Promoting energy efficiency in the building sector as a mechanism for mainstreaming sustainable development Survey of the residential sector in Algeria 2000 - 2017

تشجيع فعالية الطاقة في قطاع المباني كآلية لتحقيق التنمية المستدامة - دراسة حالة القطاع السكني في الجزائر 2000-2017

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Received:08/09/2019 **Accepted :03/01/2020** **Published :15/01/2020**

ملخص: تختلف نسب استهلاك الطاقة في العالم بين مختلف القطاعات ويمثل قطاع المباني نسبة 40٪ من الطاقة المستهلكة سنويا في العالم، ونظرا لارتفاع نسب الاستهلاك العالمي في الطاقة تم بذل جهود متنوعة في تطوير السياسات الهادفة لتشجيع فعالية الطاقة بالعالم، ومنه تهدف هذه الدراسة إلى تقديم نظرة عامة حول سياسات وإجراءات تشجيع فعالية الطاقة بالعالم مع التركيز على حالة الجزائر من خلال اعتماد المنهج الوصفي التحليلي استنادا على مجموعة وثائق صادرة عن الهيئات الحكومية الجزائرية كوزارة الطاقة، الوكالة الوطنية لترشيد وترقية استخدام الطاقة وذلك بتحليل واقع استهلاك الطاقة في قطاع السكنات بالجزائر والسياسة التي اعتمدتها الجزائر في مجال فعالية الطاقة قصد تحقيق أهداف التنمية المستدامة، وقد خلصت الدراسة إلى أن هناك العديد من العراقيل التي تقف وراء تطوير فعالية الطاقة في قطاع المباني، وعلى الجزائر بذل المزيد من الجهود من أجل التنفيذ الحقيقي والفعلي للبرامج المدرجة.

الكلمات المفاتيح: فعالية، طاقة، مباني، تنمية مستدامة، جزائر

تصنيف JEL: N7، Q4، N6، Q01.

Abstract: World energy consumption rates vary among different sectors and the building sector accounts for 40% of the world's energy consumption annually, and due to the high world energy consumption rates, various efforts have been made to develop policies to promote energy efficiency in the world, and from wich this study aims to provide an overview of policies and measures to promote energy efficiency in the world, focusing on the situation of Algeria by adopting a descriptive analytical approach based on a set of documents issued by the Algerian government agencies, such as the Ministry of Energy, the National Agency for the Conservation and Promotion of Energy Use, by analysing the energy efficiency policy adopted by Algeria to achieve the objectives of sustainable development**.** The study concluded that there are many obstacles that stand in the development of energy efficiency in the buildings sector, and that Algeria should exert more efforts for real and effective implementation of the listed programs.

Keywords: Efficiency, energy, buildings, sustainable development, Algeria

Jel Classification Codes : N7 ،Q4،N6 ،Q01.

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Introduction:

International concerns about energy conservation began to emerge during the 1973 oil crisis. At this time attention was focused on how to conserve non-renewable energy sources. Since then, buildings have been considered as a high potential for energy saving, thus improving the energy efficiency of buildings has become an important aspect of energy conservation. It has attracted attention from relevant bodies in developed countries where energy laws have been developed accordingly.

During the late 1980s and 1990s, the economic imperative of energy conservation began to diminish as oil prices gradually fell to pre-1970s levels and economic concerns were replaced by a call to limit greenhouse gas emissions to protect the environment from the potential threat of climate change. The environmental aspect has driven the recent development of the importance of energy efficiency in buildings and their inclusion as an imperative necessity in the policies of the countries. The residential sector is consideredthe most important sector in energy consumption, estimated at about 40% according to the International Energy Agency. Algeria, like other countries, seeks to achieve a strategy of stronger diversity, moving toward renewable sources, and achieving energy efficiency, especially in light of the increasing demand and environmental waste resulting from fossil fuels, which represents 84%.

In the past, the problem of the study on the reality of the housing sector in the program and the strategies adopted by Algeria in the field of energy efficiency and sustainable development is highlighted, especially as it represents 42% of Algeria's total national energy consumption according to the National Agency for Energy Use and Regulation, which is Algeria's commitment to the policy of developing energy efficiency in the residential sector in order to achieve sustainable development?

Previous studies:

An article by Sunday Olayinka Oyedepo (energy utilization as a tool for sustainable development in Nigeria)

The study aimed at clarifying behaviors that contribute to energy efficiency and how to maintain them in order to achieve sustainable development using analytical descriptive approach and found that energy efficiency needs to be addressed in order to achieve sustainable development.

Second article by M.A. Rosen and Chair (The Role Of Energy Efficiency In Sustainable Development)

It examined the relationship between energy efficiency and sustainable development and found that there was a great correlation between the realization of sustainable development and energy efficiency. Achieving sustainable development required increased energy efficiency and conservation.

The third article bay Pervez Hameed Shaikh (**Building energy for sustainable development in Malaysia)**

She discussed Malaysia's energy efficiency policy, pointed to the role of energy efficiency in buildings in achieving the environmental dimension of sustainable development, and concluded that energy efficiency was crucial in achieving the environmental dimension of sustainable development.

Research methodology: the study lies in answering the issue raised in order to recognize the role of energy efficiency to achieve sustainable development on the one hand and to highlight the position and policy of countries in encouraging this by focusing on Algeria, especially the residential sector, which represents 42% of the national energy consumption, where we are highlighting the most important energy efficiency laws in Algeria in the residential sector and the range of programs that Algeria used in developing energy efficiency

The descriptive analytical method was used for the period 2000-2017 according to a set of tools, including the interview and internal documents of the official national bodies concerned

with energy and their effectiveness as the agency of energy rationalization and promotion of the Ministry of Housing and the Ministry of Energy

I.energy efficiency in the building sector:

I. 1 The Definition

They are several definitions of energy efficiency in buildings, the most important of which are: **Definition 1:** "Use less energy while maintaining the same level of service can be achieved by reducing energy usage all or increasing the throughput per unit of energy consumed energy efficiency can be achieved through the optimization of operational and maintenance practices using higher-efficiency equipment and the development of advanced energy use control systems" (Pereia, Vaco Manuel Figueiredo, 2010).

