

Renewable energies in the service of sustainable development

الطاقات المتجددة في خدمة التنمية المستدامة

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Abstract:

Researchers, professionals and policy makers are unanimous today about the importance of renewable energies, their positive impact on the economy and their impact in terms of added value, socio-economic and environmental benefits. The purpose of this paper is to show the growing importance of renewable energies and their contribution in development, their advantages and disadvantages and the energy strategy adopted by Algeria for the development and promotion of this sector. As a result, despite the availability of abundant sources of renewable energy and efforts to establish a legal and institutional framework and the development of an ambitious agenda for the coming decades, much remains to be done to bridge the gap. delay and develop this niche and take certain measures deemed urgent.

Keywords: Renewable energy; energy efficiency; energy transition; Energy strategy

المخلص:

يجمع الباحثون والمهنيون وواضعو السياسات اليوم أهمية الطاقة المتجددة، تأثيرها الإيجابي على الاقتصاد من حيث القيمة المضافة والفوائد الاجتماعية والاقتصادية والبيئية. الهدف من هذه الورقة هو إظهار الأهمية المتزايدة للطاقات المتجددة ومساهمتها في التنمية ، ومزاياها وعيوبها والاستراتيجية الطاقوية التي اعتمدها الجزائر لتطوير وتعزيز هذا القطاع. إلا أنه وبالرغم من توفر مصادر وفيرة من الطاقة المتجددة والجهود المبذولة لإنشاء إطار قانوني ومؤسسي وتطوير برنامج طموح للعقود القادمة ، إلا أنه ما زال هناك الكثير مما ينبغي عمله لتعويض التأخر المسجل لتطوير هذه الشعبة واتخاذ الإجراءات الاستعجالية.

الكلمات المفتاحية: الطاقات المتجددة، النجاعة الطاقوية، الانتقال الطاقوي، إستراتيجية الطاقوية.

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1. INTRODUCTION

Energy, whose global demand is continually growing, is one of the determining factors for economic and social development. To answer this, several solutions are implemented, such as fossil fuels, the development of energy efficiency and renewable energies. The latter increase the energy supply and support economic growth, while limiting its impact on the environment.

The intensification of the use of these energies since the signing of the Kyoto Protocol in 1997 is at the heart of contemporary political concerns aimed at reducing the exploitation of fossil resources "over exploited" and limited. Natural energies (water, wind, sun, geothermal energy, plants) that are renewable, inexhaustible and clean (without toxic waste or greenhouse gases) offer an alternative for sunny and windy regions, such as 'Algeria.

In this article, we are interested in the importance of renewable energies in the world, their impact on the economy and the environment and the energy strategy of Algeria in this context. We approach this work by defining renewable energies, their advantages and disadvantages and global investments in the sector as well as their economic benefits. Next, we present Algeria's strategy for the development of renewable energies and its prospects.

1. Renewable energies and energy transition

Renewable energies are energies based on the use of natural elements, such as sunlight, water and wind renewed or regenerated naturally and inexhaustible. They are available in hydroelectric, solar, wind, hydroelectric, geothermal and tidal energy. Biomass (wood, plants, agricultural waste ...) is also a source of renewable energy.

The prospects for implementing the energy transition range from ordinary citizens to the highest levels of power in all areas, including research (Raymond, 2017)

This transition is based on the gradual abandonment of energy risk technologies to reduce greenhouse gas emissions to negligible levels, opening the door to a gradual decline in fossil fuel consumption (Brandes & Günther, 2017).

2. Advantages and disadvantages of renewable energies

Renewable energies are an inexhaustible source of energy, ranging from solar to wind energy through geothermal energy. Thanks to these low polluting energies, one can envisage a system of prolific energy production more respectful of nature. However, while renewable energies (RE) have many advantages, there are also some disadvantages associated with their operation.

2.1 Advantages of renewable energy:

There are a multitude of advantages of renewable energies, such as the economic, environmental and specific advantages of certain types of them.

