

## RENEWABLE ENERGIES AND THEIR ROLE IN ENVIRONMENTAL PROTECTION WITHIN THE FRAMEWORK OF SUSTAINABLE DEVELOPMENT

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### **Abstract:**

The countries sought to focus on the environmental issue and the requirements of achieving sustainable development by integrating the environmental dimension into various development programs and promoting the use of clean energy sources and their widespread adoption to mitigate the effects of climate change resulting from greenhouse gas emissions, by issuing several legal texts in this field. In recent years, there has been increasing talk about renewable energies due to their connection with global warming and the safety of the planet. Renewable energy is actually energy produced from renewable natural resources, which is less expensive and more efficient, especially in isolated areas. This study will explore the relationship between regulatory laws and the optimal use of renewable energies in order to preserve the environment from the threats that threaten it and achieve sustainable development in all sectors. This is through talking about national and international laws to protect the environment within the framework of sustainable development with the aim of shifting towards the use of renewable energies in various fields of life. It will also present a practical application model for the optimal use of legal texts and environmental elements within the framework of environmentally friendly alternative energies, through the use of solar panels in energy production.

**Keywords:** Legal texts .Renewable. Energies. Environment-Sustainable. Development. Solar energy.

## 1. Introduction

The environment is among the most significant topics that have garnered considerable attention worldwide, in light of the issues it faces. Numerous agreements have been made, and international conferences have been convened with the goal of finding practical solutions to the environmental challenges in order to achieve an ecological balance amid excessive use of environmental elements for economic development and sustainability. Ensuring the development and economic well-being depends on respecting ecological systems and guaranteeing the sustainability of environmental riches. The interactive relationship between protecting the environment from violations and achieving sustainable development requires a balance so that one aspect does not dominate the other. This balance is something countries have strived to embody at both international and domestic levels. Algeria, like other countries, has focused on environmental issues and the requirements for sustainable development by incorporating environmental dimensions into various development programs and encouraging the use of clean energy sources to reduce climate change impacts caused by greenhouse gas emissions through the issuance of many legal texts in this field.

In recent years, there has been widespread discussion about renewable energies due to their connection to global warming and the safety of our planet (Lammel and Graßl 1955). Renewable energy is, in fact, energy produced from renewable natural resources, offering lower costs and higher efficiency, especially in remote areas.

According to United Nations estimates, 65% of the world's total electricity production will come from renewable energies by 2030 (Asdrubali, et al. 2015), and it could reduce carbon dioxide emissions by up to 90% by 2050. The Algerian state has adopted the policy of using solar panels to generate energy, thus contributing to the stabilization of populations in their areas despite the widespread use of fossil fuels for electricity generation.

We have chosen the state of Adrar for our practical study on the use of alternative energies, despite the region being rich in oil and gas, as the state adopts a policy of climate preservation by reducing the use of fossil fuels and relying on clean energies.

Our study will explore the national and international efforts to protect the environment within the framework of sustainable development, aiming at transitioning towards the use of renewable energies in various aspects of life.

### **1.1 Study problem**

The problem of this study can be formulated in the following questions:

- To what extent have national and international efforts contributed to environmental conservation?
- How effective are they in achieving a balance between the requirements of sustainable development and the needs of environmental protection in the context of transitioning towards alternative energies?

To address this issue, we divided the topic into two main axes: the first axis deals with national and international efforts to protect the environment within the framework of sustainable development, and the second axis is a practical model on the optimal use of environmental elements in the context of environmentally friendly alternative energies.

## **2. National and International Efforts to Protect the Environment in Accordance with Sustainable Development Requirements**

The concept of the environment is linked to many factors and fields that make defining a precise scientific and legal concept of the environment difficult, due to the varying doctrinal and legislative views on the environment. Scholar Michel Prieur sees the concept of the environment as fluctuating, changing, and variable([Al-Baz 2005, 11](#)).