Definition Two: "A strategy that reduces the consumption of services provided and reduces environmental costs, economic and social problems related to energy production and consumption" (Lionel, 2010) .

Through the above definitions, we conclude that energy efficiency in buildings is the use of less energy to produce the same effect or function, which covers all practices such as thermal insulation, metal fenders, recombinant electricity use techniques, etc.)

Intended to provide a range of services such as (lighting, cooling, cooking...) which reduce environmental, economic and social costs related to the production and consumption of energy.

I. 2 International experience in energy efficiency :

Over the past three decades, most countries have reduced energy intensity, which translates into higher energy intensity in basic end uses such as (automobiles, electromechanical devices, heating and industrial processes). Governments have implemented a wide range of policies and programs, such as energy efficiency standards, awareness campaigns, market obligations and financial incentives to accelerate energy efficiency development among international energy efficiency experiences, the most important of which are:

I.2-1 European experience in energy efficiency development:

Many actions have been taken to enhance energy efficiency at the local level. In 1998, the European Commission proposed pathways for energy efficiency exploration during the period 1998-2010 by introducing the concept of smart energy, and the energy efficiency policy was adopted with the publication of the Green Book on Energy Efficiency in 1998. 2005, which represents a future vision for the EU under the strategic energy challenges until 2020, when the EU has an arsenal of legislation to enhance energy efficiency such as environmental designs, guidelines etc.Each EU member country has adopted strong commitments to energy efficiency , energy efficiency emission standards, as reflected in the national indicative targets for 2020. In June 2010 , the European Commission proposed a new energy efficiency education adopted in October 2012, to promote the 20% energy saving target for 2020, where it is estimated that energy efficiency use would save 150 billion euros per year, hence the idea of **20/20/20** creatinga 20% reduction in greenhouse gas emissions, 20% reduction in energy consumption, and 20% increase the contribution of renewable energies within this new EU Directive, which would include innovative overall energy efficiency measures, which would include For SMEs .

I. 2-2 Experience of Mediterranean countries in the field of energy efficiency development:

Energy efficiency has been characterized by gradual developments , which today represent a great challenge to the policies of most of these countries. With the exception of Tunisia. which has long embarked on a policy of controlling energy consumption, the rest of the countries have seen few concrete energy efficiency measures, although the situation has been reversed in recent years, and one of the most important energy efficiency and efficiency

programs in the Mediterranean countries is Tunisia. Lebanon adopted a national energy efficiency plan for the period from 2011.

I. 2-3 North American experience in energy efficiency:

Canada is a leading energy-efficiency country, and the first plan for 2010 has been developed for energy efficiency and clean energy technology investments have increased to $891 million to provide 25655 TJ energy. The first plan included a set of measures taken by power distributors, particularly in the new building area , and the renovation and replacement of electro-domestic tools with more energy-efficient models (Rahman Amal, 2016 - 2017, page 209).

II. Sustainable development and its dimensions:

The concepts on sustainable development are numerous and will be addressed in this area, the most important concepts of sustainable development and their dimensions as follows:

II.1The concept of sustainable development: Definitions on sustainable development are numerous, the most important of which are:

The first definition: "Is to meet the needs of individuals in the present without compromising the ability of future generations to meettheir special needs" (Ahmed Debeish, Marwa Boukdoum, 2018, p. 05)**.**

Definition Two: "The conservation and sustainability of multiple resources in the environment to meet financial, social and economic needs and the management of the most advanced technology while ensuring the continuity of resources for the next generations (wafia Frukhie, 2018).

This is why the concept of sustainable development can be understood as the rational and rational use of renewable or non-renewable resources at present by taking into account the immediate needs and needs of individuals and of the future without neglecting future generations and what they need to cover their requirements by reconciling economic, social and environmental aspects.

II.2 The importance of energy efficiency for sustainable development:

The expansion of fossil fuel consumption has resulted in the emission of large amounts of gases and particles (sulfur dioxide, nitrogen oxides, carbon oxides, and hydrocarbons), which, by accumulating in the atmosphere, is changing the composition of air, resulting in a breakdown in its ecosystem and air has become a source of many hazards and harmful to all aspects of living. The negative environmental effects of fossil fuel combustion have been numerous: Air pollution, water pollution through acid precipitation, climate change, and ozone layer erosion (saida snossi ,Beja Ahmed, December 2016). There are many signs of further deterioration, such as the rise in temperature of the Atlantic and Indian Ocean, which covers 72% of the Earth's surface (Omer, Energy enviroment and sustainable development, 2008).The decline caused a humanitarian impact, and various diseases, especially for the population living in barracks near the factories using fossil energy, spread thinly to the economic impacts of (reduced labor productivity, high health care costs, depletion of foreign exchange reserves, high costs of environmental protection and pollution treatment programs) (sadia snoussi, December 2016) and energy efficiency, among them many benefits (International Agency for Renewable Energies and Energy Efficiency, September 2012, pp. 05-06)**.**

- **Reduction of greenhouse emissions:** By reducing consumption that is directly proportional to the volume of fossil energy produced in generating plants;
- **Reduction in total investments:** Since the cost of providing kilowatts of energy through encouraging programs is much lower than its energy counterpart by adding generation units to existing or new stations;
- **Impact on Income:** The consumption of energy-saving devices will directly affect the consumer by reducing the monthly billing value

➢ **Impact on the national economy**: Reducing energy demand contributes to saving domestic sources, which extends the life of the non-consensual use of depleted resources or allows their export potential, thereby increasing export earnings, reducing trade deficits and reflecting the balance of payments

➢ Achieve high levels of health, comfort, and prevent diseases and health problems.