2.2 Advantages:

a) Renewable energies with economic potential:

Renewable energies offer considerable potential for economic, industrial, social and growth development. The strong growth in global renewable energy markets is creating multiple opportunities for investment in activities located along the value chains of each industry. Global competition will further accelerate the share of renewable energy in the global energy mix at an increasingly competitive cost and create new industries.

They are an answer particularly adapted to the considerable energy needs of many countries. They make it possible to valorize their natural resources, hydraulics, sunshine, wind, biomass ..., to bring the production sites closer to the consumption centers and to reduce the dependency of these countries on fossil fuels.

b) Cheap energies:

Renewable energies allow a long-term control of energy prices. These are energies produced from free resources. Currently, it is the costs of technological development and investments in production equipment (wind turbines, solar modules, biomass boilers, etc.) that

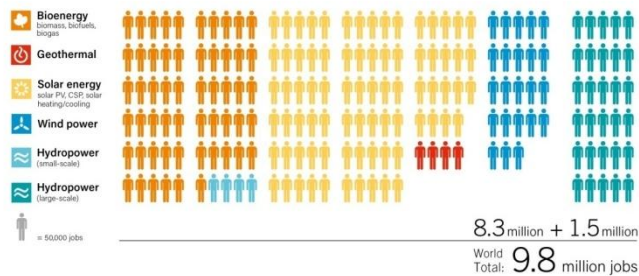
weigh on the cost of renewable energies. In the future, renewable energies will become the least expensive energies and at economically affordable and stable prices compared to other energies. Some technologies such as onshore wind have almost reached parity with the costs of thermal electricity, while other sectors such as solar photovoltaic or biomass significantly reduce their initial gap in competitiveness. Benefiting from a global market, a stream of regular technological innovations and various financial incentive schemes, investment in renewable energy production equipment is stimulated by the prospect of producing energy for renewable energies. competitive conditions, with very low operating costs compared to other energy sources.

The International Renewable Energy Agency (IRENA) estimates that the costs of electricity generated from wind and solar PV could fall by 26% and 59% respectively by 2025 (REN21, 2016). Recent transactions in Denmark, Egypt, India, Mexico, Peru and the United Arab Emirates have seen electricity costs drop to \$ 0.05 / KWh. This figure is well below the cost of fossil or nuclear electricity produced in these countries. Which demonstrates de facto that renewable are the most economical option.

c) Renewable energies create jobs:

Renewable energies are an important source of job creation and skills training. They registered 9.8 jobs registered in 2016 (figure 1) and 10.3 million jobs in 2017, a world record never reached according to the International Renewable Energy Agency Irena (REN21, 2018). An additional 500,000 jobs were created in the photovoltaic, bioenergy, wind, solar and hydro sectors, marking a global annual increase of 5.3%. Among the most mobilized countries are China, Brazil and the United States.

Figure 1: Jobs created in renewable energies in 2016



Source: Renewables 2017 Global Status Report

Algeria, like North African countries, has a significant global potential for renewable energy and one of the largest solar energy potentials in the world (Schäfer, 2016) is found here. The energy efficiency promotion program should lead to the thermal insulation of 100,000 dwellings per year as well as the conversion to LPG of more than one (1) million passenger cars and more than 20,000 buses, at the same time as more than 180,000 jobs will be created.

d) Security and energy independence:

Renewable energies contribute to security of supply and energy independence. Produced from natural and local resources; for the most part infinite on a world scale, they do not exhaust any stock. Their use protects against the risk of supply disruption and price volatility resulting from the vagaries of international energy commodity markets.

They are the most suitable vectors for the development of decentralized energy production. The use of this asset, which is particularly important for developing countries, makes it possible, in fact, to promote the natural resources of the territories by businesses, communities and individuals. It contributes to the security of local supply, the control of consumption and the reduction of fuel poverty.

1.2 Environmental Benefits:

Renewable energies seem to be the answer to the planned disappearance of fossil fuels compared to renewable energies, which constitute an almost unlimited resource. In addition, greenhouse gas emissions are significantly reduced thanks to these renewable energies.

In general, renewable energies are cleaner than fossil and fossil fuels currently being exploited worldwide. They are more environmentally friendly, available in bulk and are "free" once the production facilities are profitable.

