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The Inevitable Shift towards Renewable Energy as a Mechanism of Establishing Energy Security and Ensuring Sustainable Development in Algeria

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Abstract:
Given Algeria's expertise in the energy area, the study's objective is to examine the move toward renewable energy sources from different angles. In addition to their role in guaranteeing both energy security and sustainable development, Given the fluctuating costs of traditional energy sources and their unfavourable impacts on the environment, the study concluded that the energy transition towards renewable energies plays a significant role in attaining the security of the energy supply. By favourably influencing economic, social, and environmental facets of sustainable development, renewable energies also play a significant role in accomplishing this latter goal. Additionally, the hunt for new energy sources guarantees that importing nations will have access to an adequate and inexpensive supply. At the same time, exporting countries strive to improve output by looking for new sources to increase exports.
Keywords: Renewable Energy, Energy Security, Sustainable Development, Energy Sources.
JEL Classification Codes : Q2 ; Q4; Q01

1. INTRODUCTION

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Energy has picked up a significant put within the worldwide economy due to the viable part that it plays in different imperative divisions, which has made its cost within the worldwide markets live in a state of insecurity, especially in wars or emergencies. It could be in addition to the commitment of this imperative substance to the progressing advancement and sustainable development of numerous nations, particularly those with expansive savings of fossil vitality within the framework of gas or petroleum. And it is the same traditional energy that will mark future depletion. That is based on data on the amounts of energy consumed in the world's strongest and fastest-growing economies. Based on this, long-term drift will torment existing economies. Therefore, modern technologies have emerged and exploited alternative energy sources that are not inferior to conventional energy, known as renewable energy.

In light of rapid technological development that has contributed to the emergence of mechanisms and techniques that exploit the multiple sources of renewable energy in the form of solar energy, wind energy, hydropower, and geothermal energy, in this context, Algeria has also moved towards investing in renewable energy. By launching an ambitious program to develop renewable energies and energy efficiency, and based on the government's vision based on a strategy centered around valuing inexhaustible resources such as solar resources, to use them to diversify energy sources, to achieve energy security in the future, and keep pace with the era New and sustainable energy.

- **Research Question**

Based on these indicators and in light of the capabilities that Algeria has, the following research question emerges:

To what extent can renewable energies achieve energy security and ensure sustainable development?

- **Hypotheses**

- The energy shift toward renewable energy assists in achieving energy security if the available opportunities are fully used.
- Renewable energies contribute to achieving sustainable development in its economic, social, and environmental dimensions.

- **Significance of the Study**

The study's significance lies in highlighting the status of the transition to renewable energies in achieving energy security in light of the different perspectives on this concept among energy exporting and energy importing countries, as well as the economic, social, and environmental importance of adopting renewable energies as an

alternative or complementary energy source to traditional energy. Hence, this leads us to uncover the aim of the current study:

1- Knowledge of the basic concepts of renewable energy;
2- Highlighting the importance of the transition toward renewable energies;
3- - Getting familiar with the concepts related to energy security;
4- Highlighting the role of renewable energies in ensuring energy security;
5- Presenting the contribution of renewable energies to achieving sustainable development goals;
6- - Addressing the axes of the renewable energies program in Algeria;
7- - Diagnosing the contribution of renewable energies to the global energy mix.

- **The methodology**:

To tackle the problem of the study and according to the nature of the topic, we used the descriptive approach to present theoretical aspects related to energy, renewable energies, and sustainable development. Also, we employed the analytical approach to analyze Algeria's potential in the field of renewable energies.

2. The Theoretical Part of the Study

2.1 The concept of renewable energy

- **Definition**

The energy transition entails transitioning from the current energy system to a mix of energies based primarily on renewable energies, which is implicit in the development of alternatives to fossil fuels by shifting from non-renewable (conventional) fossil energies to inexhaustible renewable energies, resulting in increased global interest in diversifying and renewing sources. Energy, particularly renewable energy sources, is being used to lessen reliance on old energy sources that are nearing extinction, and renewable energy sources are distinguished by continuity and permanence. Therefore, Energy could be defined as the primary generator of economic activity and the world's economies have relied on energy from numerous sources to generate economic progress in all industries, in addition to meeting individuals' wants and aspirations (Deni & smith stegen, 2012, p. 311).

Renewable energies are the constant regeneration in nature and have sources other than the sun, air, and water energy. It demonstrates that the energy quantities produced by various renewable energy sources surpass the energy quantities consumed (Benfriha et al, 2020, p. 14).

We may also define renewable energy as energy derived from limitless natural sources that are continually refreshed and do not have negative environmental consequences (Madahi, 2016, p.03). Renewable energy is both clean and ecologically beneficial.

UNEP definition: Renewable energy is energy whose source is a fixed and limited stock in nature, which is renewed periodically faster than the rate of its

consumption. It appears in the following five forms: Biomass, sunlight, wind, and energy Hydroelectricity, is the energy of the earth's interior (Kafi,2015, p.02).