The environment is defined as the natural surroundings in which humans live and from which they draw the economic and social necessities of life, which are also affected by the development of this life. It is an ecological-historical concept that considers ecological aspects alongside historical, social, and economic ones at the same time, ensuring that the natural aspects of the environment are not overlooked nor given utmost importance at the expense of economic and social aspects([Al-Sheikh 2002, 23](#)).

It is the physical or biological system in which humans and all living beings exist, characterized by complexity and the interaction of its constituent elements([Khan 2002, 06](#)).

Some expand the concept of the environment to include, in addition to the external surroundings of natural and man-made elements, cultural heritage,

monuments, and other rare components that are considered a common heritage for all humanity and should be preserved for future generations (Danah 1995, 04).

Therefore, the environment can be defined as the medium in which living organisms, including humans, live, along with the necessary and sufficient elements for life to thrive, and all that humans have created by harnessing these elements for their benefit.

Given the importance of the environment and the magnitude of risks threatening it, countries have turned towards establishing systems and laws that contribute to preserving the environment from repeated and increasing violations of environmental elements. This is referred to as environmental law, which consists of legal texts aimed at protecting all components of the environment, including natural, human, and industrial elements, and organizing the relationship between humans and environmental elements in the context of working towards sustainable development.

## **2.1 National Efforts to Protect the Environment within the Framework of Sustainable Development**

Domestic laws of countries have been influenced by developments in the efforts to protect the environment and link it to sustainable development, amid the increasing attention of international organizations working in this field, such as the United Nations Environment Programme and its role in encouraging countries to issue legal texts concerning the protection of various environmental elements from all harm, parallel to achieving sustainable development in all areas of the state. Facing environmental challenges requires countries to adopt long-term working methods to select effective methods to achieve set goals (Al-Niklawi 1999, 162).

In Algeria, the environment was not a primary concern for the Algerian state immediately after independence, due to the poor living standards of individuals and the fragile state infrastructure in all areas. This led the state to focus on creating comprehensive development to overcome underdevelopment as soon as possible, neglecting the idea of protecting the environment and considering attention to the environmental element as an impediment to development itself (Kahloula 2001, 61).

However, the policy gradually changed after the increase in environmental risks and threats due to the rise in industrial activity, especially in industrial areas, and

the growing global concern for environmental problems and pressures exerted by environmental organizations. The Algerian state gradually began to pay attention to environmental issues by issuing numerous legal texts related to this field. We will discuss the latest environmental regulatory texts in Algerian legislation.

### **2.1.1 Environmental Protection under the 2020 Constitution**

The idea of environmental protection was not enshrined in the constitutions of states before the Stockholm Conference in 1972, which marked the starting point for recognizing constitutional protection of the environment from all forms of violation. As a result of the ongoing deterioration of environmental elements and the growing public awareness of environmental risks and their sensitivity to humans, states were compelled to recognize the constitutional right to the environment(Delhoste 2004, 441).

The constitutional legislator introduced a new paragraph in the preamble of the 2020 Constitution to enhance environmental awareness among Algerian individuals. It states: "The people remain concerned about environmental degradation and the adverse outcomes of climate change, and are keen to ensure the protection of the natural environment, the rational use of natural resources, and their preservation for the benefit of future generations."

The legislator has recognized the magnitude of the risks threatening the environment amid global technological and industrial development, necessitating intensified efforts at all levels of the state through the design and implementation of strategies that balance the requirements of development with the imperatives of environmental protection. This contributes to the growth of ecological awareness among individuals about environmental protection, the rational exploitation of environmental resources, and their preservation for future generations, which means the necessity of integrating sustainable development within the requirements of environmental protection.

The constitutional founder is expected to make environmental citizenship a constitutional value and to work on forming an environmental and scientific culture to increase environmental awareness and eliminate ecological illiteracy in Algeria(Samia 2022, 82).

This was embodied by the introduction of Article 21 of the Constitution, which stipulates that the state ensures the protection of agricultural lands, guarantees a healthy environment for the protection of individuals and their well-being,

ensures continuous awareness of environmental risks, the rational use of water and fossil energies, and other natural resources, and protects the environment in its terrestrial, marine, and aerial dimensions, taking all measures to punish polluters.