1.3 Specific advantages for types of renewable energy:

-Electric energy is clean energy, without rejection or waste, it allows with a good coefficient of performance to ensure a good energy independence. On land or off-shore, wind turbines demonstrate excellent production capacity and are a viable alternative for the most remote areas whose access to electricity is difficult.

-Biomass energy is linked to the burning of wood. Wood is a very present fuel. If this energy still rejects greenhouse gases, releases are lower compared to the amount of CO₂ that a tree has absorbed during its lifetime. A well-managed and renewed forest makes it possible not to exhaust the wood reserves. Biomass is therefore an energy that participates in local development while being very cheap.

-Solar energy is widely acclaimed in the energy sector and is developing at a high speed. For the production of electricity and heating thanks to photovoltaic solar thermal panels, solar can be exploited on a large scale in parks provided for this purpose or small scale in households, even if the solar panels have a better performance in a very sunny area.

Solar energy is the most productive and safe type of energy for Algeria.

2. Disadvantages of renewable energies

Energy is essential for life, but the increasing increase in human consumption has a significant and significant impact on the

environment. Oil and gas reserves are limited, their prices remain volatile, and their use produces significant amounts of carbon dioxide (CO₂), which, released into the atmosphere, is partly responsible for the greenhouse effect. Nuclear energy that does not emit CO₂ directly generates hazardous waste for thousands of years.

Energy sources must be diversified, with obvious priority to renewable, non-polluting and inexhaustible energy sources.

2.1. A relatively negative impact on the ecosystem:

Using renewable energy means adapting the production infrastructure by major projects. Exploiting such energies can have a negative impact on ecosystems. Renewable energies do not always rhyme with "clean energies": building sites leads to carbon dioxide (CO₂) production, and can generate heat and economic growth leads to an increase in energy demand, which directly translated by an increase in these emissions (Kapor, Magala, & Swazi Tshabalala, 2016).

2.2. The high cost of installation:

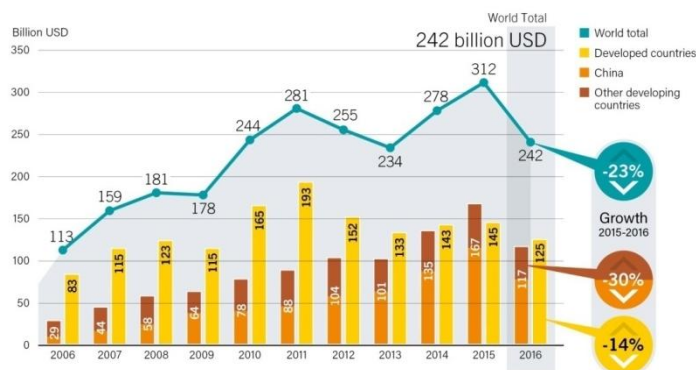
Its relatively high cost to purchase facilities whose profitability is relatively long and dependent on nature. Indeed, periods without wind or high brightness can strongly hinder the production of wind and solar, because the energy production of the wind is very dependent on the strength of the wind. To overcome this, wind turbines are always placed in very windy areas. However, some populations refuse their establishment because of the noise and visual nuisances that they would cause.

3. Growing investments in renewable energies

The total number of countries with renewable energy policies has increased since 2015, 173 countries have renewable energy targets and 146 countries have national support policies. have given more importance to renewable energy production technologies, especially solar photovoltaic and wind energy (REN21, 2016).

Global investments in renewable energy have changed significantly, especially in emerging and developing countries. The period 2006-2016 represents a significant shift in its development. Investment flows reached \$ 242 billion in 2016 (Graphic 1).