2.2 The Sources of Energy

Energy is divided according to the criterion of durability and renewable energy into:

- Traditional (depleting) energy sources: Nonrenewable resources Its equilibrium in nature is permanent, and it declines over time as usage or extraction processes rise, making it prone to depletion, including exhausted energy supplies such as coal, oil, and natural gas.
- Renewable Energy Sources: These are resources whose available balance rises as the economy grows. As long as the rate of extraction from them does not exceed the rate of renewal, there are limited renewable energy sources accessible in nature. Unlike traditional energy, it is pure and does not contaminate the environment. Solar energy, wind energy, tidal energy, and tidal energy are the most important renewable energy sources (Beraji, 2013, pp. 17-18).

2.3 Renewable Energy Features

With the rise of sophisticated renewable energy exploitation in today's globe, a set of characteristics that describe renewable energies have evolved, and among the most significant qualities of this form of energy are the following (Fawzy, et al, 2015, pp. 07-08):

- ✓ Long-term energies, because their extraction is related to renewable resources;
- ✓ Consistently in nature and sustainable;
- ✓ Various methods for utilizing renewable energy help to reduce greenhouse gas emissions. It was a cause of concern while using exhausted fuels, and therefore, renewable energies and their enhanced ways may help to solve the global warming phenomenon.
- ✓ In addition to the availability of renewable energy in a variety of forms in nature, they are regarded as protected sources for all countries and do not need a transfer from one location to another;
- ✓ The utilization of renewable energies necessitates the employment of highly advanced tools and procedures, which has resulted in Because of the high prices, the usage of these types of energy confronts hurdles and impediments.

3.4 Why Renewable Energy

The movement toward renewable energies did not emerge by happenstance. But, this trend was related to a series of motivations, one of which may be environmental. That is, wastes damaging to the environment that come from the exploitation of traditional fuels are a reason for the acceleration of this form of energy.

The amounts of energy that could be exploited from diverse renewable energy sources have also contributed to the growth of human life and accelerated the surge in interest in this form of energy. And the fact that they are eternal, in particular, has prompted the major players in the energy sector to scramble to find alternate energy sources. Hence three are three main incentives that motivate countries to shift towards renewable energies, which are (Ait Zian and Levi, 2008, p. 03):

- **Climate Change:** Renewable energy has the potential to help secure energy demands while also lowering greenhouse gas emissions. According to sources, the amount of greenhouse gases, such as carbon dioxide and methane, is increasing in the thin atmosphere surrounding the globe, and this increase in the number of gases increases the high temperature, and many researchers believe that this high temperature portends potentially negative and catastrophic results and that now is the appropriate time frame to address this imbalance, and renewable energy is the appropriate measure to carbon-free.
- **Energy Security:** Most predictions suggest that oil and gas supplies will be depleted. This supply will soon disappear due to the ongoing rise in global energy use. Hence, it is vital to start thinking about finding new substitute sources right away.
- **The Cost:** Most predictions predict that petroleum and gas reserves will decrease. This supply will soon disappear due to the ongoing rise in global energy use. Hence, it is vital to consider finding substitute sources, such as bioenergy.