III. Algeria's strategy to achieve energy efficiency

Algeria has adopted a series of laws aimed at developing energy efficiency, including:

III.1Legal mechanisms for energy efficiency in Algeria: In order to achieve energy efficiency, Algeria has promulgated numerous laws, executive decrees and ministerial decisions on energy efficiency mentioned in the following tables (3.2.1):

Table (01): Legal framework for adopting energy efficiency

The content of the law	Subject	Date of promulgation of the Act	Law No.
▪ Introducing energy efficiency standards into new buildings and monitoring power-use devices. ▪ The use of high energy yield devices such as low-energy light bulbs. ▪ Mandatory and periodic energy audits of the most energy-consuming enterprises. ▪ Sensitize and educate users on the energy economy through the transmission of information programs that promote and promote the culture of the energy economy. ▪ · Organize and coordinate the implementation of energy control programs by drawing on a competent national authority represented in the national agency for energy conservation and conservation. ▪ Develop incentive and promotional measures by granting financial, electrical and physical privileges to activities and projects that contribute to the development of energy efficiency and the promotion of renewable energies. ▪ Development of a bank of statistical data on energy in order to improve knowledge of the national energy consumption system.	Related to power control	**28 July 1999**	**99/09**
▪ Liberalization of the sector by opening the door to private investors ▪ Establish procedures for promoting electricity production from renewable energy.	On electricity and public distribution of natural gas through pipelines	**05 February 2002**	**02/11**
▪ Promoting renewable energies to achieve environmental protection goals. ▪ Contribute to sustainable development by conserving traditional energy sources and valuing renewable sources. ▪ The formulation of a national program for the promotion of renewable energies and the establishment of a national body to develop energy use.	On the promotion of renewable energy in the context of sustainable development	**14 August 2004**	**04/09**

Source: Prepared by researchers based on: SaïdaSnoussi, Ahmed Beja, Energy Efficiency and Renewable Energy Program as a mechanism to embody sustainability Case Study of Algeria, Communicating in the Economics of Governance and Law, issue 48, 2016.

Table (02): Most important Algerian implementing decrees related to energy efficiency:

The content of the decree	Date of issuance of the decree	The name of the decree
Including the thermal organization of buildings.	April 2000	**2000/90**
The modalities for the preparation of the national energy control program are specified.	May 2004	**04/149**

Related to energy audits of more energy-consuming installations.	26 December 2005	**05/495**
The rules for energy efficiency applied to devices that are electric-fired, gas-fired, and petroleum products are specified.	January 1, 2005	**05/16**

Source: Prepared by researchers based on: National Energy Rationale Agency (APRU), Legislative Text Council, 2010 Edition.

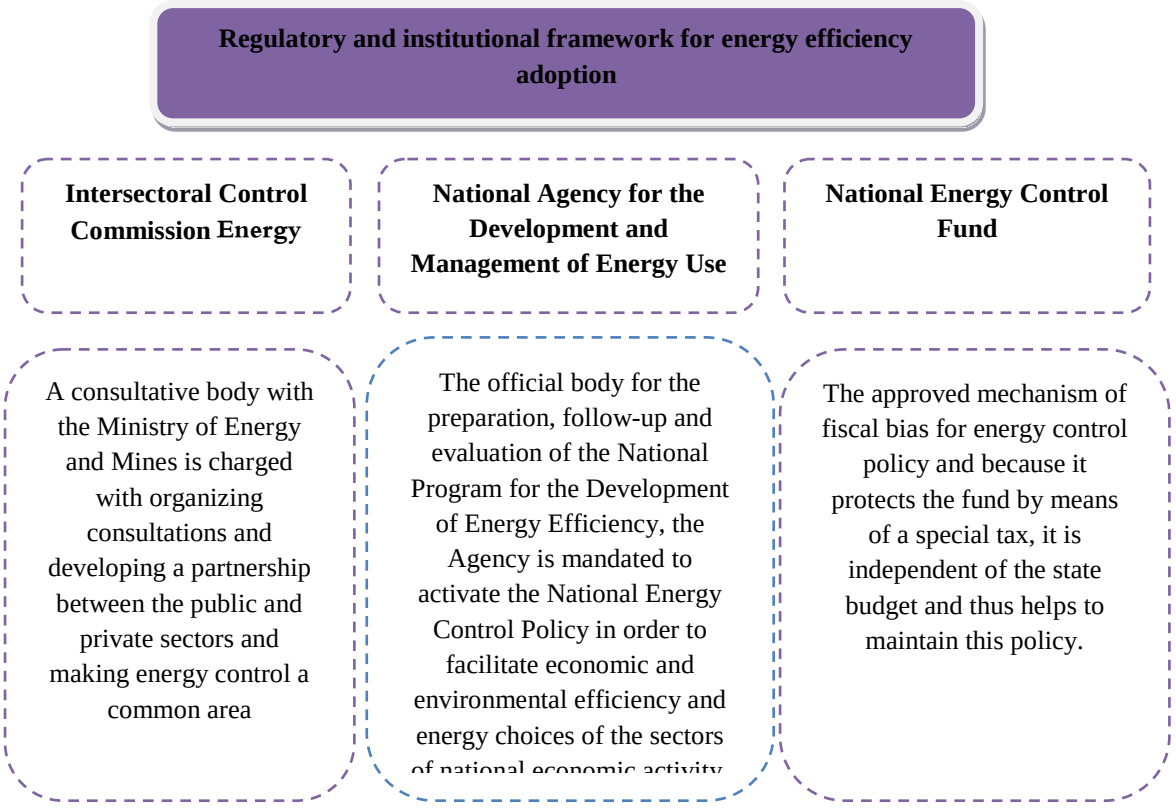
Table (03) Ministerial decisions on energy efficiency adoption