Graphic 1: Global New Investments in Renewable Energy 2006-2016



Source: REN21 World Renewable Energy Report 2017

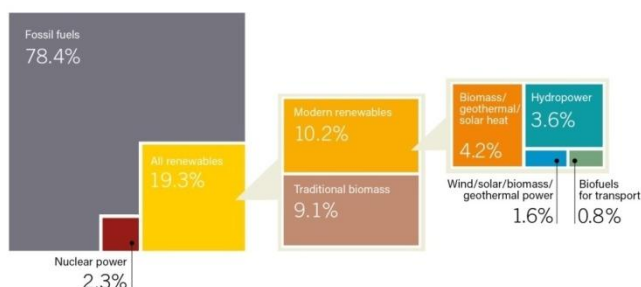
Investments are expected to grow from \$ 305 billion in 2015 to an average of \$ 900 billion a year between 2016 and 2030, and the share of renewables in the energy mix is expected to double by 2030. China was the leading destination for renewable energy investments in 2017, with a record high of 126.6 billion euros, an increase of 31 percent over the previous year according to the United Nations Development Program. environment (UNEP).

4. Evolution of the Renewable Energy Supply Structure:

Renewables reached more than 19.3% of global energy capacity in 2015. They supplied 24.5% of global electricity by the end of 2016 (REN21, 2018).

For the first time in the industrial era, worldwide installed renewable capacity in 2016 surpassed conventional new fossil and nuclear facilities (Figure 2).

Figure 2: Estimated Renewable Energy Share of Total Final Consumption, 2015



Source: REN21 World Renewable Energy Report 2017

5. Energy strategy of Algeria

Renewable energies are at the heart of energy and economic policies led by Algeria, including the development of photovoltaic and large-scale wind, the introduction of biomass (waste recovery) and the development of solar energy. . However, its large solar potential favors solar systems over wind systems. More specifically, the installation of photovoltaic systems, isolated or connected to the network, can be used in almost all places with appropriate sizing (Bouchakour, 2013).

The energy strategy is based essentially on the development of renewable energies and energy efficiency is linked to a roadmap grouping a series of objectives and action plans broken down into the short, medium and long term aiming at energy efficiency. , in order to achieve savings in terms of energy consumption, encompassing mainly sectors of the agriculture industry and public lighting, as well as legislative, organizational and institutional reforms.

This strategy is accompanied by the establishment of a national research program (NRP) for renewable energies.

5.1 Legal and regulatory component:

The promulgation of a legal and regulatory framework favorable to the promotion of renewable energies and to the realization of related infrastructures is essential for its success. In this context, Algeria promulgated an important regulatory system composed, in addition, of law 11-11(*Law No. 11-11 of 18 July 2011*)¹, executive decrees 11-423 (*Decree No. 11-423 of December 08, 2011*)², 13-218 (*Executive Decree No. 13-218 of June 2013*)³, 13-424(*Executive Decree No. 13-424 of 18 December 2013*)⁴. Among other things, it provides for direct and indirect support for renewable energies and the reduction of customs duties and VAT on imports for the components of this industry.

5.2 The institutional component:

Organizational and management institutions are necessary for the support and development of renewable energies. In this context, Algeria has established a number of agencies with complementary missions.

-The National Agency for the Promotion and Rationalization of the Use of Energy (**APRU**):

The National Agency for the Promotion and Rationalization of the Use of Energy is a public industrial and commercial establishment created in 1985, under the supervision of the Ministry of Energy. Its

¹ *Law No. 11-11 of 18 July 2011 on the Supplementary Finance Law for 2011;*

² *Executive Decree No. 11-423 of December 08, 2011, setting out the operating procedures of the Special Appropriation Account No. 302 -131 entitled "National Fund for Renewable Energies and Cogeneration,"*

³ *Executive Decree No. 13-218 of June 2013 setting the conditions for granting bonuses for the costs of diversification of electricity production,*

⁴ *Executive Decree No. 13-424 of 18 December 2013 amending and supplementing Executive Decree No. 05-495 of 26 December 2005 concerning the energy audit of major energy-consuming establishments*

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main mission is to implement the national energy management policy through the promotion of energy efficiency.

She is also responsible for:

- The coordination and animation of the national energy management policy;
- The implementation and monitoring of the National Program of Energy Management (PNME);
- The awareness and dissemination of information on energy management towards different targets (general public, professionals, schools ...);
- The setting up of programs and sectoral projects in partnership with the sectors concerned (Industry, Building, Transport, ...).
- Renewable Energy Development Center (**CDER**):

The Center for the Development of Renewable Energies (CDER) is a Public Scientific and Technological Establishment (EPST) responsible for developing and implementing research and development programs, scientific and technological, energy systems exploiting energy solar, wind, geothermal and biomass energy.