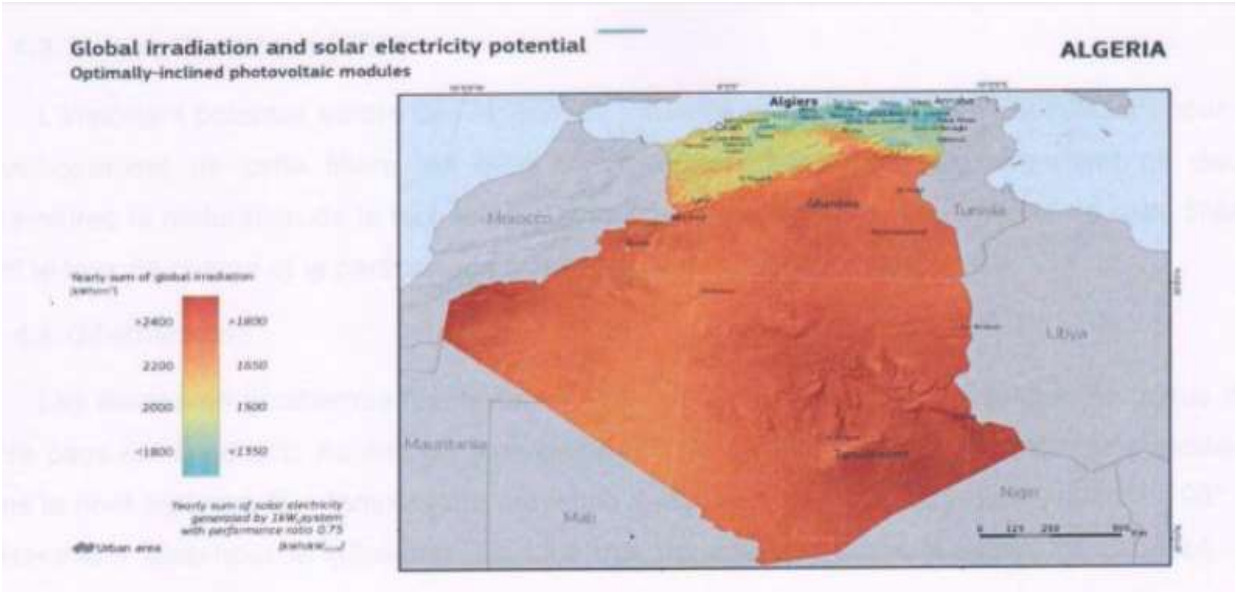
2.5 Renewable Energy in Algeria

The need to switch to alternative fossil energy sources, particularly those that make up a large portion of Algeria's energy production levels as natural gas and petroleum, was imposed by the country's energy situation, particularly from the observed fluctuation in the levels of energy production during the study period and extending from 2009 to 2018.

Contrary to many other nations, Algeria is endowed with abundant natural resources that should not be both neglected and undervalued. These resources serve as the cornerstone of any ambitious program involving renewable energies, and the following are some of the most significant ones (www.energy.gov.dz):

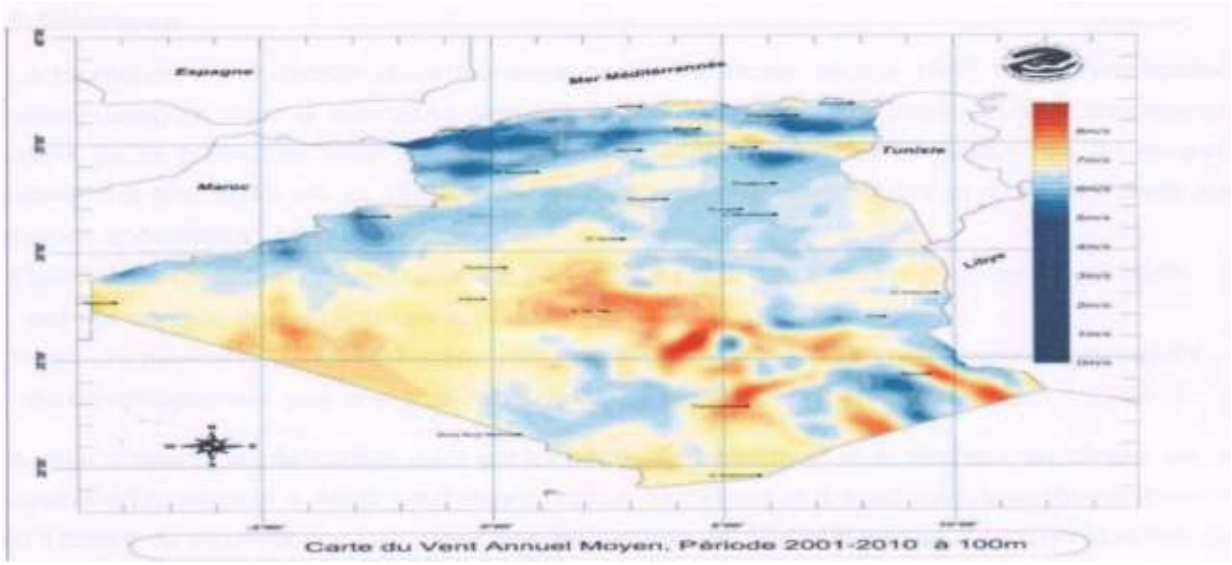
- **Solar energy** in Algeria constitutes an important and a large part of the total renewable energy available to Algeria. The Algerian desert covers 86% of the total area in the country, and the average radiation in this desert is 3500 s/year, while the other 14% of the country has average radiation of 2000 h/year. 23It is the alternative energy that the Algerian authorities are eager to exploit, according to a national program for renewable energies.

Figure (01): " Algeria's solar energy potentials



- **Hydropower:** Algeria has several dams, but the production of hydropower in Algeria remains small due to the weakness and lack of hydropower production sites in Algeria.
- **Wind Energy:** Algeria has natural qualifications in the field of wind energy, especially in the great south, where the wind speed in this region ranges between 4 and 6 / s. 25 Hence, the exploitation of this type of energy is keen to go towards manufacturing or acquiring wind turbines, which are of high price.

Figure(02): Algeria's wind energy potentials



3. The Concept of Energy Security

3.1 Definition

The world today is characterized by rapid development, and this has had a significant impact on the energy sector, particularly after the recent shift from energy consumption is in line with energy production to the opposite. These developments take many different forms, particularly in the industrial and technological sectors.