It is noteworthy that the Algerian legislator here focused on fossil energies and not on renewable and environmentally friendly alternative energies, indicating that the constitutional legislator is still far from thinking about constitutionalizing the issue of energy transition and reliance on alternative energies as an embodiment of the pursuit of energy security, despite legislative texts issued in this area that reinforce this direction. The focus on the sustainability of fossil energies and other natural resources for future generations necessitates the rational and prudent exploitation of these energies and the gradual transition towards sustainable alternative energies.

- Then, in Article 63, the constitutional legislator emphasizes the right of citizens to access drinking water, and the state works to preserve it for the benefit of future generations.
- Article 64 of the Constitution: "The citizen has the right to a healthy environment in the framework of sustainable development." This is a clear indication from the constitutional legislator of the integrative relationship between environmental protection and achieving sustainable development, which means integrating the environmental dimension into all development processes in the country and in a sustainable manner.
- The environmental element was also added to the advisory body, the National Economic, Social, and Environmental Council, by Articles 209 and 210 of the 2020 Constitution. This council can discuss all aspects related to economic, social, and environmental development through its advisory role by presenting reports, opinions, and studies related to the environmental aspect that are raised to the Council of Ministers.

Thus, the new direction of the constitutional legislator in the field of the environment marks the beginning of a launch for reinforcing regulatory texts for the environment based on the availability of a constitutional reference. The enshrinement of the environment in the Constitution is intended to enhance the protection of environmental elements from dangers and violations in order to achieve development and ensure the rights of future generations.

### **2.1.2 Environmental Protection under Recent Legislative Texts**

The 2020 Constitution ensured the embedding of general principles for the protection of the environment in its various elements, but it left the determination of mechanisms to legislative texts. This is explicitly mentioned in Article 139 of the Constitution, which states that the parliament is competent to legislate on several subjects, including the general rules related to the environment.

This is embodied in Law 03-10 related to environmental protection within the framework of sustainable development, which focused on the preventive aspect to reduce the increasing environmental risks and the growing global awareness of the need to preserve environmental components and ensure their sustainability. This is internally embodied through the involvement of citizens in finding solutions to environmental problems and establishing the right to environmental information.

This law aims to define the basic principles and rules for managing the environment and working to promote national development efforts for sustainable development to ensure a healthy living standard for individuals.

It also seeks to prevent forms of pollution and damage to the environment, ensure the preservation of its components, and repair damaged environments. This also includes the rational ecological use of available natural resources using environmentally friendly and cleaner technological techniques. All of this is through enhancing awareness campaigns, information dissemination, and the active participation of citizens.

The environment is defined in Article 04, paragraph eight, as follows: "The environment consists of abiotic and biotic resources such as air, atmosphere, water, land, subsoil, plants, and animals, including genetic heritage, and the interactions between these resources, as well as places, landscapes, and natural landmarks."

It is noticeable that this definition by the legislator enumerates and restricts the elements that make up the environment to only natural elements, omitting the mention of industrial elements that result from human activity and the transformation of environmental elements for human service, which suggests an adoption of a narrow definition of the environment.

Law No. 11-02 dated February 17, 2011, related to protected areas within the framework of sustainable development, aims to classify protected areas and

determine how they are managed and protected within the framework of sustainable development according to the principles and legislative bases in the field of environmental protection.

Law No. 04-09 dated 27th Jumada Al-Thani 1425, corresponding to August 14, 2004, related to the promotion of renewable energies within the framework of sustainable development. This law aims to protect the environment by encouraging the use of non-polluting energy sources and contributing to the reduction of climate change from greenhouse gas emissions. It contributes to sustainable development by preserving traditional energies, saving them, and contributing to the national policy of territorial planning by valuing renewable energy sources and promoting their use.