The CDER as a scientific center is actively involved in the national research and technological development program defined by the five-year orientation and program law on scientific research and technological development.

- National Agency for Investment Development (**ANDI**):

Created as part of the 1st generation reforms initiated in Algeria during the 1990s, the Agency in charge of investment has evolved to adapt to changes in the economic and social situation of Algeria. Initially APSI, Agency for Promotion, Support and Monitoring of Investment from 1993 to 2001, then ANDI, National Agency for Investment Development, this government institution was entrusted with the mission of facilitation, promotion and accompanying investment.

7. Renewable energy development prospects

7.1 In the world:

According to scenario 450 of the International Energy Agency, which would maintain the rise of the temperature on the surface of the globe below 2 ° C, renewable energies will have to cover, in 2040, 58% of the needs in electricity, 22% for renewable heat and cold production and 20% for transport. Renewable energies will represent nearly 60% of new installed capacity until 2040. More than 4,000 GW will have to be commissioned between 2016 and 2040, four times the thermal capacity installed during the same period. Several factors favor this evolution: the decrease of the costs, the diffusion of the technologies on a world scale, the economic and geopolitical tensions related to hydrocarbons.

The Ecofys expertise (energy consultant) has produced a strong and ambitious scenario that shows that it is technically possible to reach almost 100% of renewable energy sources by the year 2050 using current technologies (Jeffries, 2017).

As for the growth of renewable energies in the world, it is in the emerging countries that the IEA predicts that it will be the strongest. Thus, China alone is expected to install nearly 1,300 GW of renewable energy by 2025, or 33% of new global capacity.

7.2. In Algeria:

The renewable energy program, established as part of this strategy, is to achieve 22,000 MW for the needs of the national market over the period 2015-2030, of which more than 4,500 MW will be achieved by 2020, stands as follows:

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Table 1: The Renewable Energy Development Program 2015-2030

	1st phase 2015-2020 (MW)	2nd phase 2021-2030 (MW)	TOTAL (MW)
Photovoltaic	3000	10575	13575
Wind	1010	4000	5010
CSP		2000	2000
Cogeneration	150	250	400
Biomass	360	640	1000
Geothermal	05	10	15
Total	4525	17475	22000

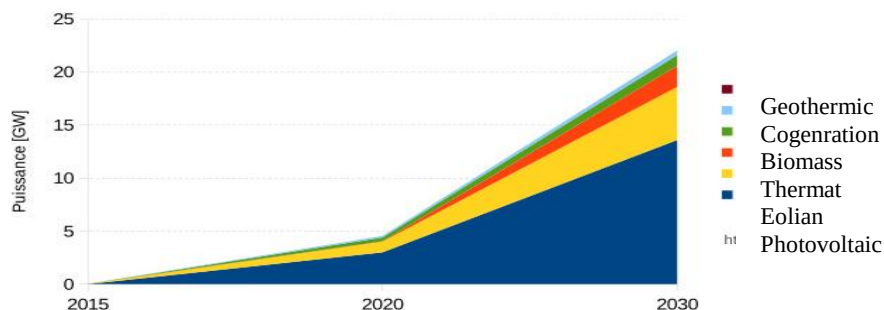
Source: ANDI report, April 2017.

The Energy Efficiency Promotion Program (Graphic 2) aims, mainly, to improve the thermal insulation of buildings, the development of the solar water heater, the generalization of the use of energy-saving lamps, the replacement of the entire mercury lamp stock with sodium lamps, promotion of LPG / c and NG / c, promotion of cogeneration, solar air-conditioning projects and desalination of brackish water

Main objectives of the program:

- The development of energy efficiency with the priority of photovoltaic and large-scale wind;
- The introduction of the biomass (waste recovery), cogeneration and geothermal sectors;
- the achievement of a financial gain of \$ 42 billion by 2030 through the reduction of 9% in energy consumption through the implementation of a national program for the development of efficiency energy.