Due to its association with the requirement to supply fuel for troops, the term "energy security" first appeared in the early 20th century during the First World War (Parker, 2015, p. 183). And then it became a concept related to three basic dimensions, the first of which is ensuring the supply of energy, then ensuring the ability to bear costs, and then the ability to sustain (osieczko et al, 2018, p. 186).

It also could be defined as the capacity and ability of energy users—individuals, institutions, or nations—to quickly and affordably acquire the right kind of energy when they need it (proedrou, 2017, p. 183).

To summarize the preceding principles, energy security is connected to the capacity to assure access to all types of energy, as well as the continuity of receiving this energy at a reasonable price for all consumers.

3.2 The Significance of Energy Security

Energy's development was a concern regarding the continuation of its supply among producers and consumers, making maintaining this continuity a challenge in and of itself. In addition, a variety of factors have contributed to the ongoing search for energy security, the most notable of which are (bašová, 2018, p. 151):

- Protecting national economies from unanticipated challenges posed by natural gas suppliers;
- The primary requirement for the security of the state and its population is the provision of the bare minimum of energy on its territory;
- Disruptions in energy supply cause an immediate drop in production and an increase in energy prices, which causes an increase in the consumer price index;
- Energy Security falls under Human Security because it plays a direct role and contributes to food security, water security, and climate security in general;
- Global energy supply networks are under severe strain. It is an urge to shift to low-carbon supply systems rather than traditional ones that cause anxiety and doubt about the success of this transition.

- The growing interest in energy security points to three distinct dimensions: an economic one based on the ability of the household sector to meet energy needs; a material dimension based on approved infrastructure based on its energy efficiency; and a political dimension based on the ability of the

government to meet energy needs. Then, following my conduct concerning energy guidance.

3.3 Energy Security in Algeria

Energy security did not remain confined to its archaic and traditional conception of the provision of energy supplies alone: it underwent several stages, including nationalizing wealth, a process that many other countries, particularly developing ones, followed in its footsteps. Algeria was also on this path, and on February 4, 1971, it nationalized hydrocarbons, marking a crucial turning point in the reality of energy security in Algeria (Ben Sheikh, 2012, p. 193).

It was necessary to address the reality of energy production and consumption in Algeria during the period spanning from 1999 to 2018, a stage that saw the launch of a long-term energy program in addition to its inclusion of economic changes that Algeria had not previously experienced. This is because energy production is a clear indicator of achieving energy security by keeping up with and confronting energy consumption.

Table 01 development of energy production I Algeria (1999-2018)

Year	Energy Production	Energy Production Growth Rate Percentage	Year	Energy Production	Energy Production Growth Rate Percentage
1999	147728	///	**2009**	164375	6,2
2000	153224	3,72%	**2010**	162648	1,1%
2001	147262	3,9%	**2011**	157663	3,1%
2002	154396	4,84%	**2012**	155626	1,3%
2003	167610	8,56%	**2013**	148842	4,4%
2004	170646	1,81%	**2014**	155327	4,36%
2005	179706	5,31%	**2015**	154878	0,3%
2006	177906	1%	**2016**	166184	7,3%
2007	178035	0,07%	**2017**	165861	0,2%
2008	175246	1,6%	**2018**	165241	0,4%

Source: Prepared by the researcher on the basis of the annual reports of the Algerian Ministry of Energy Available on bit Iy/3tdtZIb

The various amounts of energy generated in Algeria between 1999 and 2018 are displayed in Table Number 01. The values range from 147,262 kilowatt-hours (the lowest amount produced in 2001) to 179706 kilowatt-hours (the highest amount produced during the study period, which was recorded in 2005), and they represent quantities that did not stabilize at a single level but were instead known to fluctuate from one level to another.

The aforementioned table also makes it clear that the first half of the studied period, or from 1999 to 2008, illustrates Algeria's continuous rise in energy production, which increased from a value of 147,728 kilowatt-hours in the year 9 to a value of 175,246 kilowatt-hours in 2008. This increase is demonstrated by the growth rate of energy production, which reached 8.56% during the first half of the studied period. A period of security and political stability for Algeria known as the "Black Decade," in which many industries, including the energy sector, experienced production disruptions, began in 1999. What makes this period unique is how the stability Algeria is currently experiencing is reflected in its most productive industries. The first half of the investigated period is represented in the energy sectors, as indicated in table (01) above.

The discernible development During the period under study, 2 Algeria's energy production lasted no more than ten years. This production has declined since 2009, the second half of the studied period. In 2009, energy production recorded a value of 5 kilotons of oil equivalent, which is low compared to what was produced in the year 2008, meaning that energy production decreased during a year by 11,000 kilotons of oil equivalent. This decline in production has continued and reached an amount of 148,842 kilotons of oil equivalent in 2013, a decrease from 2012. Or, as it is known, January 16, 2013, incident "where a terrorist group carried out an attack on an Algerian oil facility 2 southeast Algeria," and the effects of this incident persisted for the following three years. Then, after the year 2016, energy production in Algeria began to recover, reaching a record of 166184 (kilotons of oil equivalent 2016, but this recovery did not allow the country to achieve significant levels compared to the first half of the study period.

