Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2021.27347

228 (2021) 63–71
July

Current and post COVID-19 energy challenges in Algeria

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Received 2 February 2021; Accepted 18 April 2021

ABSTRACT

The world is going through a health crisis which has triggered an unprecedented economic crisis, according to economists, unprecedented and worrying in its origin, nature, course, and geographic coverage. The confinement of populations, the blocking of logistics chains, the stoppage of economic activity imposed by this COVID-19 health crisis, have highlighted the vulnerability of value chains. Nowadays, the limits of the "just in time" strategy can be observed. To remedy this, it is necessary to understand the characteristics of this economic crisis in its current context. In addition, the pandemic with its effect in prolonged waves caused a more or less severe recession depending on the country, which led to a drop in global energy demand by 6% and an 8% decrease in greenhouse gas emissions. Also, the forecasts are not optimistic for the water sector, which is no exception. Climate change models indicate that precipitation could decrease by more than 20% by 2050. The challenge for Algeria in the years to come is to adapt to a decrease in renewable water resources. The country must mobilize unconventional water resources (desalination and reuse of wastewater) which will be a strategic component in water management. In addition, the development of unconventional resources leads to an increase in electrical energy demand of 12% by year, which must count in the national energy balance. The objective of this work is to offer practical solutions to current energy challenges, defeat the post-COVID-19 energy battle, and face the future water stress that threatens our country.

Keywords: Renewable water; Unconventional water; Energy transition

1. Introduction

One of the first post-COVID-19 studies in this field was carried out by Chen et al. [1] dealing with climate change issues, and the interactions between the attributes of technology and the socio-psychological factors of the citizen, as well as the dynamics of energy consumption patterns in New York households. The results of the survey showed that there were no longer peaks in consumption in the morning or in the evening at the household level, but rather a much higher than average electricity consumption. This study also provides data for further research on examining technology choice and energy dynamics in times of crisis, such as COVID-19, such as Home Energy Management Systems (HEMS).

Cheshmehzangi [2] presented the results of a small pilot study conducted in China, addressing household energy consumption. It used 352 households and considered their consumption during three periods of pre-pandemic (and pre-containment), the start of the COVID-19 epidemic and after the containment. Each period was identified as a 2.5 months range, from November 2019 to the end of June 2020. The samples of the study samples highlight the main implications of energy consumption, some of which are seen as intermediate changes and others may seem more prolonged. The results of the study demonstrate the impact of COVID-19 on household energy consumption

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Presented at the First International Webinar on The Impact of COVID-19 on the Environment, 30–31 December 2020, held online by the University of Blida, Algeria

as well as on transportation. Preliminary suggestions for cities/regions experiencing longer confinement have been given, a relevant database is provided for larger-scale research on the assessment of household energy consumption during times of health emergency and crisis, as in the case of COVID-19.

In another study, Elavarasan et al. [3] presented global scenarios of power systems during COVID-19, as well as socio-economic and technical issues faced by utilities. He also scrutinized the Indian Power System as a case study. The current issues and challenges faced in managing consumer load demand, including measures taken by the electric utility sector for the proper functioning of the electric system were highlighted, with recommendations aimed at decision support.

In addition, Heffron et al. [4] undertook a study that examined Europe in terms of its ability to balance fluctuating electricity production and demand, by introducing low carbon renewables, to ensure a more resilient and sustainable energy future. Through this study, five recommendations emanate, described as "urgent policies for Europe" to deal with the possible impacts of COVID-19 on the economic and societal conditions, prerequisites for the flexibility of energy systems.

In order to establish a roadmap for scientists, lawmakers and other stakeholders to overcome the tragic effects of COVID-19, and develop a sustainable environmental system to minimize the impact of these infectious epidemics in the future. Siddique et al. [5] made a number of recommendations relating to the challenges facing water, air and energy resources, including renewable and non-renewable energies.

In another paper, Jiang et al. [6] underlined the impacts and challenges of COVID-19 pandemics on energy demand and consumption and highlighted energy-related lessons and opportunities. Changes in energy needs are compared and analyzed from several angles depending on the available data. The authors argue that their work could offer a course of action to open up new ways to increase energy efficiency and promote energy savings.

Amir and Khan [7] focus their work on the impacts of COVID-19 in the African energy sector. They analyzed recent developments in African renewable energy production. Within the frame of the African renewable energy sector in the context of COVID-19, they have issued relevant recommendations. Also, they pointed out that first, there is an imminent need for restructuring of the power grid, energy storage technologies and parallel mitigation of environmental factors with seasonal variations.