## **2.2 International Efforts to Protect the Environment within the Framework of Sustainable Development**

The environment has become one of the major concerns for countries at the international level, being considered a common heritage of humanity. This is through the holding of many international conferences and agreements aimed at reducing environmental violations. The United Nations, through its organizations, has adopted a series of international charters that support the protection of all vital and non-vital elements of the environment. These have enshrined the rules of international environmental law, which has reflected on member states through the enactment of laws concerning environmental protection. These laws are in harmony with international charters and laws and embody the desired objectives. This is in order to reduce and minimize the negative impacts of climate change that threaten the world and to use clean energies within the framework of what is called the green economy.

### **2.2.1 United Nations Efforts to Reduce Environmental Violations**

The United Nations has held numerous conferences and established many charters to confront environmental hazards and pressure the international community to preserve the environmental heritage and ensure its sustainability alongside achieving comprehensive development for peoples. Among the international conferences held by the United Nations in the field of the environment, the most significant are:

### **A. The 1972 Stockholm Conference on the Human Environment**

This conference marked the actual start of internationalizing the environmental issue in international conferences as a primary issue. The participants adopted a series of principles for proper environmental management and declared a plan for the protection of the human environment. It aimed at cooperation and dialogue between advanced industrial countries and developing countries to identify the link between economic growth and environmental conservation([United Nations 1972](#)). This conference also established the United Nations Environment Programme (UNEP).

### **B. The 1992 Rio Conference**

The United Nations Conference on Environment and Development (UNCED), also known as the "Earth Summit," was held in Rio de Janeiro, Brazil, to discuss the impact of human social and economic activities on the environment([United Nations 1992](#)).

### **C. The 2002 World Summit on Sustainable Development in Johannesburg**

This conference adopted a political declaration and an action plan containing provisions covering a range of activities and measures to be taken to achieve development with respect for the environment. The conference adopted a set of resolutions related to water, energy, health, agriculture, biodiversity, and other areas of interest([United Nations 2002](#)).

### **D. The United Nations Rio+20 Conference**

Twenty years after the "Earth Summit" in Rio de Janeiro, the 2012 United Nations Conference on Sustainable Development in Rio (also known as Rio+20) produced a document containing clear and practical steps for implementing sustainable development. The conference adopted a set of guiding principles regarding green economy policies and financing efforts towards sustainable development([United Nations 2012](#)).

### **E. The 2015 United Nations Sustainable Development Summit in New York**

This conference set forth a plan to find new ways to improve the lives of the world's people, eliminate poverty, enhance prosperity and well-being for all, protect the environment, and combat climate change([United Nations 2015](#)).

## **F. The 2022 Stockholm Conference**

Participants emphasized the importance of multilateralism in addressing the Earth's triple crisis – climate, nature, and pollution – accelerating action to implement the United Nations Decade of Action for the Sustainable Development Goals, the Paris Agreement on climate change, the post-2020 Global Biodiversity Framework, and encouraging the adoption of green recovery plans for the post-COVID-19 period(United Nations 2022).

## **G. The Climate Ambition Summit at the United Nations Headquarters in New York on September 20, 2023**

A roadmap for a livable planet was sought in light of the increasing damage from climate change and a significant rise in greenhouse gas emissions, away from pollution, which was accompanied by climate change. This necessitates efforts to reduce these emissions over the next three decades and aims to assist countries not responsible for these changes but affected by them. Due to the negative impacts of climate change on terrestrial, marine, and atmospheric environmental elements, with fossil energy being the main cause, five decisive measures were agreed upon to accelerate the transition to the use of renewable energy, such as wind and solar power, which are considered clean and environmentally friendly energy(United Nations 2023).

These measures include:

- Making renewable energy technology a global public good: Not limiting it only to developed countries and removing obstacles that could hinder the smooth transfer of knowledge and technology related to the production and use of devices and means associated with renewable energies.
- Improving access to components and raw materials worldwide: By enabling all the world's people to access devices related to renewable energies and ensuring their wide marketing.
- Achieving equality of opportunity in renewable energy sources: Through effective policies to encourage investment in renewable energies by increasing the private sector's contributions and establishing systems and incentives for that.
- Shifting subsidies from fossil fuels to renewable energy: Which would reduce emissions and contribute to sustainable economic growth, create jobs, and preserve public health.