3.4. Renewable Energy in Algeria

The Reality and Prospects of Renewable Energy in Algeria is a priority since it intends to adopt the approach of renewable energy in order to find comprehensive and sustainable solutions to environmental challenges and to preserve traditional energy resources. Algeria has paved the way for the dynamics of green energy by launching

ambitious programs to develop renewable energy. The vision of the Algerian government is based on a strategy that revolves around valuing resources that never run out, such as solar resources, and using them to diversify energy sources in preparation for Algeria's future. Through the integration of initiatives and skills, Algeria intends to enter the era of sustainable new energy.

3.5.National Program for the Development of Renewable Energies (2011-2021):

This program is centered around establishing renewable energy capabilities estimated at around 11,111 megawatts during the period of 2012-2021, of which 21,111 megawatts are directed towards meeting the national demand for electricity and 21,111 megawatts directed towards export. The program includes the implementation of sixty (60) solar photovoltaic and thermal power stations, wind energy fields, and mixed power stations. Additionally, this program is committed to placing renewable energies at the core of Algeria's energy and economic policies, as program leaders estimate that the proportion of electricity production from renewable sources will reach around 1% by 2021. Through the Renewable Energy Development Program, Algeria aims to be a primary player in electricity production from both solar energy types (photovoltaic and thermal), wind energy, which represent engines for sustainable economic development that can stimulate a new growth model. The following are the stages of the Renewable Energy Development Program during the period of 2012-2021:

From 2012 to 2020, establishing a total capacity estimated at 221 megawatts.

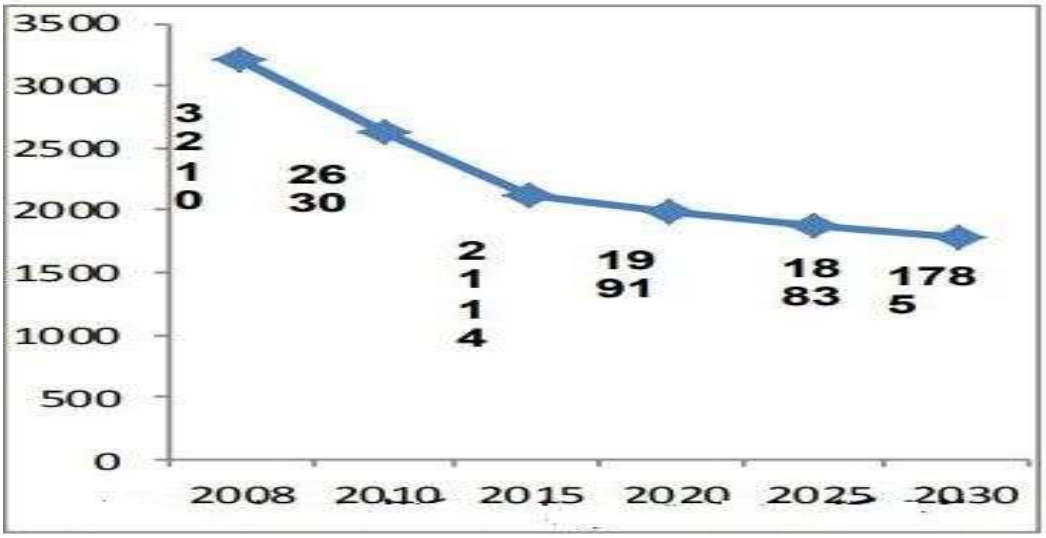
By 2022, establishing a total capacity approaching 021 megawatts.

By 2011, establishing a total capacity of around 1011 megawatts for the domestic market and the possibility of exporting around 1111 megawatts.