In order to increase the resilience of the water sector in a context of growing scarcity, triggered by extreme climatic variations and also by the COVID-19 pandemic, Antwi et al. [8] examined the depths of responses preliminaries from the governments of 27 European countries. Only 11 countries, or 40.7%, have implemented at least one policy intervention in the water sector. These actions were generally short-term measures involving either full cost absorption or deferral of water bills. Much attention should be paid to the processes of water governance and management. The authors also proposed future research directions, including a study that will harmonize water demand and consumption trends during the pandemic in Europe, as well as an assessment of how the water sector can resist possible external shocks in the future.

From the literature review, it is clear that there have been several studies that have addressed the impact of COVID-19 on the electric power sector. But, very few discussed this repercussion on the two closely linked natural resources, namely, water, and the natural gas that are used by the Algerian power plants to generate electricity.

The only investigation that addressed the challenges facing water and energy resources is that of Siddique et al. [5], but the authors did not discuss the natural gas resource which is important in the production of gas, electricity and indirectly water. Also, the proposed recommendations are too narrow.

On the other hand, through the present paper, the inventory of all energy and water resources existing in Algeria is presented, as well as the forecasts of these resources (renewable and unconventional potential) by 2030. Also, the energy needs for water are highlighted, because the major challenges post COVID-19, will deal with these two resources.

The objective of this work is to provide an inventory of resources, water demand, as well as energy need, on one hand. Also, this study aims to propose practical solutions, in the short and medium-term, to meet the current energy and water challenges, and to win the battle of the energy transition "EnT" of the post-COVID-19, to face the development of the water resources sector in Algeria, with an analysis of the interactions between water and energy.

2. Water and energy, two rare resources in Algeria

Algeria's annual water needs by 2030 will rise to 12.9 billion m^3 against 10.4 billion m^3 currently, or around 260 m^3/cap/y, far from the threshold of 500 m^3/cap/y, which is widely recognized as a scarcity threshold indicating a development of water deficit and underlying crises [9].

To cover this demand, a national water plan for 2030 was put in place, based on the continued mobilization of conventional and unconventional water resources by focusing on regions with a deficit through the exploitation of all the available supplies in order to intensify and expand the connection and transfer network between large complex reservoirs in the country [9].

These constraints and problems mainly concern the decrease in water resources due to the impact of climate change which has become a reality in Algeria and whose effects on our environment are already visible.

The future development of water resources is highly dependent on the availability of electric energy. For example, the desalination of seawater, the recycling of wastewater and the introduction of drip irrigation require very high amounts of power.

This sector must conduct a large-scale study program to understand the current and future impact of climate change, identify and quantify the associated costs and their interactions with water and energy and find well-adapted solutions.

The objective of this work is to provide an inventory of resources, water demand, as well as energy needs. This study also aims to propose practical solutions, in the short and medium-term, to meet the current energy and water challenges, and to win the battle of the energy transition "EnT" of the post-COVID-19, to face the development of the water resources sector in Algeria, with an analysis of the interactions between water and energy.

To achieve this, Algeria must first adopt plans and programs, simplify the methods and the value chains, and shorten the time by hooking the wagons to the locomotives of nations possessing the expertise, the technology, and the experience in the field of EnT.

2.1. Water in Algeria

The water resources in Algeria are illustrated in Fig. 1 and Table 1.

- 10 billion m^3 in the northern regions: 7.4 (water surface), 2.6 (underground resources).
- 5.37 billion m^3 in the Saharan regions: 0.37 (water surface), 5 (underground resources).

Table 1 provides information on the resources in the five major hydraulic basins in Algeria.

The structures of the sedimentary basins of the Sahara are in favor of large and deep reservoirs, which have been fill by the rains of the quaternary period. The groundwater table of the Continental Terminal (100–400 m deep) and the Continental Intercalary "Albian" water table (1,000–1,500 m deep) contain significant reserves (30,000 to 40,000 billion m^3), but their exploitable potential is very limited (5 billion m^3/y) because they are non-renewable [10].

2.1.1. Renewable water resources

Renewable water resources (surface water and groundwater) are about 16 billion m^3 for an average year based on climatic data (annual database – before the 1980 s). This estimate has been revised to about 12.3 billion m^3 given the droughts suffered by Algeria since the 1980 s, with a decrease in resources of about 25%.

