage investment in this sector, thereby increasing economic growth and sustainable development. This study aimed to analyze Algeria's strategy for achieving this transition and the key accomplishments and projects that have been implemented.

The study concluded that Algeria has indeed taken the first steps toward transitioning to renewable energies in accordance with the National Program for the Promotion of Renewable Energies by 2030. Algeria can be classified as being in the launching phase of renewable energies, where fossil fuels still play a dominant role in the Algerian energy sector and the economy as a whole.

Keywords: Renewable energies; sustainable development; energy transition policy._

* *Corresponding author.*

INTRODUCTION

Energy is considered the primary driver and the lifeblood of every society. The demand for energy has increased significantly in recent decades as a result of this. But if the use of conventional energy sources keeps growing, there will be a threat in the form of pollution in the environment, which has become more pronounced and is having a detrimental impact on the ecosystem's ability to maintain its ecological balance. As a result, there has been a change in focus toward using renewable energy sources to achieve sustainable development. There is no doubt that the energy system plays an important role in achieving development. It is a key factor in boosting production and increasing economic and social growth by creating job opportunities and improving the overall standard of living. In other words, any disruption in energy supply will inevitably result in significant economic losses. All of this has necessitated a shift towards adopting alternative, sustainable, and renewable energy sources to ensure the continuity of the energy system and achieve sustainable development.

The economies of Arab countries heavily rely on traditional energy sources (oil, coal, natural gas) in the energy sectors. Development has become closely tied to the revenues from the export of these conventional energy sources. Any increase or decrease in the prices of these energies will undoubtedly negatively impact development policies in these countries, leading to severe crises resulting from price declines, not to mention the issue of the depletion of these traditional energy sources.

All of this has forced Arab countries to search for new energy sources by adopting a range of policies and programs aimed at developing and utilizing renewable energy. These countries have made substantial investments in this field to advance and activate renewable energy use, with the goal of establishing sustainable development principles, preserving the environment, ensuring the sustainability of depletable and environmentally harmful traditional energy sources, and mitigating social issues such as poverty and unemployment.

Statement of the Problem: Based on the above, this research paper will attempt to address the following issue:

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How can the policy of transitioning to renewable energy sources serve as a tool for achieving sustainable development in Arab countries, including Algeria?

The aim of the Study:

The objectives of the study are as follows:

- Defining the concept of renewable energy and discuss its main sources;
- Highlighting the role of renewable energy in achieving the goals and dimensions of sustainable development;
- Presenting the current energy policy in Algeria, focusing on renewable energy sources, the motivations for their utilization, and the strategy adopted in this field.

Study Sections: In this research paper, we will cover the following elements:

- Concepts related to renewable energy and sustainable development
- The current state of the transition policy towards renewable energy in Algeria
- Barriers and challenges of using renewable energy and ways to address them.

sub-questions:

Here's the translation of your questions:

- Why is there a shift towards consuming renewable energy, and what is its relationship to sustainable development?
- What are the barriers and challenges of transitioning to renewable energy consumption?
- What is the current state of renewable energy and energy transition in Algeria?

First: Concepts Related to Renewable Energy and Sustainable Development

1. Definition of Renewable Energy and Its Sources:

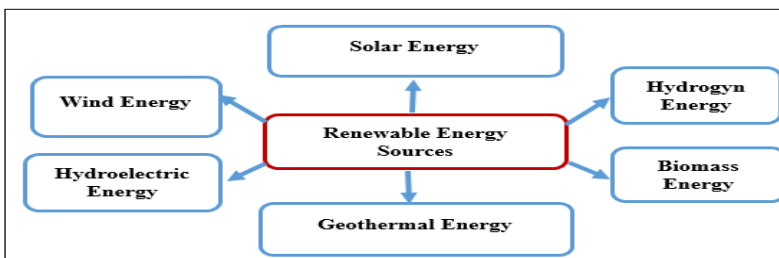
Renewable energy resources are those that come from natural processes like sunshine, wind, water, and biofuels and are replaced more quickly than they are used up, according to the International Energy Agency (IEA). The shift to a more sustainable energy system with a reduced carbon intensity depends heavily on these sources (Ahlam, 2014, p. 6).

Renewable energy is defined by the United Nations Environment Programme (UNEP) as energy that is periodically replenished rather than originating from a fixed and limited supply in nature. It can be found in five different forms: geothermal, hydroelectric, biomass, solar, and wind energy (Tawati, 2020, p. 16).