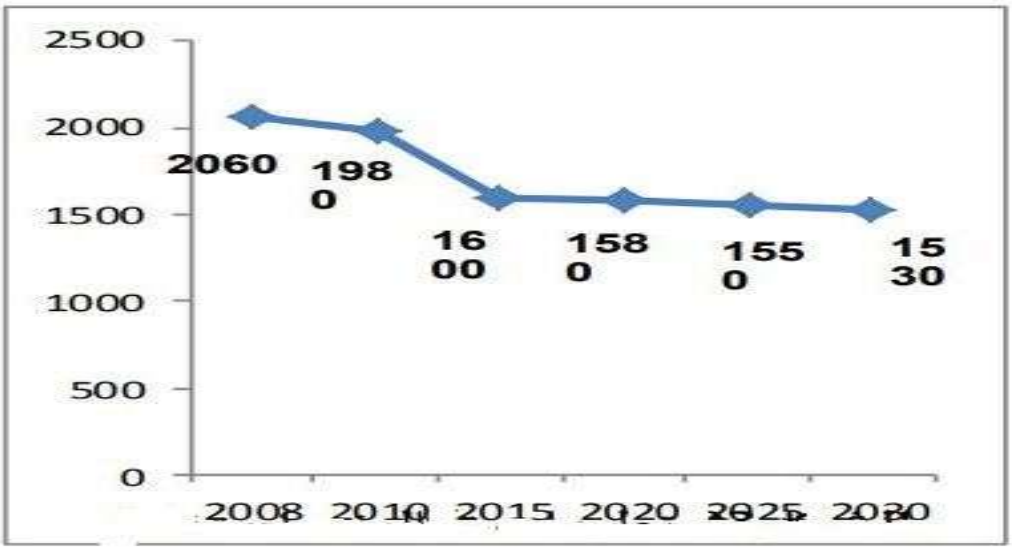
Until 2021, establishing a capacity of around 21,111 megawatts for the domestic market and the possibility of exporting around 21,111 megawatts.

In the context of developing renewable energies, the Algerian government issued the revised National Program for the Development and Promotion of Renewable Energies (2015-2020-2030) at the beginning of 2015. This program comes as a complement to the program related to renewable energies that was issued in March 2011. The February 2015 program was characterized by highlighting and focusing on the exploitation of both solar and wind energy, given the great potential that Algeria has in both energies, and with a focus on solar thermal energy starting from 2021.

Figure(03): Developments in the Costs of Wind Energy Exploitation (Dollar/Kilowatt)



Figure(04): Developments in the Costs of Solar Energy Exploitation (Dollar/Kilowatt)



4. The Role of Renewable Energies in Enhancing Energy security and Echieving Sustainable Development.

4.1. The role of renewable energies in enhancing energy security:

The top priority is energy security since an opportunity has arisen through applying selected energy policies. Most nations are attempting to achieve it. Even though the notion of energy security is relatively new and has received attention in

recent years in the wake of the oil crisis in the 1970s, countries have long sought to guarantee their energy supply demands.

The energy transition's role in guaranteeing energy security: We might think of a transformational energy policy as having an approach that is useful in preserving the security of the energy supply. In light of the following worldwide developments: shifting the cost of conventional energy sources and their detrimental environmental impacts, in addition to the issue of depletion through: (Fawzi et al., 2015, p. 09).

- working toward the gradual and phased use of renewable energies as a long-term replacement for conventional energy in the field of electricity generation, particularly in the process of converting wind and solar energy to make it easier to exploit them and providing the technology for this;
- international organizations encouraging this type of initiative (shift towards renewable energies) by providing benefits and advice;
- working to open specific markets for renewable energy products;
- The advent of renewable energy sources as a tactical option is made possible by the fact that conventional fuels, particularly petroleum, undergo a series of oscillations due to rising production costs or market speculation;
- The cost of acquiring energy transformation technology has decreased due to the quick and widespread transmission of this technology, which has a more positive impact on renewable energy sources. Considering the expenses;
- Establishing research facilities and labs to examine the energy transition to renewable sources of energy and abandonment As a result of the gradual phasing out of traditional energy sources, renewable energy will become a prominent business within a short time. This will allow us to satisfy a variety of current and future energy demands in a sustainable and renewable manner.

4.2 The role of renewable energies in achieving sustainable development:

The notion of sustainable development incorporates two aspects. The two most important are development as a changing process and sustainability as a temporal dimension. In its 1987 report titled "Our Common Future," the Environment and Development Committee, often known as the "Brand Land" Committee, stated that sustainable development is that which serves the requirements of the present without jeopardizing future generations' capacity to meet their own needs (Al-Khawaja, 2006, p. 415).

There is a close relationship between renewable energy and sustainable development because energy is the primary source of the ability to carry out various activities, and since work is the fundamental foundation for sustainable development

in economic and social fields, the availability of energy in the appropriate form and quantity is critical. It is a necessary condition to develop because of the energy required to meet the needs and requirements of human societies in terms of economic, social, and environmental aspects. As a result, we will examine the role of renewable energies in achieving sustainable development dimensions.

4.3 Renewable energies and the economic, social and environmental dimensions of sustainable development

According to recent United Nations Environment Program research, increased investments in renewable energy will contribute to supplying the world with a quarter of its clean energy demands by 2030, and renewable energy may play an essential part in this. The aspects of this kind of energy in attaining sustainable development. The three positive components of sustainable development are represented by the economic, social, and environmental elements.