Water availability has fallen to less than 350 m^3/cap/y, which is significantly lower than the

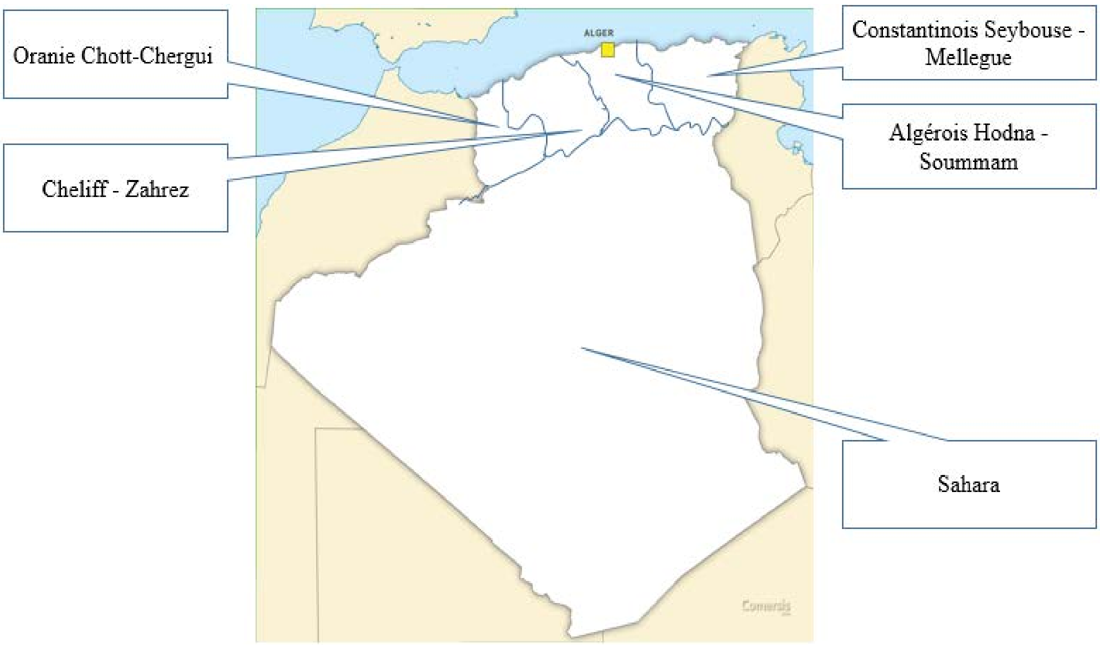

Fig. 1. Five major hydraulic basins in Algeria.

Table 1
Water resources in Algeria [10]

Basin	Water surface (billion m^3)	Underground water (billion m^3)	Total (billion m^3)
Oranie – Chott Chergui	0.65	0.6	1.25
Cheliff-Zahrez	1.71	0.83	2.54
Algérois-Hodna-Soummam	1.69	0.74	2.43
Constantinois-Seybouse-Mellegue	3.00	0.43	3.43
Sahara	0.37	5 Albien	5.37
Total	7.42	7.6	15.02

"scarcity threshold" of 1,000 m^3/y set by UNDP. This is below 500 m^3/inhabitant/y, the "absolute scarcity threshold".

2.1.1.1. Surface water resources

The volume of terrestrial water in solid, liquid and gaseous form is about 1.384 billion km^3 of which only 0.26% is directly exploitable fresh water. It is estimated that there is theoretically enough fresh water to supply some 20 billion people. Unfortunately, it is not evenly distributed, as evidenced by the vast arid and semi-arid regions [11].

Surface water inflows reach several million cubic meters for the basins with the least amount of water on an annual average:

The Sahara basins Djorf Torba-Bashar (350 hm^3) and Brézina-El Bayadh (122 hm^3), and billions of cubic meters measured for the areas with the most amount of water: Beni Haroun-Mila (1,000 hm^3) and Kissir-Jijel (680 hm^3) [10].

This runoff is largely due to rapid and powerful floods.

They are generally recorded over an estimated average period of 20 to 30 d for the basins of southern Algeria and two to three months for the basins of northern Algeria.

Surface water resources are estimated at around 8.376 billion m3 for an average year. These water resources are characterized by their variability – the resources for nine out of 10 y or for four out of 5 y are well below this average.

In a year of drought, the inflow of water can drop to less than 25%–30% of this average value. Managing the uneven distribution of water resources in time and space has involved the construction of large dam reservoirs for the storage of inflows from wet years and use them in dry years. In addition, transfer of water from regions with a surplus of water to regions with water scarcity in order to encourage balanced economic and social development throughout the Algerian territory.