The content of the resolution	Decision
Sets the equipment and items of home-use devices that are subject to the rules for power efficiency and power operation.	**Joint Ministerial Decision of 03 November 2008**
The energy efficiency rating of home-use devices subject to the rules for energy efficiency and electrical power.	**The Joint Ministerial Decision of 29 November 2008**
The provisions on the regulations governing and exercising power efficiency control for home-use devices subject to the rules for power and electrical power efficiency.	**Ministerial Decision of 29 November 2008**
On energy labelling of refrigerators, aggregators and home-based appliances that are subject to the rules for power efficiency and electric power.	**Resolution of 21 February 2009**
It is about the strong marking of household bathers subject to the rules for energy efficiency and powered by electric power.	**Resolution of 21 February 2009**
Relates to the energy section of the home-use air conditioners that are subject to the rules for energy efficiency and electrical power.	**Resolution of 21 February 2009**

Source: Prepared by researchers based on: Energy efficiency improvement project for lighting and appliances, International Renewable Energy and Energy Efficiency Agency, Cairo, September 2012, p. 7.

III. 2 Regulatory and Institutional Framework: The regulatory and institutional framework for the adoption of energy efficiency in Algeria ((National Agency for the Development and Conservation of Energy, 2013):

Figure (01): Regulatory and institutional framework for energy efficiency adoption



Source: Prepared by researchers based on: National Agency for the Rationalization and Rationalization of Energy Efficiency, 2011-2013, pp. 4-5.

III. 3 Programs for the development of energy efficiency in Algeria:

There are several programs, the most important of which are The National Program for Energy Efficiency**:**

Algeria, through its energy efficiency policy, is pursuing ambitious goals in this field, in order to reduce energy consumption, protect the environment and preserve this wealth for generations to come from the logic of sustainable development. This policy was reflected in the approval of the energy efficiency program and covers all sectors of activity (buildings, industry, transport) and after its implementation, the energy economy accumulated in the range of 2030 will exceed 60 million tons of oil equivalent. The Eminent Operations of this Program (National Agency for the Development and Management of Energy Use, 2016, pp. 06-07) addressed the following:

- **Transport sector:** The program in this sector proposes to upgrade the liquefied propane gas, as the market share of the liquefied propane gas in 2020 is expected to increase by 20% and will be accompanied by direct financial assistance to beneficiaries who wish to convert their vehicles to work with refined propane gases. The program also included the promotion of natural gas/fuel, and the idea was first made since the early 1990s, when Algeria conducted the study of the conversion of fuel-to-natural gas-to-gas-based utility vehicles. The facilities were completed by Sonelgas to distribute the fuel on a pilot basis.
- **Industry Sector**: Intervention in this sector is carried out at two levels: Joint financing for stronger energy audits and feasibility studies that allow organizations to determine exactly which technical and economic solutions are most appropriate to reduce their energy consumption, **while the second** is co-financing the underlying costs associated with introducing the energy efficiency of economically and technically viable enterprises.

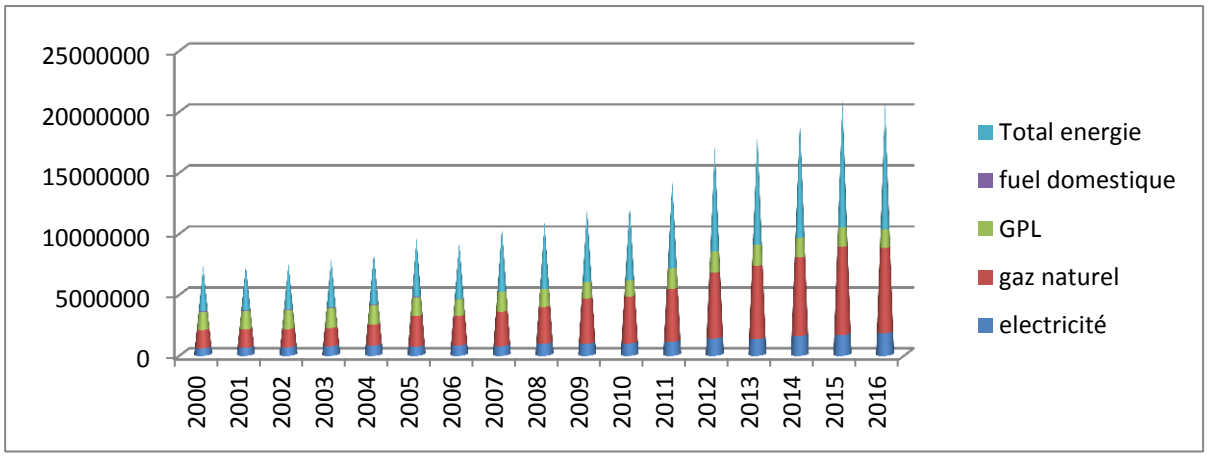
IV.Energy efficiency in the residential sector in Algeria:

The case study is based on data set (energy production, energy consumption, etc. in barracks in Algeria, the National Program for High Energy Efficiency in Electrical Systems, the role of the National Program for Energy Efficiency in Sustainable Development)

IV. 1 Energy production in residential sector in Algeria :

The building sector is one of the largest energy-consuming sectors in Algeria, particularly in light of the increasing population and the various housing programs approved by the Algerian Government to fight fragile homes, which has led to the increase in the production of energy directed to the residential sector in recent years, as follows:

Figure (02) represents total energy production targeted in the residential sector for the period 2000-2016.