4.4. Renewable energies and the economic dimension of sustainable development

Renewable energy and the economic dimension of sustainable development have led to higher demand. For the distribution of energy in reaction to industrialization, urbanization, and the difference in societal purchasing power, The distribution of primary energy use worldwide is incredibly unequal, with per-person energy consumption. Economic development is dependent on the availability of energy services required to either raise and improve productivity or to help increase income locally by improving agricultural development and providing job opportunities outside of the rental sector and by other means. It is equivalent to three-quarters of direct energy in industrial market economies (Report of the World Commission on Environment and Development, 1978, p. 115). It is well recognized that work possibilities increase when contemporary fuel sources and energy services are unavailable. Increasing productivity has little impact on overall economic prospects.

Compared to previous decades, employment in the renewable energy sector is growing. Twenty, according to a study titled "Green Jobs: Towards Sustainable Work in a Low Carbon World." was released by the United Nations Environment Program in collaboration with the International Labor Organization and the International Association of Trade Unions in December 2007. According to the survey, more than 100,000 solar photovoltaic systems are utilized worldwide, and around 300,000 wind turbines are used. More than 600,000 individuals work in solar thermal energy in China and the United States, while 2.1 million people are engaged in biomass projects in four countries. Brazil, the United States of America, Germany, and China are the top-ranking nations, with 302 million people using renewable energy in the nations that have statistics on these subjects (United Nations Environment Program, 2006).

In Algeria, short-term investments in renewable energy will create roughly 45,000 jobs, and that figure will eventually climb to 1.4 million. At least 289594 institutions are expected to be working in the field of new and clean energies by 2025, and by 2030, at least one will have implemented a renewable energy supply system (Eishawi & Badawi, 2017, p. 50).

4.5 Renewable energies and the social dimension of sustainable development:

Society's issues related to energy use include poverty alleviation, women's opportunities, and transformation. Statistically and urbanized, limited access to energy services marginalizes the poor and significantly reduces their ability to improve their living conditions, as about a third of the world's population does not have access to the necessary energy sources, while weakly reaching another third, and the rural population's dependence on traditional fuels for heating and cooking has negative effects. The environment and population health. In addition to the fact that there is still great variation between countries in rates of energy consumption, rich countries consume energy at a rate of more than 25 times per capita. Compared to poor countries, investing in renewable energy would achieve social dimensions. The following are important in the context of sustainable development and the most important of them (Al-Zawiya, 2013, pp. 143–144):

- The use of depending on new and renewable energy sources, such as solar heating photovoltaic cells, agricultural waste recycling procedures, and turning them into organic fertilizers, contributes to the eradication of unemployment and poverty and the prevention of resource waste;
- Contributes to the utilization of solar energy for thermal heating or power generation in distant regions by learning several experiences and skills, including the ability to contribute to local development, by steaming, drying crops, or de-isolating distant locations;
- In distant and isolated desert locations, infrastructure projects like hospitals, schools, and clinics need enormous amounts of funding, but if they are technologically advanced, they may save money. Green buildings that get their energy from renewable resources will save the expenses of wire maintenance, establishing conventional stations, and connecting to power; it will also encourage investment in this area;
- These systems stand out because of their proximity to the communities they serve, which fosters a feeling of value and communal ownership as well as sustainable growth;
- New, environmentally friendly, and highly sophisticated career prospects are provided by renewable energy systems. It supports the creation of high-quality

jobs quickly, making it significantly preferable to the conventional energy industry in this regard, which necessitates the availability of significant money.

4.6 Renewable energies and the environmental dimension of sustainable development in Algeria:

Given the damaging effects that pollution has on the environment and the fact that many natural resources are non-renewable, which mandates their utilization under regulations, this factor is crucial for sustainable development. It ensures survival and neither interferes with nor muzzles growth (Geddy, 2006, p. 24).

The greenhouse effect is one of the most significant environmental effects linked to the use of conventional energy. In contrast, the consumption of energy is linked to the phenomenon of an increase in the Earth's temperature as a result of an increase in the concentration of various gases in the atmosphere, the most significant of which is carbon dioxide. Because they are successful in lowering the emissions of these gases and from it, renewables have a good impact on preserving the environment.

Environmental pollution, as a result of emissions from conventional fuels, amounted to about 190 million tons. of carbon dioxide in 2017, in addition to other gases. The World Bank reports on development emphasized the need to pay attention to the environment as a cornerstone in development, especially when it comes to preserving natural resources. A contemporary trend has emerged to include environmental indicators in measuring economic growth, and these indicators are known as indicators of economic growth.

For economic well-being, the measurement of economic growth is not limited to the mere calculation of average individual consumption; rather, it must take into account the environmental degradation resulting from development plans. and economic and environmental resource depletion (Kawan and Jaba, 2015, p. 57)

The Algerian government has taken significant steps to promote the use of renewable energy sources. In 2015, the government launched a new energy policy, which aimed to increase the share of renewable energy in the country's electricity mix to 27% by 2030. To achieve this target, the government has introduced various measures such as feed-in tariffs, tax incentives, and the creation of a regulatory framework for renewable energy projects. The government's efforts have resulted in the construction of several large-scale renewable energy projects, including the 4,000 MW solar photovoltaic project in the Sahara desert and the 1,000 MW wind farm in the western region of the country (Ministry of Energy Transition and Renewable Energies, Algeria, 2021.).