2.1.1.2. Underground water resources

The potential groundwater resources are estimated in 2011 at around 2,602,822,992 m^3/y, of which 794, 213, 270 m^3/y come from the irrigation water returned via surface water in particular [12].

2.1.2. Unconventional water resources

Unconventional water resources offer the potential for water resources in Algeria. They involve recycling of wastewater, artificial recharge of groundwater and production of freshwater by seawater desalination or demineralization of brackish water. The Algerian National Strategy for Water Resources estimates the volume of water that could be exploited from unconventional water resources represents more than 2 billion m^3.

2.1.2.1. Potential of wastewater

Wastewater is a resource that can be treated to provide recycled water suitable for irrigation, commercial and industrial uses. In Algeria, the actual treated water is 805 cubic hector meters and expected to reach 1.2 billion m^3 in 2014. Actually, 177 wastewater treatment plants are operating with a total capacity of 12,000,000 EQH (equivalent inhabitant), and the treated volume reaches 800 hm^3/y. In addition, 106 treatment plants are under implementation to achieve in 2012 a total treatment capacity of 7,965,058 EQH. At the completion of the actual program in 2014, a total capacity corresponding to 1.2 billion m^3/y was to be achieved [13].

2.1.2.2. Seawater desalination

Desalination has overcome technological difficulties, and it is now economically competitive. Today, it represents a technologically feasible alternative for drinking water or agriculture and irrigation of certain profitable crops.

The reverse osmosis technique consists of passing seawater at a pressure of 70 bars through a membrane to produce fresh water. This technology has made a significant contribution to reducing operational costs and has been adopted by a large number of countries as the technique of choice. The advantages of this technology are:

- Desalination plants can be built using a Build, Own, Operate and Transfer (BOOT) system.
- Desalination plants can be built quickly (12–24 months, including the design phase).
- Algeria started producing freshwater by desalination or demineralization in 2005, the overall production capacity is around 2,310,000 m^3/d.

Desalination of seawater may be the most appropriate solution to the situation in many regions of Algeria to bridge the gap between water demand and supply.

The national strategy estimates the contribution of the sea to water desalination at around 1,000 Mm^3 by 2030 [14].

2.1.2.3. Brackish water

In Algeria, about a quarter of groundwater is either entirely, or partially, brackish water. This water is mainly located in the desert and semi-desert regions of the country.

The exploitation of brackish water resources began in 2000. The volume of brackish water mobilized is about 510,160 hm^3/y, of which 160 hm^3/y are used to satisfy the drinking water supply. 12 plants operate in the provinces of Tlemcen, Oran, Tizi Ouzou, Béjaïa, Illizi, Biskra, Ouargla, Médéa and Aïn Defla. The production of drinking water is 24.2 hm^3/y [15].

2.2. Future demand for water

According to figures published by the Ministry of Water Resources, the volume of annual needs forecast for 2030 consists of 4 billion m^3 for household consumption (3.3 billion m^3 currently), 8.3 billion m^3 for agriculture (6.8 billion m^3 currently) and 0.6 billion m^3 for industry (0.3 billion m^3 currently) (Table 2) [9]:

2.2.1. Water demand for drinking water and industrial water supply

Forecasts of future domestic water use are based on population growth, rural-to-urban migration and water demand projections per capita. Algerian industrial and tourist water needs are estimated at 0.6 billion m^3 by 2030.

2.3. Balance of resources-demand supply

The current balance between water supply and demand is analyzed by river basin (the analysis is done basin by basin). This involves comparing water resources and demand in order to obtain a representative image of the water situation on a given date. The assumptions taken into account can be summarized as follows:

- The water demand taken into account corresponds to the demand expressed by users, mainly in the consumption of water and irrigation.
- The value of the water resource taken into account in this balance corresponds to the volume of water regulated by dams and water withdrawals directly from rivers and groundwater.

2.4. Surface-water forecast

Algeria relies primarily on surface water. Currently, it has almost 80 surface reservoirs with a total capacity of 8.6 billion m^3 and aims to increase that to 139 by 2030 [16].

The volumes exploited and the exploitable surface water data come from the Algerian Report of the national debate on water, the national water plan and specific studies carried out for the construction of project dams.

The planned dams are intended to be built further from the place of use of the water, and their construction is increasingly complex and costly in technical and economic terms. They will allow the exploitation of additional water in the region of 5 billion cubic meters. These projects mainly consist of increasing irrigation for areas already equipped for irrigation, and will not make any significant difference in water balances.