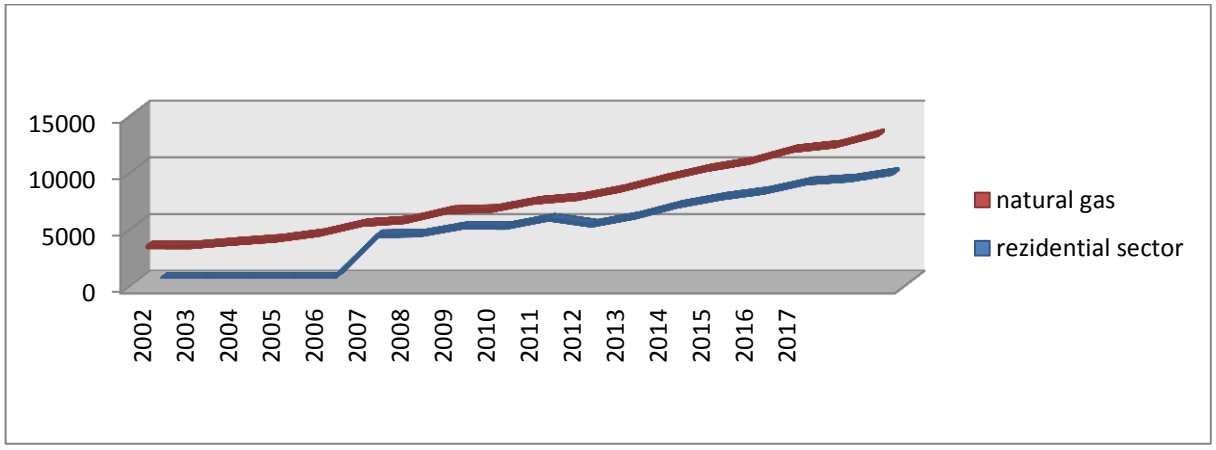


Source: Internal documents of the National Energy Agency for the Development and Rationalization of Energy Use (accessed as of June 2018)

In Figure 02, we note that energy production in the residential sector depends on natural gas because of Algeria's natural gas capabilities.Following is the second production of electric power as a result of the increase in the population and due to its natural area estimated at more than 2 million km 2, it needs more power generation capabilities to reach all Algeria's countries.

IV. 2 Energy consumption in Algeria:

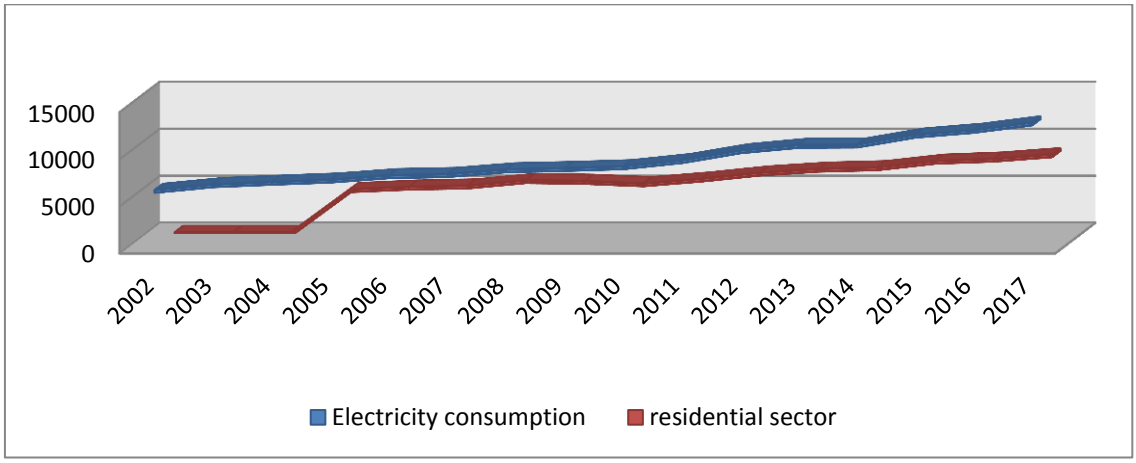
Figure (03): The development of natural gas consumption in Algeria in the residential sector in 2002 - 2017



Source: Internal documents of the National Energy Agency for the Development and Rationalization of Energy Use (accessed as of June 2018)

The natural gas consumption in Algeria has continued to increase for the first 10 years as of 2000, reaching 3781 for all sectors, including industry, transport and housing, natural gas consumption for the same year in the residential sector (2271), while the value of natural gas consumption for the same year was estimated at (8021) for the same year in 2010 and was recorded at 4689 for the same period in 2000, rising to 13655 years at 2017 .