Renewable energy is any energy that comes from solar, geophysical, or biological sources that is renewed in nature at a rate that is equal to or greater than its consumption, according to the Intergovernmental Panel on Climate Change (IPCC). The source of this energy is the natural flow of energy, which includes wind, solar, geothermal, biomass, water movement, and tidal energy in seas. Using a variety of technologies that offer energy services like fuel and electricity, these sources can be transformed into primary energies like heat, electrical energy, and kinetic energy through a series of processes (Bouzeid & Mohamed, 2017, p. 116).

From the previous definitions, we can conclude that renewable energy sources are represented in the following form:

Figure 01: Sources of Renewable Energy



Source: Prepared by the researchers.

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Definition of Sustainable Development and Its Dimensions:

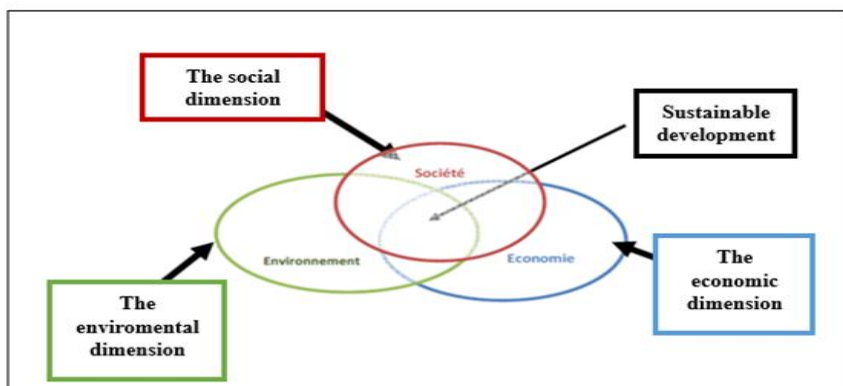
The concept of sustainable development has crystallized over the last few decades of the past century, particularly in the early 1970s. This period witnessed a rise in environmental awareness and an increased focus on preserving natural resources, combating pollution, and avoiding disruptions that could reduce or eliminate the future generations' ability to live in satisfactory conditions. Governments around the world realized that environmental issues could not be separated from economic development issues, necessitating the maintenance of a balance between the economy and the ecosystem.

Below, we will discuss the most important definitions of sustainable development, starting with the most widely quoted definition:

- **Sustainable development:** is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (United Nations, 2002).

- Ghneim and Abu Zant (2007) explore the philosophy and planning methods of sustainable development. that takes into account both the social and environmental aspects of economic growth. It also involves protecting future generations' rights, reducing the risks of environmental degradation, and making the best use of the resources at hand to meet individual needs while maintaining social justice and equality.

Figure 02: Dimensions of Sustainable Development



Source: Prepared by the researchers.

- The Relationship Between the Shift to Renewable Energy and Sustainable Development:

Currently, it is impossible to discuss sustainable development without addressing the energy transition towards the use of renewable energy, as they are closely linked and highly interrelated. Renewable energy contributes significantly to achieving the dimensions of sustainable development through the following:

A- The Role of Renewable Energy in Achieving the Economic Dimension of Sustainable Development:

(Kumar, 2020) Due to rapid population expansion, a growing economy, and improvements in living standards, there is a greater need for conventional energy, which could result in lower access to energy services and higher energy expenditures. Nearly all products and services require energy as an input, and without it, most economic activity would be impacted. As a result, it is thought that the best approach to handle the problem of satisfying the rising energy demand to accomplish economic development is to take advantage of renewable energy sources. the following are the primary ways that renewable energy helps to realize the economic aspect of sustainable development (p. 7):

At the macroeconomic level the deployment of renewable energy has unlimited potential to stimulate the economy and attract more investment. Establishing new renewable energy projects will contribute to generating more wealth through the efficient use of resources at affordable prices, as well as reducing fossil fuel imports. Additionally, the deployment of renewable energy projects encourages the growth of an industry for various by-products required in the renewable energy sector, such as the production of silicon used in solar cells, batteries, electrical inverters, and other products.