2.5. Underground water forecast

The groundwater forecast takes into account the impact of the national water resources strategy measures on inputs and outputs. This mainly involves:

- Implementation of the irrigation water-saving program, which will lead to a significant reduction in water withdrawals and irrigation returns;
- Use of surface resources to replace extraction of groundwater. A volume of about 100 billion m^3 extracted for drinking water from groundwater is delivered, and replaced by surface water (100 billion m^3 per year by 2025);
- Artificial recharge of groundwater. The national water resources strategy has estimated this recharge at around 200 billion m^3 per year by 2030, with around 100 billion m^3 of treated wastewater;
- Reinforcement of the monitoring system and penalties for over users and the restriction of groundwater pumping (revised pricing framework, removal of subsidies encouraging overuse, implementation of measures for the establishment of protected and prohibited areas, etc). All these measures are aimed to improve groundwater recharge and reduce water withdrawals in order to help contain demand. Under these conditions, the groundwater balances will slowly balance out, mainly by a decrease in the outflow through natural outlets.

2.6. Unconventional water resources forecast

The unconventional resources mainly consist of groundwater recharge, seawater desalination and wastewater treatment.

The Algerian national strategy for the development of water resources gives an important place to the exploitation of unconventional water resources.

This strategy has estimated the proportion of this resource at around 1.624 billion m^3/y, including 824 billion m^3 from seawater desalination and about 800 billion m^3 from wastewater.

This water potential will be used for watering green spaces and sports fields and for developing irrigation around urban areas.

3. Use of primary energy in Algeria

The Algerian population is around 45 million people and is expected to reach 50 million by 2030; more than

Table 3
Breakdown of national consumption by form of energy [17]

Designations	National consumption (%)
Naturel gas	37
Oil products	26.7
Electricity	29.9
LPG	4
Other	2.5

Table 2
Evolution of the future water demand regardless of climate change

Area of use	Water needs in 2019 (billion m^3)	Water needs 2030 (billion m^3)
Drinking (rural and urban) and industrial water	3.3	4.0
Industry and tourism	0.3	0.6
Irrigation water + agriculture	6.8	8.3
Total, including isolated industry and tourism	10.4	12.9

60% live in the coastal area. Population growth and rapid urbanization have an impact on energy demand and the environment.

Algeria reached 59.6 billion toes in 2017, an increase of +2.1% compared to 2016 in total national consumption, which represents more than a third (35.9%) of total production. This increase is driven mainly by that of final consumption which recorded an increase (+4.1%) to reach 44.6 billion toes, driven in particular by natural gas (+7.9%) and electricity (+6.4%), and 14.9 billion Toe for other non-energy consumption as illustrated in Fig. 2 [17].

The structure of national consumption remains dominated by natural gas (37%) followed by electricity (30%) and petroleum products (27%), as illustrated below:

Also, it should be noted the continued significant increase (7.9%) in the consumption of natural gas to 13.7 billion toes, induced by the growing needs of customers, especially those in the household sector, where the total number of subscribers reached 5.3 million in 2017, or more than 345,000 new customers. And an increase in electricity consumption (6.4%) to reach 13.3 billion toes, due in particular to the increase in demand from high and low voltage customers (mainly households), including the total number of subscribers exceeded 9.2 million at the end of 2017, as compared to 8.8 million at the end of 2016, representing an increase of more than 4.3% [17].

In addition, the distribution of consumption in the manufacturing industry sector by sector shows the predominance of the building materials industry sector with 60% followed by the chemicals, rubber plastic and the food industry with 17% and 12% successively (Table 4) [18].

The consumption analysis illustrated in the graph of Fig. 2, reveals that consumption is absorbed by the housing, transport sectors and construction industries. Respectively 19.8 billion toes, 14.9 billion toes, and 9.9 billion toes. These three sectors represent an extraordinary