Figure (04): Development of electric power consumption in the residential sector for the period 2002-2017



Source: Internal documents of the National Energy Agency for the Development and Rationalization of Energy Use (accessed as of June 2018)

As can be seen in Figure 04, the general level of electricity consumption in Algeria, both public and private, has risen to 2007 (7779) (4946) in the residential sector, while 2012

(10304) (6326) was recorded in the residential sector and (7573) in 2015. The highest value was 2017, which is 13270 for public consumption and 8268 for the residential sector

IV.3 The National Program for Energy Efficiency in the Barracks Sector in Algeria: As stated in theory, the energy program included several sectors, including the residential sector, we drop what has been discussed in the theoretical aspect of the practical aspect and outline the most important of which are as follows:

a) Encouraging the use of low energy light bulbs: Research indicates that energy-saving lamps are 30% to 80% less than conventional lamps and that the use of such lamps in European countries has not exceeded 13% of the general consumption in those countries, the generalized use of such lamps in the case of Algeria will help 30% of the energy consumption, i.e. 1,000 megawatts per year. The aim of the operations under this part is to replace all energy-efficient lamps in the national market and, according to Ministry of Housing and Urban Development statistics, the housing boom is estimated at 900,000 dwellings in 2020 at 5 fenders per dwelling. The objective in the 2030 range is to achieve an energy economy of an estimated 2 million tons of oil equivalent. Expected energy profits of 2030 are estimated at 20 million tons of oil equivalent. Local production of low-consumption lamps will also be encouraged, particularly through partnership (National Energy Efficiency Program, 2016).Energy performance was also introduced in public lighting, where public lighting is one of the most energy-consuming centers of community property The energy efficiency program for local communities is aimed at replacing the sum of the mercury lamps (energy-consuming and harmful) with more successful lamps (sodium under high pressure), with 150,000 sodium lamps and a non-stress compound that will enable a power economy of about 10 million tons in 2030, and reduce local bill capacity.

In addition, the project is designed to provide the necessary information to the public and private sectors in order to ensure that the project is completed and that the project is completed in a timely manner. The objective of this program, within 2030, is to achieve a cumulative energy profit of more than 7 million tons of oil equivalent, including:

- **The project** aims to establish operational engineering requirements that integrate energy and ocean conservation techniques as well as residential functional improvements by reducing the use of heating and air conditioning The National Agency for the Conservation of Energy has launched a pilot project to isolate 600 new dwellings, which have concluded an agreement with the National Housing Fund (CNL), the Diwan Real Estate Promotion (OPG), the state of Algeria (50), and Al Balida (80), Al Baleida (80). The National Energy Control Fund covers 80% of the extra costs resulting from thermal insulation of new buildings Figure (01). (National Agency for the Development and Conservation of Energy, 2013 edition, p. 06)

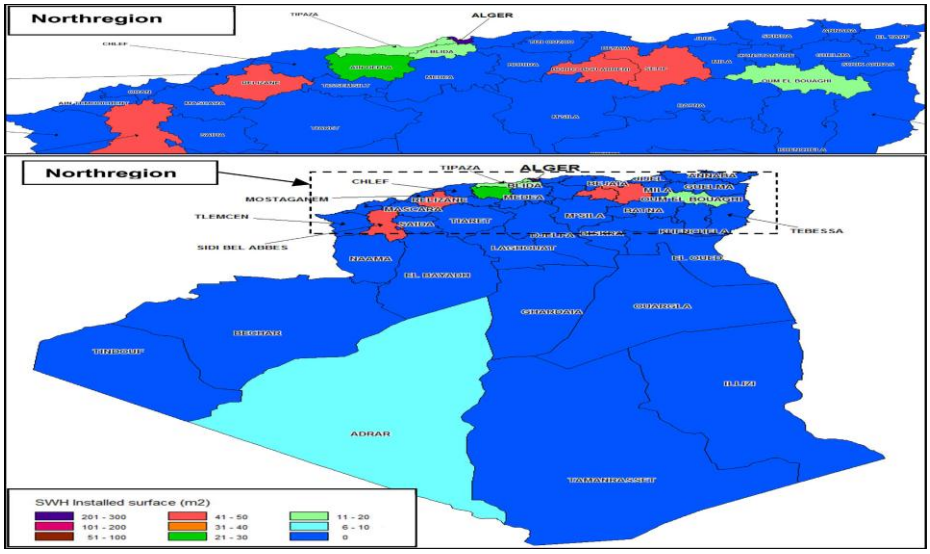
- **The thermal isolation of 1500 old buildings:** The residential complex is large and varied; the data related to the restoration (thermal isolation) are: Buildings facing the residence and buildings targeted to the services sector, especially (hotels, schools, health institutions, etc.). The period (2011-2013) included a partial overhaul of the outer holes where the bead windows were replaced by double-glazed windows, while the insulating and polystirene materials were integrated on level surfaces of the flat, glass and rocky surfaces on sloping surfaces. The project aims to rehabilitate 1,500 houses of this type of procedure that allow energy saving from 20% to 80% of annual data consumption (heating and cooling) and to raise the private sector to engage in this project.

- **Development of Local Insulation Industry:** The Energy Use Development Agency revealed that there are several products that can be made locally such as cork, polystirene, rock wool, glass wool and even local materials such as stones. It also explained that it will work with the National Investment Development Agency to find out how to grant facilities to investors, but these are insufficient to require a review of the overall construction system as well as the rehabilitation of the national housing hangar, estimated at 7 million houses, which even if they do not achieve the same profits as new ones but reduce energy consumption, and the agency works on setting up a program for double windows and reinforcing the ceilings

and external isolation obtained by using cement and polystirene foam. (https://portail.cder.dz/ar/spip.php?article2304, 2011)