-Increased access to modern forms of energy contributes to transforming agricultural-based economies into industrial-based economies, where modern forms of energy play a key role in more advanced value-added activities that characterize more industrialized economies.

b- The Role of Renewable Energy in Achieving the Social Dimension of Sustainable Development:

Universal access to electricity and modern energy sources enables a wide range of superior energy services, even in situations where energy use is limited. By improving health and education, the use of renewable energy sources by individuals raises living standards and boosts social development indices. Here are some examples of how the social component of sustainable development is impacted by the use of renewable energy. (Sahari, 2022, p. 49):

- Access to modern forms of energy requires a large workforce, which will contribute to job creation, potentially reducing poverty levels directly.
- Access to modern forms of energy significantly improves the quality and availability of educational services. Electrification of rural areas helps retain good teachers, which in turn enhances the quality of rural education.
- Providing sustainable energy in the healthcare sector contributes not only to supplying electricity for lighting, cooling, and powering medical equipment but also enhances modern healthcare services by offering cleaner and more affordable fuels for institutional use.

C- The Role of Renewable Energy in Achieving the Environmental Dimension of Sustainable Development:

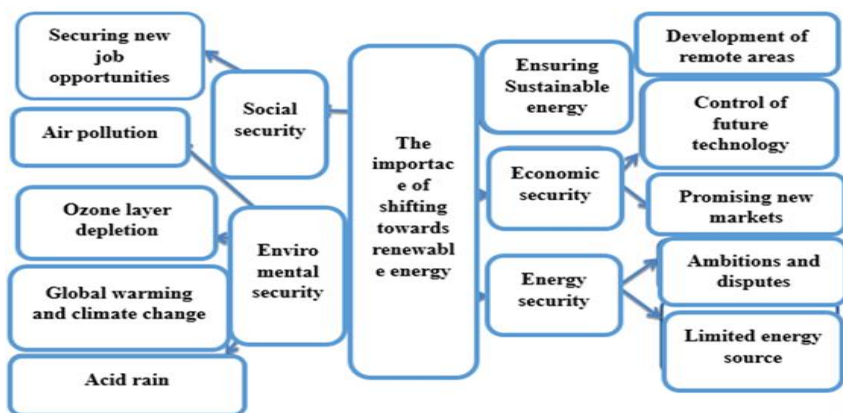
The production of electricity through renewable energy sources helps mitigate the negative environmental effects of the energy industry, like lower carbon dioxide emissions from power plants that burn coal, oil, and natural gas. Thus, the effects of air and water pollution, as well as global warming, are lessened. These factors pose a threat to human health and can result in major ailments like respiratory disorders, neurological damage, heart problems, and more. By preventing a variety of other environmental risks, such as seawater pollution and the endangerment of marine life brought on by the release of fossil fuel liquids containing toxic materials and heavy metals like lead and mercury, renewable energies not only protect human life but also wildlife. Additionally, acid rain, caused by the

interaction of water particles in the atmosphere with sulfur dioxide and nitrogen oxide emissions, harms forests, lakes, and freshwater, and it also causes the corrosion of steel structures like bridges and the weathering of stone buildings

The world strives for sustainable development, which is facilitated by renewable energy sources like solar and wind power, and which requires realizing the maximum possible environmental balance. Using energy sources that don't negatively impact the environment or climate is one way that countries can achieve economic equilibrium. (Bouhlal, 2020, p. 357).

The following figure summarizes briefly the main results of the energy transition and its relationship to the dimensions of sustainable development:

Figure 03: The Importance of Transitioning to Renewable Energy for Achieving Sustainable Development



Source: Prepared by the researchers

Secondly: The Reality of the Energy Transition Policy towards Renewable Energy in Algeria

Internal factors such as the decline in national oil and gas reserves and the annual increase in domestic demand by about 7%, along with external factors such as falling fuel prices and the global shift towards renewable energy, have been putting pressure on decision-makers in Algeria to respond to these changes. This has made the energy transition a necessity for Algeria.

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In this context, Algeria has outlined a national program aimed at transitioning from a model of traditional energy production and consumption to a model that enhances the use of sustainable renewable energy. This will help avoid energy shortages and increase opportunities for energy exports in international markets.

In 2011, Algeria adopted the National Renewable Energy and Energy Efficiency Program for 2030, which aims to expand the use of renewable energy to reduce reliance on natural gas as the dominant source for electricity generation. The program targets a renewable energy contribution of around 27%, with the goal of producing 22,000 megawatts of electrical energy, of which approximately 10,000 megawatts would be exported, and the remainder allocated to domestic consumption.