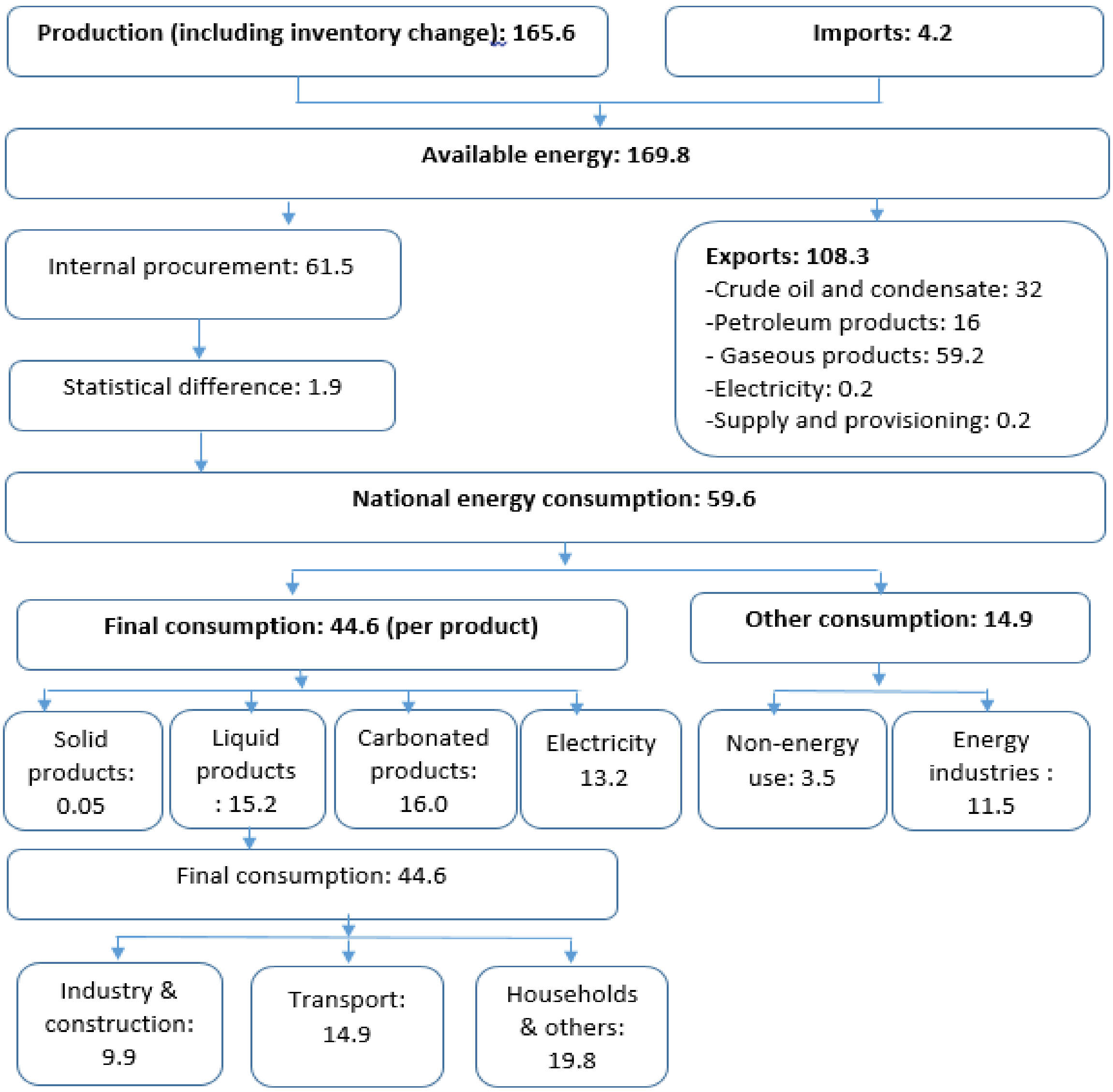

Fig. 2. Summary of energy flows in 2017 [billion Toe].

source for the control of EnM energy, and the EnT energy transition. Indeed, several sectors and several ministerial departments are concerned by this EnT. This means that EnT is a horizontal process, in which the value chains have to be simplified and shortened.

3.1. How is the energy situation in Algeria?

Algeria has 2,500 billion m^3 of gas in reserve, and consumption is around 60 billion m^3/y, which means that in 40 y, there is a risk of a serious problem of availability of this essential product for the Algerian citizens. Therefore, the kinetics of natural gas consumption must be quickly curbed.

3.1.1. How to brake?

- There can be no braking if the focus is not redirected to renewable energies, because Algeria has a huge solar resource, whose solar irradiation is around 3,000 kWh/m^2/y, and the solar kWh is today, cheaper than thermal kWh.
- It really is a scandal, if natural gas is kept in use in the same way, and with this trend, nothing will be left for future generations.
- The energy sector is moving in parallel on thermal energies, and the partnership with the leading general electric (GE), is the best proof, with this partnership thermal energy in Algeria is confirmed. The time has come, to say; stop, braking and giving way to solar photovoltaic (PV) and wind power plants.