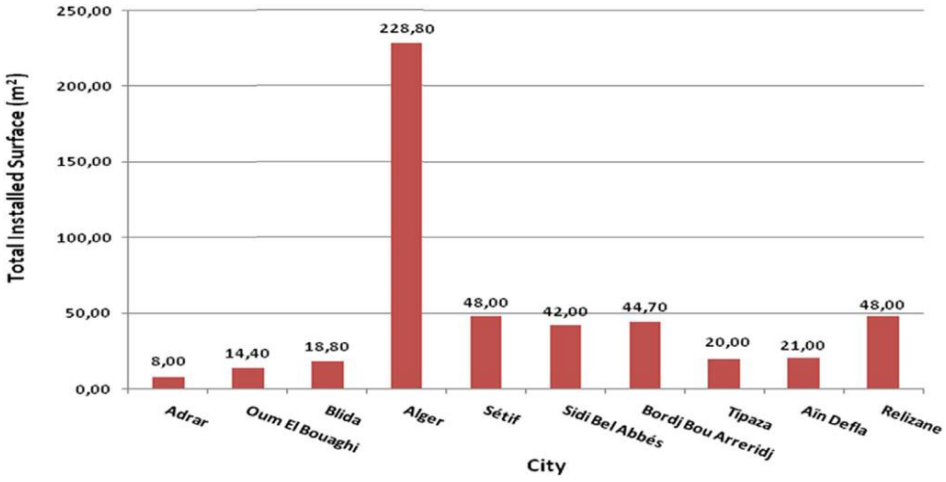
1. **Integration of renewable energy technology:** This technology has included the generalized use of the solar water heater, which is a device designed to convert sunlight into heat and which then goes to water by heat transfer phenomena. Hot water is heated in a insulated tank for use during periods of sun absence consisting of one or more solar power pools, a storage tank, and a circulation system for the thermal reactor that transfers heat generated from the solar power pools to the storage tank (R. Sellami, 2016). In terms of use of hot water, the priority for the authorities is to replace solar heating with gas heating, in this regard, considerable efforts will be made to encourage the intensive introduction of solar water heaters with special attention to their local producers and according to data issued by the National Bureau of Statistics (ONcThe National Real Estate consists mainly of individual and traditional houses in reality (Figure09) at 674%, which helps to integrate solar heater.

Figure (09) Distribution of solar water heaters installed over the country and potential sectors of solar heater use



Source: Sellami, others,**Market evaluation and development programs of the solar water field in Algeria** , Renewable and Sustainable Energy Revieus 65(2016) p, 621.

Figure (10) represents the sum of the installed surfaces of the local solar heater for each city



Source: Sellami, others,**Market evaluation and development programs of the solar water field in Algeria** , Renewable and Sustainable Energy Revieus 65(2016) p, 621.

IV. 3Energy efficiency in home appliances in Algeria: Especially electric appliances, refrigerators and air conditioners, are the most energy-consuming appliances in Algeria.

IV. 1 Energy efficiency rating for home-use devices in Algeria: Electrical energy-fueled devices are subject to two sections 1 with two ratings :(A+) and (A++) and the device is limited by alpha-yield indicator (αI) as per table (01) and section 2 is a "A" to "G" by table (02)

Table (01) (02) : Classification of equipment by manufacturers I and II.

Classifyenergyyield	Energy yield index
A –أ	55>I
B – ب	75 > I ≥ 55
G – ج	90 > I ≥ 75
D – د	100> I ≥ 90
E – هـ	110> I ≥ 100
F – و	125> I ≥ 110
G– ز	I ≥ 125

Classifyenergyyield	Energy yield index
A+	iα < 30
A++	30 ≤ I α < 42
G –A – ز – أ	42 ≤ I α

(A I) = Annual stronger Set Consumption / Annual stronger Consumption α System measured by α System x 100

Source: The Legislative and Regulatory Engraving Authority of Energy (PEDA), op. cit.p. 29-31

IV.2 Classification of air conditioners with household use subject to the rules for electrical power efficiency and effectiveness:

The energy efficiency class is determined according to tables (03), (04) below when the energy level of return (EER) is determined according to the experimental procedures of the applicable technical systems and in fair necessity.

Table (05) (06) Air-cooled air conditioners

The devices of the Spirit and Multi Split system	Classify energy efficiency
3,00 < EER	A –أ
3.00≥EER>2.80	B – ب
3.80≥EER>2.60	G – ج
2.60≥EER>2.40	D – د
2.40≥EER>2.20	E – هـ
2.20≥EER>2.00	F – و
2.00≥EER	G– ز

The devices of the Spirit and Multi Split system	Classify energy efficiency
3.20 < EER	A –أ
3.20≥EER>3.00	B – ب
3.00≥EER>2.80	G – ج
2.60≥EER>2.60	D – د
2.60≥EER>2.40	E – هـ
2.20≥EER>2.20	F – و
2.20≥EER	G– ز

Source: Complex Legislative and Regulatory Provisions for Energy, National Energy Agency for the Development and Rationalization of Energy Use, Edition 2010, p. 33

IV.3 Classification of household filters subject to the rules for energy efficiency and electricity-burning according to their electrical efficiency:

- Class A: phosphoric sulphides without a combined ballast with less absorption power expressed below the following value calculated by luminous flux calculated by or equal to:Where 0.15 Q+0.0097Q lives NQ: Is the light flow of the lamp in the bulb,

Other lamps with less than the absorption power expressed by watts shall be of the following value according to the luminous flux expressed in or equal to the womb: 0.15 Q + 0.0097Q Q: is the light flow of the lamp in the bulb.If it is not listed in the following table, you should calculate a reference force of WR based on the following table:

If a class is not within A, reference force WR must be calculated according to the following methods:

Q is the light flow of the lamp and calculates the energy efficiency indicator according to the following combination:

E1=W/WR Where WR is the power of the luminaire in the watts and the energy efficiency category is determined by the following table:

Table (07) Energy efficiency of lamp

The devices of the Spirit and Multi Split system	Classifyenergyefficiency
3.60 < EER	A – أ
3.60≥EER>3.30	B – ب
3.30≥EER>3.10	G – ج
3.10≥EER>2.80	D – د
2.80≥EER>2.50	E – هـ
2.50≥EER>2.20	F – و
2.20≥EER	G– ز

Source: Complex Legislative and Regulatory Provisions for Energy, National Energy Agency for the Development and Rationalization of Energy Use, Edition 2010, p. 37

IV. 4 For energy efficiency measures, household and battery assemblies, three standard values are listed for household product types:

Refrigerator, air conditioners, pharmacies.