In 2015, the program was revised while maintaining its broad objectives of conserving fossil energy resources through efficient consumption. However, the share of photovoltaic solar energy was increased fivefold to contribute 62% of the planned 22,000 megawatts for 2030. Through this program, Algeria also aims to protect the environment and contribute to international efforts to reduce carbon dioxide emissions, with a planned reduction of 60% in greenhouse gases by 2030, thus supporting the achievement of sustainable development goals.

The National Energy Transition Program was also launched in February 2020. This program aims to diversify energy sources by developing renewable energies and implementing large-scale renewable electricity projects. Additionally, it focuses on enhancing energy efficiency measures across various sectors to achieve energy savings by 2030.

- **Renewable Energy Potential in Algeria:**

- **Solar Energy:** Ouahiba (2011) Due to its geographical location, Algeria has some of the most significant solar fields in the world. The duration of sunshine across Algeria exceeds 2,000 hours per year and can reach up to 3,900 hours in the high plateaus and desert regions. The daily energy obtained from a horizontal area of 1 square meter reaches 5 kilowatt-hours across most parts of Algeria, which is about

1,700 kilowatt-hours per square meter per year in the north and 2,650 kilowatt-hours per square meter per year in the south.

- **Wind Energy:** Universal access to electricity and modern energy sources enables a wide range of superior energy services, even in situations where energy use is limited. By improving health and education, the use of renewable energy sources by individuals raises living standards and boosts social development indices. Here are some examples of how the social component of sustainable development is impacted by the use of renewable energy. (Sihem 2023).

Additionally, Algeria has over 200 geothermal sources, with Jurassic limestone in northern Algeria representing a significant reserve of geothermal heat. The country also possesses substantial hydropower potential, receiving large amounts of rainfall annually, estimated at around 65 billion cubic meters, and a significant reserve of untapped biomass for energy generation.

- **Achievements in Renewable Energy in Algeria:**

The Algerian government aims to generate about 15 gigawatts of renewable energy by 2035, relying on photovoltaic solar energy, solar thermal energy, wind energy, as well as combined generation, biomass, and geothermal energy. By the end of December 2021, the total capacity of renewable energy in Algeria reached 567.1 megawatts, excluding hydropower. Algeria has successfully equipped approximately 840 schools with solar systems, with an estimated capacity of 6.7 megawatts in these schools by the end of last year. The country plans to add 2 megawatts more, dedicated to around 339 schools.

The launch of the "Solar Project" aims to generate 1,000 megawatts annually, reaching 15 gigawatts by 2035. The project includes plans to produce 50 megawatts in Béchar, 100 megawatts in Ouargla, 250 megawatts in Touggourt, and 300 megawatts in both Laghouat and El Oued. Algeria intends to start producing the first 50 megawatts from the project in the first half of 2023.

Algeria collaborates with international organizations and countries to secure funding, facilitate technology transfer, and enhance expertise in various sectors, including renewable energy and innovation.

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Engagement with International Organizations

1. **World Bank** – Algeria has worked with the World Bank on economic development projects, including infrastructure and energy initiatives.
2. **African Development Bank (AfDB)** – The AfDB supports Algeria in financing sustainable development projects, particularly in energy and digital transformation.
3. **European Union (EU)** – Algeria participates in EU-funded research and innovation programs, such as the Partnership for Research and Innovation in the Mediterranean Area (PRIMA), focusing on water scarcity, agriculture, and food security.

Additionally, previous projects include supplying many households and offices in the south with photovoltaic solar systems, as well as the development of several hybrid solar power stations.

• Key Achievements of the National Energy Efficiency Program:

Construction Sector: This sector is the largest energy consumer, accounting for 46% of total energy consumption. The following results have been achieved:

ECO-LUMIERE Program:

a- Indoor Lighting: 500,000 energy-efficient light bulbs (LBC) were given out to different households in 22 provinces as part of the program. The government started a project to distribute one million light bulbs across the country during the expansion phase. CNES in 2020.

b- Public Lighting: As an initial phase, 10,000 traditional light bulbs were replaced with energy-efficient bulbs in 27 municipalities in Algiers. Additionally, 1,996 LED lights were installed in 4 municipalities. Currently, efforts are underway to upgrade the public lighting network, which consists of approximately 3.5 million light bulbs, by installing LED bulbs at an average rate of 40,000 per year.