- Tripling investments in renewable energy: By involving all financial and banking institutions in accelerating the transition to alternative energies and increasing investment through the provision of necessary financing.

Through these conferences that demonstrate the extent of efforts and endeavors by the United Nations to reduce environmental violations at the expense of personal interest and economic profit, these efforts have contributed to the establishment of international environmental law aimed at protecting the environment through defining the procedures and mechanisms capable of achieving this protection.

### **2.2.2 International Agreements for Environmental Protection**

International agreements made in the context of environmental protection occupy a significant space in the legislation of international environmental law, comprising more than 250 legal acts in the field of international environmental law including treaties, agreements, declarations, and international provisions. These aim to protect the components of the marine, atmospheric, and terrestrial environment, alongside achieving sustainable economic development for peoples.

We will focus on some of the most important of these agreements:

#### **A. The 1982 World Charter for Nature**

This agreement included a set of principles related to protecting the environment from pollution in wars and hostilities, and ensuring the preservation of natural resources for future generations.

#### **B. The 1982 United Nations Convention on the Law of the Sea**

This agreement defined frameworks and methods for exploiting the marine environment of seas and oceans and ensuring the protection of the environmental and marine wealth from the risks of marine pollution.

#### **C. The 1985 Vienna Convention for the Protection of the Ozone Layer**

This agreement established a set of objectives to protect the ozone layer from gaseous emissions, which pose a risk to this layer and lead to many risks to the environment in its various elements.

#### **D. The 1992 United Nations Framework Convention on Climate Change**

This is a multilateral treaty adopted in 1992, shortly after the Intergovernmental Panel on Climate Change issued its first assessment report in 1990, to stabilize

greenhouse gas concentrations "at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system."

A set of standards was established to reduce carbon emissions, accelerate the global transition in the field of energy, and assist countries in adapting and building resilience to escalating climate issues.

### **3. A Practical Model for the Optimal Use of Environmental Elements within the Framework of Environmentally Friendly Alternative Energies**

With the global population reaching 8 billion people, the demand for energy has increased, and traditional methods of energy production no longer meet the needs of individuals, especially in desert and mountainous regions(Perera and Nadeau 2022). Therefore, it has become necessary to diversify energy sources while considering environmental conservation. Energy issues are linked to environmental problems because the production of energy by burning fossil fuels is the primary cause of air pollution in urban areas, in addition to their high prices. When talking about sustainable development, it is essential to mention energy consumption and its rationalization because reducing energy consumption and increasing energy efficiency fall within the realm of using sustainable energy sources at home(Chen, et al. 2023, 1775).

The Algerian state has adopted the policy of using solar panels to produce energy to contribute to the stabilization of populations in their regions. We will take the city of Adrar as a sample. This region, located in the far south of Algeria, is mostly remote and isolated, causing fluctuations in the supply of electricity and fossil energies. Several methods for generating energy are used despite the widespread use of fossil fuels for electricity generation because the area is rich in oil and gas. However, the state adopts a policy of climate preservation by reducing the use of fossil fuels and relying on clean energies, aligning with the principle of sustainable development.

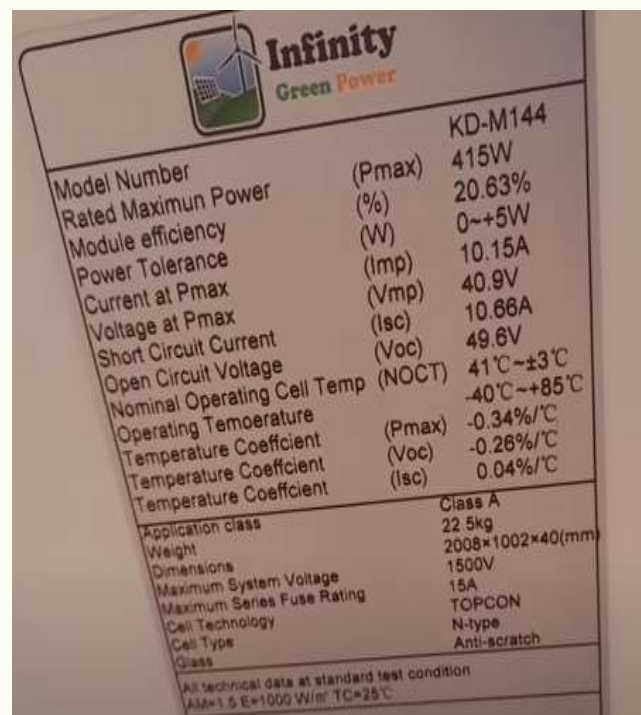
In this study, we will conduct an experimental study to understand how to link renewable energies with environmental conservation and achieve sustainable development. We will explore the feasibility of installing a solar panel energy production system, using this energy for air conditioning in a traditional home made of compressed mud bricks in the Adrar region, and compare it with another dwelling built with cement to understand the impact of environmentally friendly materials in reducing energy and consumption bills.