The adoption of renewable energies in Algeria has significant environmental benefits. Firstly, renewable energies reduce greenhouse gas emissions, which contribute to climate change. Secondly, renewable energy sources do not produce hazardous waste, which reduces the negative impact on soil and water resources. Thirdly, renewable energies promote energy independence, which reduces the reliance on fossil fuels, including oil and gas, that can be subject to price fluctuations and supply disruptions (International Renewable Energy Agency, 2019).

Despite the positive impact of renewable energies, there remain significant challenges to implementing a sustainable energy policy in Algeria. The lack of adequate infrastructure and technical expertise, particularly in remote areas, has hampered the development of renewable energy projects. Additionally, the high upfront cost of renewable energy technologies, such as solar and wind power, makes it challenging for many households and small businesses to access these resources. Furthermore, the lack of a robust legal and regulatory framework has created uncertainty for investors and developers (Hassani, et al, 2020)

To overcome these challenges, the Algerian government must continue to promote renewable energy development by providing the necessary incentives and support to investors and developers. Additionally, the government must focus on increasing public awareness of the benefits of renewable energies and promoting energy efficiency to reduce energy consumption (Renewable Energy Policy Network for the 21st Century, 2021).

Renewable energies have become an essential component of sustainable development in Algeria. The government's efforts to promote renewable energy development have resulted in several large-scale renewable energy projects, which have significant environmental benefits. However, significant challenges remain, including the lack of adequate infrastructure and technical expertise and the high upfront costs of renewable energy technologies. Overcoming these challenges will require continued government support, public awareness campaigns, and a robust legal and regulatory framework. By addressing these challenges, Algeria can continue to make progress towards a sustainable energy future while protecting its environment for future generations.

5. CONCLUSION

Energy is an essential resource for achieving sustainable development sufficiently in various economic and social aspects, so we find that there is a significant increase in demand for it mainly related to the growth rates achieved in the economy, which explains the significant increase in demand for energy in developed countries, which

are characterized by high growth rates compared to In underdeveloped countries, which leads to the depletion of various sources of traditional energy that are threatened with exhaustion, which prompted the countries of the world to search for alternatives to conventional energy and the desire to follow the path of energy transition towards renewable energies to ensure an acceptable level of energy supplies at acceptable prices for energy importing and conservative countries On the levels of export for the exporting countries, especially since most countries of the world suffer from an increase in internal consumption of energy, in addition to the fact that renewable energies are distinguished by their availability in different countries of the world, but in varying proportions. Ensuring energy security due to declining reserves of fossil energies, concerns about climate change Because of carbon emissions resulting from fossil energies, in addition to the constantly decreasing cost of renewable energies due to the technological development adopted in its production, the contribution of renewable energies to the global energy mix was estimated at 19% in 2012, and electricity produced from renewable sources accounted for 23.7% in 2015, in addition to the close relationship between Renewable energies and sustainable development, because providing energy in the appropriate manner and in the required quantities is a necessary condition for the development events.

- **The Findings**

- The need to pay attention to research and development in the field of renewable energy technologies, especially those related to solar cells, to increase supplies, and work to reduce their costs to compensate and compete with traditional energies;
- Encouraging scientific exchange between different countries of the world, and being informed of all that is recent in the field of developing techniques for the production and exploitation of renewable energy;
- The need to rationalize energy consumption to ensure the preservation of the welfare of society on the one hand and contribute to reducing the burden of obtaining it on the other hand;
- Total dependence on fuels to supply internal energy needs leads to the emission of carbon dioxide and thus pollutes the environment and increases global warming;
- Gradually increasing the interest of countries in renewable energies;
- Attempting to adopt renewable energies programs in line with the renewable energy sources available in the country, ie the adoption of solar energy in the case of Algeria;
- Enact laws and legislations necessary to provide an energy work environment

- **Recommendations:**

- Rationalizing the usage of fossil fuels within the available resources and using all available tools to reduce energy consumption.
- Develop a long-term strategy to reduce dependence on depleted energy and direct the exploitation of renewable energies by finding incentives that launch renewable energy investments and promote decentralized projects to generate renewable energy.
- Maximize utilization of depleted energy resources by increasing and improving energy efficiency (less production and more efficiency).
- Developing a plan for renewable energy and assessing the technical viability of renewable resources.
- Achieving the right balance between using fossil fuels effectively and emphasizing the use of renewable energy sources.
- The need to pay attention to research and development in the field of renewable energy technologies, especially those related to solar cells, to increase supplies, and work to reduce their costs to compensate and compete with traditional energies;

Encouraging scientific exchange between different countries of the world, and being informed of all that is recent in the field of developing techniques for the production and exploitation of renewable energy.

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