-AL-SOL Program: The creation of solar water heaters is the main

objective of this program. It has placed in 500 solar water heaters in mosques, schools, and different types of homes. Another 2,000 heaters are in the process of being in. The usage of solar water heaters has also been promoted by the government.

-ECO-BAT Program: This program is dedicated to thermal insulation of buildings. It has provided thermal insulation for 600 residences across 11 provinces. Additionally, thermal insulation is underway for 1,000 new homes and 1,000 renovated homes.

-Transportation Sector: Consuming 30% of total energy use, the sector has achieved the following under the PROP-AIR Program:

- Conversion of approximately 56,000 private vehicles and 9,385 public administration vehicles to operate on LPG (liquefied petroleum gas) instead of gasoline to reduce air pollution.

- A program is underway to convert an additional 150,000 vehicles.

- This has led to the establishment of 800 conversion workshops and 7 training centers.

Third: Obstacles and Challenges in Using Renewable Energy in Arab Countries and Solutions

The energy transition process in various Arab countries, including Algeria, faces numerous challenges, including technical, technological, financial, and marketing issues. To achieve the policies set by these countries in the field of renewable energy and reach the desired goals, it is essential to seek solutions to address these obstacles.

- **Obstacles and Challenges in Using Renewable Energy in Arab Countries:**

- High Capital Requirements:** The initial investment needed for renewable energy projects is significantly higher, and the return on investment often takes longer compared to fossil fuel sources (Boujemaa & Hamza, 2014).

Renewable energy infrastructure, such as solar farms and wind turbines, involves significant financial considerations across different phases of development. Here's a breakdown:

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Capital Expenditure (CAPEX): CAPEX represents the upfront investment required to establish the infrastructure. This includes:

- **Land acquisition** and site preparation
- **Equipment costs** (solar panels, wind turbines, inverters, transformers)
- **Installation and construction** expenses
- **Grid connection** and transmission infrastructure
- **Permits and regulatory compliance** fees

For renewable projects, CAPEX tends to be **high**, as most costs are concentrated in the initial setup rather than ongoing fuel expenses.

Operating Expenditure (OPEX)

OPEX covers the ongoing costs of maintaining and operating the infrastructure, including:

- **Maintenance and repairs** (e.g., replacing turbine blades or solar panel cleaning)
- **Administrative costs** (staff salaries, insurance, monitoring systems)
- **Land lease payments** (if applicable)
- **Grid fees and taxes**

Compared to fossil fuel plants, renewable energy projects generally have **lower OPEX**, as they do not require fuel purchases.

Return on Investment (ROI)

ROI depends on several factors:

- **Energy production efficiency** (capacity factor of solar panels or wind turbines)
- **Government incentives** (subsidies, tax credits, feed-in tariffs)
- **Market electricity prices** (higher prices improve profitability)

- **Financing costs** (interest rates on loans, availability of green financing)

The **cost of capital** plays a crucial role in determining the financial viability of renewable projects. Access to **low-cost financing** can significantly improve ROI.

- **Limited Local Manufacturing Capacities:** Local manufacturing capabilities for renewable energy equipment are limited, and there is a lack of competitiveness with global companies due to insufficient national technical expertise. This forces authorities to rely on international consulting firms, alongside inadequate funding for scientific research and development of renewable energy technologies.

- **Pricing Discrepancies:** The difference between energy pricing and the average cost of production, combined with substantial subsidies for traditional energy sources over decades, negatively impacts investment in renewable energy and energy efficiency, particularly affecting the private sector and households in Algeria.

- **Limited Control Over Renewable Technologies:** There is a lack of control over and expertise in renewable energy technologies.

Energy Storage Challenges: inadequate control over energy storage technologies for energy generated from renewable sources.

- **Administrative and Financial Barriers:** Challenges in project implementation due to administrative and financial hurdles.

- **Marketing Issues:** Potential marketing problems that solar energy projects might face.

- **Weak Legal Framework:** A lack of a robust legal framework that precisely defines the production and utilization of renewable energy in Algeria.