When we talk about renewable energy, it is the opposite of energy that depletes over time. Hence, renewable energy can be defined as endless and available energy at all times, contrary to traditional fossil energies (Blaabjerg 2017). It can be defined as energy derived from naturally available materials such as the sun, wind, water, etc.

Therefore, in this section, we will explore the use of a photovoltaic solar panel for domestic use, employing multicrystalline solar panels known for their more effective utilization of sunlight (Nogueira, et al. 2015). Figure 1 illustrates the characteristics of the solar panel.

The solar panel is connected to a charge controller, an electronic device that regulates the voltage coming from the solar cells and going to the batteries (Osaretin and Edeko 2015). Figure 2 shows the solar panel, and Figure 3 presents the MPPT-type charge controller used.

The battery serves as an energy storage in the absence of sunlight. We connect the charge controller to an electric battery with characteristics shown in Figure 4



Infinity Green Power		KD-M144
Model Number	(Pmax)	415W
Rated Maximum Power	(%)	20.63%
Module efficiency	(W)	0~+5W
Power Tolerance	(Imp)	10.15A
Current at Pmax	(Vmp)	40.9V
Voltage at Pmax	(Isc)	10.66A
Short Circuit Current	(Voc)	49.6V
Open Circuit Voltage	(NOCT)	41°C ±3°C
Nominal Operating Cell Temp		-40°C ~ +85°C
Operating Temperature	(Pmax)	-0.34%/°C
Temperature Coefficient	(Voc)	-0.26%/°C
Temperature Coefficient	(Isc)	0.04%/°C
Application class		Class A
Weight		22.5kg
Dimensions		2008×1002×40(mm)
Maximum System Voltage		1500V
Maximum Series Fuse Rating		15A
Cell Technology		TOPCON
Cell Type		N-type
Glass		Anti-scratch
All technical data at standard test condition AM=1.5 E=1000 W/m <sup>2</sup> TC=25°C		


**Figure 1:** Characteristics of the solar panel

**Source:** Physics Laboratory University of Adrar Algeria



**Figure 2:** The solar panel

**Source:** Physics Laboratory University of Adrar Algeria

Model No. : INFINISOLAR VIII 5W  
 Serial No. :   
 98132103100207

PV INPUT	Nominal operating voltage 360Vdc
	Vmax PV 450Vdc
	PV input voltage range 120-450Vdc
	Isc PV 27A
AC OUTPUT	MPPT voltage range 225 ~ 430Vdc
	Nominal operating voltage 230 Vac
	Nominal output current 22A
	Nominal operating frequency 50/60Hz
	Maximum power 5000W
AC INPUT	Power factor range 0.9 lead-0.9lag
	Nominal operating voltage 230Vac
	Maximum input current 40A
BATTERY	Nominal operating frequency 50/60Hz
	Battery rated voltage 48Vdc
	Maximum battery current 137A

**Figure 3:** Characteristics of the charging regulator

**Source:** Physics Laboratory University of Adrar Algeria



**Image 4:** The stored electricity battery

**Source:** Physics Laboratory University of Adrar Algeria

Battery (12V-200Ah) with a voltage of 12 volts.