Graphic 2: Prospects for the development of renewable energies in
Algeria
The Algerian renewable energy program phases



cumulative objective

Source: cder.dz portal

CONCLUSION

Due to their multiple economic, environmental and technological cost advantages, solar, wind and biomass energies continue to develop. The Algerian energy strategy focused on the establishment of a legal (regulatory) and institutional (CDER ...), and the initiation of a rich renewable energy development program 2015-2030, However and despite they are officially considered as a national priority, It is necessary to go beyond the experimental phase and engage in the development of solar energy as a priority for renewable energy sources by creating a network of small and medium-sized enterprises and actors. in the solar value chain (design offices, industrialists, vocational training actors, research and university actors), capacity building and development of industrial skills Promotion of training and training activities research and finally the establishment of energy production processes in order to contribute to the cover energy demand and generate surpluses for export and contribute to financing national development.

Bibliography

- (IRENA), T. I. (2016). *The International Renewable Energy Agency report (IRENA)*, 2016. IRENA.
- Acket, C. (2016). *Les énergies renouvelables, état des lieux et perspectives*. Paris: Technip.
- ANDI. (2017). *ANDI report, april 2017*. Alger: ANDI.
- Bouchakour, S. (2013). Qualité de l'énergie de la centrale photovoltaïque connectée au réseau du CDER. *Bulletin des énergies renouvelables*, N° 27.
- Brandes, E., & Günther, R. (2017, September). *Myths and Realities on the Role of Renewable Energy in the Energy Transition in Germany*. Récupéré sur mobil.wwf.de: https://mobil.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/Myths_and_facts_about_Germany_s_energy_transition.pdf (Consulté le 04/07/2018)
- Jeffries, B. (2017). www.wwf.fr/sites/default/files/doc-2017-08/11. Récupéré sur www.wwf.fr: https://www.wwf.fr/sites/default/files/doc-2017-08/11_rapport_100%25_enr_2050.pdf (consulted in 21-06-2018)
- Kapor, K., Magala, M., & Swazi Tshabalala, B. (2016). *les énergies renouvelables pour éclairer la femme en Afrique, Banque Africaine de Développement*. Récupéré sur www.afdb.org: https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/AfDB-Gender_and_Energy_Desk_Review-FR-2016.pdf
- Lionel, M. (2016). *Démarche d'efficacité énergétique*. Paris: Dunod.
- Raymond, R. (2017). Transition énergétique et transdisciplinarité. *Natures Sciences Sociétés*, Supp.4, 42-44.
- Rémy, P. (2017). *Le mythe des énergies renouvelables*, Editions , 320 p, 2017. Paris: L'artilleur.
- REN21. (2016). *Renewables Global Status Report 2016*. Récupéré sur <http://www.ren21.net/>: <http://www.ren21.net/status-of-renewables/global-status-report/>
- REN21. (2018, May). *Renewables Global Status Report 2017*. Récupéré sur <http://www.ren21.net/>: http://www.ren21.net/wp-content/uploads/2017/06/17-8399_GSR_2017_Full_Report_0621_Opt.pdf

Schäfer, I. (2016). *The renewable energy sector and youth employment in Algeria, Libya, Morocco and Tunisia (2016)*. African Development Bank.

Legislative and regulatory texts:

- Loi n° 11-11 du 18 juillet 2011 portant loi de finances complémentaire pour 2011 ;
- Décret exécutif n°11-423 du 08 décembre 2011 fixant les modalités de fonctionnement du compte d'affectation spécial n° 302 -131 intitulé "Fonds national pour les énergies renouvelables et la cogénération".
- Décret exécutif n°13-218 du juin 2013 fixant les conditions d'octroi des primes au titre des coûts de diversification de la production d'électricité ;
- Décret exécutif n°13-424 du 18 décembre 2013 modifiant et complétant le décret exécutif n° 05-495 du 26 décembre 2005 relatif à l'audit énergétique des établissements grands consommateurs d'énergie.