- **Ways to Address the Challenges of Developing the Renewable Energy Sector in Algeria:**

Public-private partnerships (PPPs) play a crucial role in financing renewable energy projects by leveraging private sector expertise and funding while ensuring public sector oversight and support. Here's a breakdown of their impact and the challenges involved:

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Role of PPPs in Renewable Energy Financing

1. **Risk Sharing** – PPPs allow governments to distribute financial and operational risks with private investors, making large-scale projects more feasible.
2. **Access to Capital** – Private sector involvement brings in additional funding sources, reducing reliance on government budgets.
3. **Technology and Innovation** – Private companies contribute advanced technologies and efficient management practices.
4. **Long-Term Sustainability** – PPPs ensure that projects remain financially viable through structured agreements, maintenance contracts, and performance-based incentives.

Challenges in Attracting Private Capital and Foreign Investment

- **Regulatory Uncertainty** – Inconsistent policies, unclear legal frameworks, and sudden changes in government regulations deter investors.
- **High Initial Costs** – Renewable energy projects require substantial upfront investment, which can be a barrier for private entities.
- **Market Risks** – Fluctuations in energy prices and demand can impact profitability, making investors cautious.
- **Political and Economic Instability** – In developing regions, concerns about governance, corruption, and economic volatility can discourage foreign investment.
- **Limited Financial Incentives** – Lack of subsidies, tax benefits, or favorable financing mechanisms reduces attractiveness for private investors.
- **Promote Participation:** Engaging both the public and private sectors, as well as civil society, in energy policy formulation is crucial. Effective transition requires active involvement from all stakeholders in both the design and implementation phases of energy policies.
- **Enhance Energy Efficiency:** The government should adopt policies to increase energy efficiency, which will enhance the proportion of

generated energy. Energy conservation is considered the most effective approach to reducing energy consumption costs.

-Align Educational Output with Energy Transition Needs:

Universities and vocational training centers should align their outputs with the requirements of the energy transition. This includes training highly specialized professionals and enhancing research related to solar energy, efficient lighting, biofuel technologies, hydrogen, and other renewable energy studies.

- Improve Transparency and Accountability: The government should enhance transparency and accountability in the energy sector. Transparent processes allow for objective assessment of performance by individuals and institutions. Additionally, regulatory and oversight bodies, such as the National Energy Council, need to be empowered to carry out their roles effectively (MERTE, 2021).

Monitoring and evaluating renewable energy projects come with several challenges, particularly in data collection, transparency, and accountability. Here's a breakdown:

Challenges in Data Collection

1. **Integration of Multiple Data Sources** – Renewable energy projects rely on various data streams, including weather conditions, grid performance, and equipment efficiency. Ensuring seamless integration is complex.
2. **Real-Time Data Processing** – Large volumes of real-time data from solar panels and wind turbines require advanced analytics and storage solutions.
3. **Cyber security Risks** – Protecting sensitive energy data from cyber threats is crucial, especially as digital monitoring systems become more interconnected.

Challenges in Transparency

□ **Regulatory Uncertainty** – Inconsistent policies and unclear reporting standards can hinder transparency in project evaluations.

1. **Stakeholder Engagement** – Limited community involvement and lack of accessible data can reduce trust in renewable energy initiatives.

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2. **Financial Disclosure Issues** – Some projects face challenges in openly sharing cost structures, subsidies, and investment details.

Challenges in Accountability

1. **Corruption Risks** – Large-scale renewable investments can be vulnerable to favoritism, fraud, and mismanagement.
2. **Performance Tracking Difficulties** – Ensuring that projects meet promised efficiency and sustainability goals requires robust auditing mechanisms.
3. **Long-Term Sustainability Metrics** – Measuring the environmental and economic impact of renewable projects over decades remains a challenge.

Conclusion:

Algeria is provided with substantial reserves of conventional and sustainable energy resources. The Algerian government has implemented a number of encouraging policies targeted at advancing energy efficiency and renewable energy in order to take advantage of these clean resources. To facilitate the funding of combined energy and renewable energy projects, this entails creating an appropriate legal framework and a national energy fund. Furthermore, a bold national program has been established with the aim of making renewable energy sources account for 27% of electricity production by 2030, establishing these sources as a turning point for sustainable economic development and a unique model for economic expansion.

Despite achieving several milestones in the renewable energy sector, challenges remain that have hindered the implementation of the national plan according to its scheduled timeline. Our research has led to the following conclusions:

- Algeria, like other developing countries, has pursued the development of its renewable energy potential to achieve sustainable development. However, it remains far from the desired outcomes due to a lack of serious political will to enhance efforts to utilize this energy.