By connecting four batteries, we achieve 800 ampere-hours or  $12 \times 4 = 48$  volts

This model withstands the high temperatures in the city of Adrar.

The battery capacity (Wh) = Battery voltage  $\times$  Battery capacity (Ah)

We perform calculations to determine the amount of electricity consumption.

In the morning:

- We have 8 panels with a capacity of 415 watts  $\times$  8 = 3320 watts.
- We control electricity consumption. We use a small cooler with a power of 600 watts, running for 10 hours a day.
- The electrical power  $600 \times 10$  hours = 6000 watts, i.e., 6 kilowatts.
- Dividing the electrical power by the battery voltage, we find  $6000/12 = 500$  amperes.
- To preserve the battery, we must provide more than 500 amperes per day in anticipation of shortages.
- We have four batteries with a capacity of 800 amperes, sufficient to run the air conditioner for 10 hours a day.
- Cooling in desert areas has distinctive characteristics, and the building materials of the structure play a fundamental role in electricity consumption.

- Operating for 20 years consumes  $172800 \times 0.3 = 51840$  liters  $\times 29$  DZD - diesel price - = 1.5 million DZD.
- Excluding engine failures and the cost of spare parts, using the engines for 20 years costs 5.34 million DZD.
- The annual cost is 267 thousand DZD, and the monthly cost is 22.2 thousand DZD.

From the study, it becomes clear to us that the cost of producing electricity through renewable methods is less expensive than the equipment for generating energy through traditional fossil methods. Through this research, we attempted to combine the use of renewable energy, represented in the production of electricity using solar panels, with environmental conservation. This is achieved by reducing the emission of polluting gases and using an environmentally friendly home to lower the surrounding temperature. From an economic perspective, we conducted a study to understand the costs of producing and consuming energy in Algeria. This aligns with the concept of sustainable development, which links the environment, society, and economy, aiming to improve living conditions for every individual in society and develop production methods in ways that do not lead to the depletion of Earth's resources (Purvis, Mao and Robinson 2019).

#### **4. Conclusion**

The international community has recognized the magnitude of environmental risks due to industrial development in recent years, where the environment has become one of the major concerns for nations through the signing of numerous agreements between countries and the convening of many conferences under the United Nations, paving the way for the establishment of international environmental law.

These agreements and conferences have formed a legal reference for the world's countries to enact legal texts that focus on environmental elements and protect them from various risks, while ensuring sustainable development in all areas, both economic and social.

However, efforts to protect the environment still face reality challenges due to the stubbornness of more developed countries and their non-compliance with the measures and actions decided to reduce environmental risks. The absence of deterrence in international decisions allows those responsible for environmental damage to evade punishment. This calls for adding more legitimacy to international decisions and holding countries accountable for environmental

damages through cooperation between developed countries and developing countries, which are most affected by environmental violations. It necessitates the establishment of independent judicial bodies to monitor environmental violations and hold the culprits accountable.

There should always be a search for alternatives to fossil fuels and the use of clean and environmentally friendly energies, reducing their production costs, and ensuring their marketing to generalize their use among individuals.

In Algeria, the vast distances and uneven distribution of the population in the southern regions make it difficult to connect remote areas to electricity, leading many to use renewable energies to provide electricity and reduce consumption bills. Buildings are constructed with clay bricks for their heat resistance and good thermal insulation, despite being fragile and not resistant to weather conditions like wind and rain.

Sustainable development is achieved by preserving the environment, avoiding the exhaustion or degradation of natural resources, conserving them for the long term, rationalizing the consumption of non-renewable resources, and recycling waste. Sustainable development is also realized by focusing on the economic aspect that aims to meet most of the citizen's needs, improving their welfare and living standards. Socially, sustainable development is achieved by distributing wealth and resources equitably and establishing a social protection system that provides the right to development for all community members. Environmental awareness is also one of the most important solutions to environmental issues through awareness campaigns about the magnitude of environmental risks and promoting awareness for the use of alternative products that reduce environmental hazards.

Efforts are made to encourage scientific research in the field of the environment and renewable energies to achieve sustainable development in all its aspects in developing countries.

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