- **Energy efficiency measures, household assemblies, and batteries:** Refrigerators are classified according to energy efficiency indicator and have been graded for refrigerators A (a) very economical to G (G) low economy and include the following data (Appendix 1) : The pendulum contains a set of information: Manufacturer's name or supplier, type of apparatus (fridge, freezer, freezer, frozen freezer), consumption of electricity and kilowatt hours per year, the full capacity of frozen staring,

- **Standard Values of efficiency of domestic air conditioners and batteries:** A very economical A-to-G (G) is a low-economy, data card (Annex 2): Manufacturer's name and mark or dealer's name, rating the device based on its energy efficiency, estimates the annual consumption of energy calculated on an average usage of 500 hours per year, type of breeders, the level of noise measured during a power cycle.

- **Standard and Foliative Values of Domestic Fairs:** Incineration of Gestalt and adhesive Finger Fingers are classified according to the energy efficiency indicator, and a rating of A is placed on very economical level to G (G) is included in the following data: (Manufacturer or supplier name, photodiode stream, power absorbed in watts, yield ratio of the highest energy .

V. The National Program for Energy Efficiency and its Environmental Impacts:

Table (07) Emissions avoided by the renewable energy program and energy efficiency by 2050

2050	2040	2030	2020	2010	2007	Years
34	17	*8*	02	00	00	Carbon dioxide emissions (renewable electricity) Cells
08	02	00	00	00	00	Photovoltaic (PV
02	01	00	00	00	00	Wind
24	14	07	02	00	00	Solar thermal
794	335	101	08	00	00	Carbon dioxide emissions (GN-compound cycle generating station
06	02	01	00	00	00	Avoiding CO2 emissions (solar water heaters)
766	320	87	06	00	00	Total emissions avoided (renewable energy)

Source: Ministere de l'amenagement du territoire et de l'environnement, Seconde communication national de l'algerie sur les Changements climatiques a la ccnucc, Alger, 2010, P 183.

In this regard, the National Program for Energy Efficiency and its environmental impacts is still very weak due to the novelty of this program, which, although launched, is slow and amounts to exhaust gases of 84 million tonnes/person/year compared to other countries, Algeria's contribution to global climate change is very weak despite a combination of efforts to generate at least 40%. Of electricity in 2030.

VI. Obstacles to the application of energy effectiveness in Algeria:

- Price structure: The absence of a special tariff that promotes the rational use of energy in the housing sector;
- There is a legal absence requiring manufacturers and consumers to include this characteristic (energy efficiency) which they consider to be secondary ;
- The weak ability to operate, Algeria is one of the weakest Arab levels, despite the existence of a large institutional and regulatory system;
- The slow embodiment of the technology and the actual delay in completing many projects;
- Behavior: There are many irrational behaviors that drive away from the management of many energy.

Discussion of results : we have reached a set of conclusions that can be summarized as follows:

- The analgesics sector is one of the most energy consuming sectors at the global and national levels, accounting for more than 42% of total consumption;
- Sustainable development can be achieved by reducing energy consumption in the analgesics, which reduces CO2 emissions and this is what a study found. M.A.Rosen and Chair, " the rôle of energy efficiency in sustainable develeopment" And also a study Pervez Hameed Shaikh,. Nursyarizal Bin Mohd. Nor. Anwer Ali Sahito Perumal Nallagownden. Irraivan Elamvazuthi. M.S. Shaikh. " Building energy for sustainable development in Malaysia: A review"
- Energy efficiency in the sedatives is achieved through a range of measures (thermal insulation, energy-saving and renewable energy sources);
- Energy efficiency in the residential sector is based on a group of shareholders (consumers, policies, enterprises, finance and others);
- There is a recent trend in energy efficiency improvements through the inclusion of the National Energy Efficiency Program, as well as the enactment of a set of laws and decrees confirming their pursuit of this approach;
- Energy labelling contributes to educating consumers about the energy efficiency of household appliances and thus induces consumers to acquire economic equipment; A study indicated Sunday Olayinka Oyedepo, Efficient energy utilization as a tool for sustainable

development in Nigeria To the importance of behavior that contributes to achieving sustainable development, including consumer awareness of regulations that increase energy efficiency;

- There is a delay in the implementation of the National Program for Energy Efficiency in terms of its implementation compared to the achievements of countries such as Tunisia.

Conclusion :

With the expansion of demand and the concentration of fossil fuels, there is a need to prevent environmental conditions and achieve sustainable development, and the policy of increasing energy efficiency is one of the most important ways to achieve this.Despite the orientation of Algerian policy in the 2030 horizons through the National Program for Energy Efficiency, work in this field is still demanding.

Through these results we propose a set of recommendations, including:

- To ensure that all actors of manufacturers, distributors and consumers are ensured through the media, the integrative and the politicization of the importance of energy conservation and rationalization;
- Intensifying efforts and benefiting from international experiences, especially the Tunisian experience;
- The need to activate communication between the enterprise group and all actors in the course of the program;
- Phasing out traditional fattens and replacing them with poorly used fishes;
- Promote and support more effective behaviors such as using stoves;
- Block devices that do not meet energy efficiency standards;
- Applying taxes to ineffective practices;
- Awareness-raising and awareness-raising campaigns on the importance of energy conservation and its environmental impacts.

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