Table 4
Breakdown of energy consumption in the manufacturing industry

Designations	Consumption of energy (%)
Building materials	60
Chemical rubber plastic	17
Food industry	12
ISMMEE	8
Wood cork paper	1
Leather and shoes	1

- The objective for 2021 is to put into service 1,000 MW PV, which is equivalent to 1.5 billion m^3 of natural gas (NG) which will be saved, the financing of these investments will be made by the funds of the NG not consumed (saved) in 2021.

In addition, the analysis of consumption in general, illustrated in the graph of Fig. 2, reveals that consumption is absorbed by the housing and transport sectors, and construction industries, of respectively 19.8 billion toes, 14.9 billion toes, and 9.9 billion toes, these three sectors represent an extraordinary source for the control of EnM energy, and the EnT energy transition [18].

Indeed, several sectors are concerned by this EnT. This means that the EnT is a horizontal responsibility (Fig. 3).

3.1.2. What about electricity?

In Algeria, the electricity demand forecast is established by the System Operator (OS), a subsidiary of the Sonelgaz Group.

Based on the country's energy policy, OS calculates supply and compares it to demand in two steps:

- First step in studying the demand for electricity.
- Second-step to define an equipment program in order to meet this demand at the lowest possible cost.

It should be noted by analyzing the table below, that the electricity consumption of the hydraulic sector is 77% (curve on the right); the share of pumping and irrigation is 39%.

3.2. Energy requirements for water

As shown in Table 5, electrical energy is mainly used for the operation of pumping and injection stations intended for drinking water, industry and irrigation, as well as treatment stations for drinking water and wastewater treatment plants. It is also used for lighting and for pumping in marine outlets.

The water needs of this sector will have to increase to 16,090 GWh by 2030 (0.7–0.8 kWh/m^3). This expected increase is due to:

- Use of energy-intensive solutions, for example, seawater desalination and water transfer project.
- Use of conventional systems with high-energy consumption resources to meet the demand for water. This is

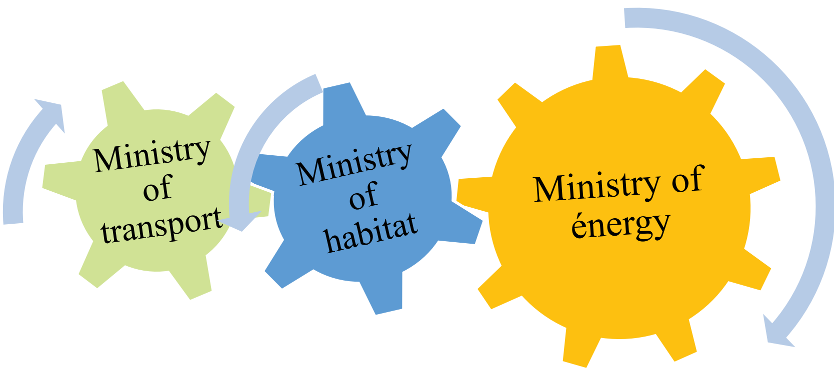

Fig. 3. Diagram illustrating the horizontal responsibility of several ministries.

Table 5
Breakdown of electricity consumption by activity sector "2017" [18]

Designations	Electricity consumption (%)	Designations	Electricity consumption (%)
Pumping and irrigation	39	Construction and public works	12
Breeding	11	Mines and quarries	11
Agricultural exploitations	0.2	Hydraulic	77
Peach	50	Total	100
Total	100		

the case of water pipes for supplying drinking water to cities.
- Development of sanitation and wastewater treatment activities.

4. Actions to be taken for a successful EnT in Algeria

4.1. Water resources sector

- Introduce new less energy-consuming techniques such as the "Reverse freezing-OSMOS hybrid process" in order to make the installation autonomous, compared to conventional energy, and will be able to meet the needs of citizens in terms of freshwater, in the most extreme cases of drought, and pandemic, etc.
- Encourage the use of solar pumping at agricultural perimeter levels.
- Generalize photovoltaic solar systems in the auxiliary motors of pumping and purification stations These recommendations aim at ensuring the autonomy of pumping and desalination installations, in case of facing future pandemics (confinement, stopping flights, etc.).