- Despite Algeria's efforts to establish an alternative energy model to oil, it still lacks a clear strategy for expanding the use of renewable energy sources.

Cost is still a big problem in Algeria, particularly when it comes to solar energy and the parts that go with it. Renewable energy has lower operating costs than traditional energy, but it won't reach its full potential until both producers and consumers can afford it.

- The efforts made in developing renewable energy in Algeria, including achievements and future prospects, do not align with the vast potential available in this field.

Algeria's transition to renewable energy has the potential to significantly reduce its reliance on energy imports while generating long-term economic savings. Here's how:

Reducing Energy Imports

1. **Harnessing Domestic Resources** – Algeria has abundant solar and wind energy potential, allowing it to produce electricity locally rather than importing fossil fuels.
2. **Energy Independence** – By expanding renewable infrastructure, Algeria can decrease its dependence on imported natural gas and refined petroleum products.
3. **Diversification of Energy Sources** – A diversified energy mix strengthens Algeria's resilience against global price fluctuations and supply chain disruptions.

Long-Term Economic Savings

1. **Lower Operational Costs** – Unlike fossil fuel plants, renewable energy systems have minimal fuel costs, reducing long-term expenditures.
2. **Reduced Subsidy Burden** – Algeria heavily subsidizes fossil fuels; shifting to renewables can ease financial pressure on the government.
3. **Job Creation and Economic Growth** – Investments in renewable energy stimulate local industries, creating

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employment opportunities and fostering technological innovation.

Algeria's renewable energy strategy aims to generate **15,000 MW by 2035**, with **1,000 MW of solar power added annually**. This shift will not only enhance energy security but also contribute to sustainable economic development.

Recommendations:

Efficiently exploit natural resources, especially those susceptible to depletion, and encourage and incentivize foreign investments due to their expertise in the sector.

- Educate consumers on the importance of energy conservation and the benefits of adopting clean energy sources.

Promote resources outside of the fossil fuel industry and gradually reduce the significant subsidies for fossil fuels. Make the switch to renewable energy and put different plans and strategies into place to maximize the use of existing renewable energy sources.

- Increase awareness among individuals and institutions about the importance of renewable energy as a clean and sustainable source through conferences and incorporation into educational curricula at various stages.
- Given Algeria's limited oil reserves and current resources, replace a significant portion of traditional energy with renewable energy by adopting a green strategy based on sustainable criteria, which will provide long-term benefits to the Algerian economy.

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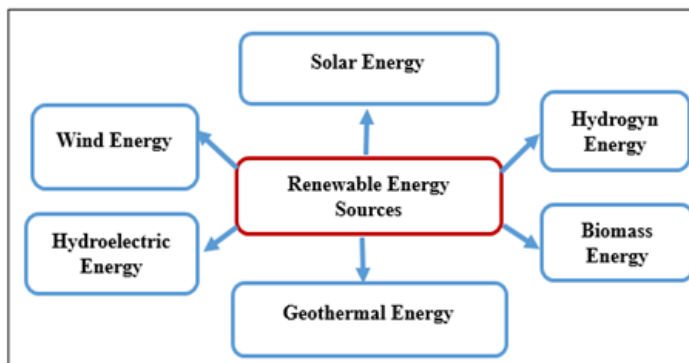
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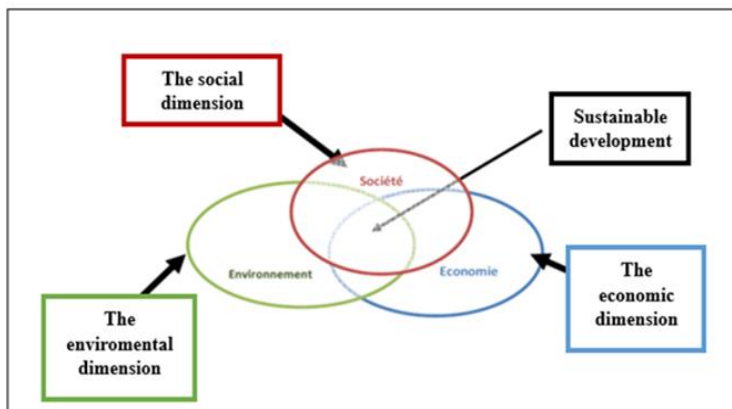
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Appendices

Appendix A



Appendix B



Appendix C