4.2. Housing sector

- Knowing that in order to have domestic hot water 400 kg of oil will be used every year per house. Solar water heaters are placed in new houses, a significant amount of oil will be saved. In addition, the solar heater's industry is starting in Algeria. This industry will boost subcontracting towards small and medium-sized businesses, as well as startups.
- Another very important action in the economy of energy is that thermal insulation must be required in the new specifications. And no authorization, or building permit, will be issued in the absence of documentary holdings in conformity with this provision in new constructions.
- Impose double glazing in new constructions, with the same guardrail as the insulation
- Establish an incentive system for old dwellings, concerning insulation, and double-glazing.
- Unfortunately, the consumption of gas and electricity at mosques is far from rational. An operation to replace incandescent lamps with low-consumption lamps, as well as an operation to rehabilitate 1,800 mosques nationwide is proving to be more than strategic.
- Generalize individual and collective photovoltaic systems on buildings, schools, universities, and all state institutions, and thus, the citizen becomes a producer of the electrical energy he consumes, and the surplus will be injected into the conventional network, and the lessee is responsible for purchasing this energy. This provision encourages the population to adhere and will be able to cope in the event of force majeure, for example, illnesses and pandemics.

4.3. Transport sector

The other most important deposit is that of transport, a great waste is seen in this sector, a volume of 15 million tons of oil are consumed annually, of which 12% are imported from abroad. What are our options? Should we continue to import as usual? [17].

- The answer is no, the major sources of energy saving in the transport sector must be found out.
- Converting cars to LPG. In fact, 80,000 cars were converted this year (2020), for the year 2021, a program of 200,000 vehicles has been launched, this action will save 200,000 tons of gasoline [18].
- Algeria will set up a first experiment in its history in the coming days, with diesel/LPG bus vehicles will emerge, which will lead to a saving of 30% in diesel consumption.
- Other niche we need to work on is CNG, which needs to be generalized quickly.
- Algeria must include clauses on future vehicle import specifications for this new nature-friendly technique.
- A collaboration between Naftal and the Ministry of Mines, to set up electrical terminals on the gas stations of the motorways supplied by photovoltaic systems, and prepare thus the ground for electric vehicles, should be done. The first step is to start with electric buses and electric trains.
- Knowing that 100 km by an electric car costs 100 DA, while 100 km by a thermal vehicle costs 300 DA, this is a coefficient cost of 5 times.
- In addition, combustion vehicles are increasingly being downgraded in Europe.

4.4. Energy sector

- Sonelgaz must be forced to stop commissioning thermal power stations.
- In addition, another company of renewable energies must be created. Because practically all international firms have changed to cope with this new situation of EnT, as an example GE, EDF, ENGIE… etc. this new company will be responsible for supporting the energy

transition and bringing the 2020/2035 solar plan to fruition, drawing on its experience of PV plants built and put into service.

- In addition, the new "renewable Sonelgaz" must invest in wind energy and geothermal energy, because Algeria has 280 thermal springs which represents a considerable deposit. Thus, in the near future, the country will have a successful energy transition and will be safe from any danger similar to that of COVID-19.

4.5. Construction industry sector

- Revise electricity and gas tariffs, lifting state subsidies on these two products.
- Encourage industrial operators to switch lighting parts and less energy-consuming manufacturing processes to photovoltaic systems.
- Require filtration, neutralization, and regeneration systems for gaseous, liquid, and solid wastes.
- Generalize the establishment of systems for detecting and controlling GHG emission levels and liquid waste at the level of all the industrial operators concerned, public and private.

5. Conclusion

Algeria is a semi-arid country, even arid, and its water resources are weak, irregular, and located in the coastal strip. The total amount of precipitation would be of the order of 100 billion m^3 of water per year, including 12.4 billion m^3 in surface runoff, and only 6 billion m^3 can be mobilized. The fall in the costs of non-conventional energies on the one hand, and the decommissioning of thermal energy, could stimulate efforts to create and innovate new, less expensive processes for the desalination of seawater, such as renewable energies (solar, wind power, etc.).

The triplet (i) energy transition, (ii) the environment, and (iii) the health crisis are inseparable.

As such, the air of fuel is behind us. By 2030, diesel and gasoline will no longer have the vocation to remain in current civilization, because climate change has already been established for a long time, all nations are heading towards de-carbonization. In addition, very likely, it will be imposed on us in the coming years.

It is high time to evaluate the strategy put in place. Today, the alarm bells have been sounded, and time is playing against us, if we return to our level of gas consumption, which is 1 billion cubic meters per week, that means that by 2040, Algeria will no longer be able to export, everything will be consumed internally. And at that point, a choice must be made, either we consume what we produce internally or we export it.

Everyone should work together to make the 2020/2035 solar program work because affects us all. To meet the current energy challenges, and defeat the energy battle of the post-COVID-19. We have to put 1,000 MW of solar photovoltaic into service each year, and therefore succeed in the 15,000 MW solar plan by 2035. To do so, we must find the means to slow down conventional energy, without compromising the standard of living and the availability of energy for citizens.

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