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Dolna 17, Warsaw,
Poland 00-773
+48 226 0 227 03
editorial_office@rsglobal.pl

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POPULATION GROWTH AND SUSTAINABLE DEVELOPMENT IN ALGERIA IN LIGHT OF ACHIEVING SOCIAL NEEDS (PROJECTIVE STUDY OF THE PROSPECTS FOR THE YEAR 2050 USING THE SPECTRUM PROGRAM)

Rima Merrad
University of Algiers 2, Algeria

Karima Fouded
University of Setif 2, Algeria

ABSTRACT

The relationship between population and sustainable development represents one of the most urgent and complex issues of the 21st century, Population dynamics and their impacts on natural resources, ecosystems and economic and social systems form a close relationship between the population in any society and the need for services in various fields, The total population size plays the largest role in determining the framework necessary for the community's various service needs.
In this context Algeria has been striving since independence to this day to implement developmental strategies that align with the population in order to achieve the greatest possible development to improve their situation in various fields, It has mobilized all its capabilities and resources to meet the needs of the population, particularly in terms of food, education, employment, and living standards. Therefore, the aim of our study is to estimate the basic needs required for the population in terms of food, education, and work, taking into account future demographic changes until the year 2050 in the context of achieving sustainable development.

KEYWORDS

Sustainable Development, Population Growth, Projections, Needs, Spectrum Program

CITATION

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Introduction:

The relationship between demographic and economic development, with its dimensions has garnered the attention of many thinkers and specialists in this field worldwide. Undoubtedly, development is one of the primary goals pursued by all countries due to its significant impact on the social, economic, and political life of the population. It is worth mentioning that sustainable development aims to meet the needs of the present without compromising the ability of future generations to meet their own needs. The latter focuses on balancing economic growth and environmental preservation, ensuring social justice, and providing opportunities for all members of society.

In the same context, population growth is one of the most prominent determinants affecting development in any country, as the human factor forms the basic pillar of economic, social, and cultural activity. In Algeria, the demographic situation is witnessing clear transformations, including the numerical growth of the population, changes in age structure, and a gradual decline in fertility rates. This indicates the beginning of a demographic transition characterized by an increase in the proportion of the youth population and a long-term reduction in fertility pressure. These changes carry significant challenges in terms of education, employment, infrastructure, and natural resources, making the achievement of sustainable development a necessary goal to

balance economic and social growth with environmental protection and ensure the well-being of future generations, Therefore, the aim of our study is to estimate the basic needs of the population (food, education, job opportunities) in parallel with the demographic changes occurring in Algerian society over time until 2050, in line with achieving sustainable development.

To reach the desired goal, we started from the following problem:

Given the projected demographic changes up to 2025, how can Algeria ensure the fulfillment of basic social needs like education, food, and employment in a way that promotes sustainable development?

We have divided our study into the following sections:

1. Study concepts

The concept of population growth: is the change in the size and population of a society over a specific period. This change is either an increase or a decrease, through natural increase and net migration. (Hilmi, 2006, p. 34)

-The concept of population projections: It means predicting the population in any country or region after a period on the basis of certain assumptions that can be achieved. The assumptions are formulated for the same society after knowing the birth and death rates and net migration for that society in previous periods. (Abu Hamza & al-Mubarrad, 2015, p. 5)

-Definition of sustainable development: The process aims to achieve the maximum economic efficiency of human activity within the limits of the available renewable resources and the ability of natural biological systems to absorb them and take care of the needs of future generations. (Abu Al-Nasr & Medhat Mohammed, 2017, p. 81)

-Definition of needs: There are many definitions of need in various scientific fields and differences in the ideological orientations of researchers, but all definitions indicate one content, the meaning of which is that need is everything that an individual needs in order to preserve his life, satisfy his various desires, and provide what is useful for his development and growth. (Mohamed & El-Desouki, 2010., p. 12)

2. Study methodology

To achieve the results and objectives of the study, we relied on the descriptive approach, which helps analyze and interpret various demographic phenomena and understand the relationships that connect them based on numbers and indicators. We also used the Spectrum population projection program developed by the United States Agency for International Development. This program is employed in demographic projections as one of the most widely used projection programs in the world. It is not limited to demographic phenomena but can also be applied in economic and social fields according to the software embedded in it. It is a system of integrated models designed to determine the future outcomes of current policies and programs. Additionally, it allows for other demographic projections, including:

- Family planning
- Focus on the projections of specific age groups
- The effects of rapid population growth on aspects such as agriculture.

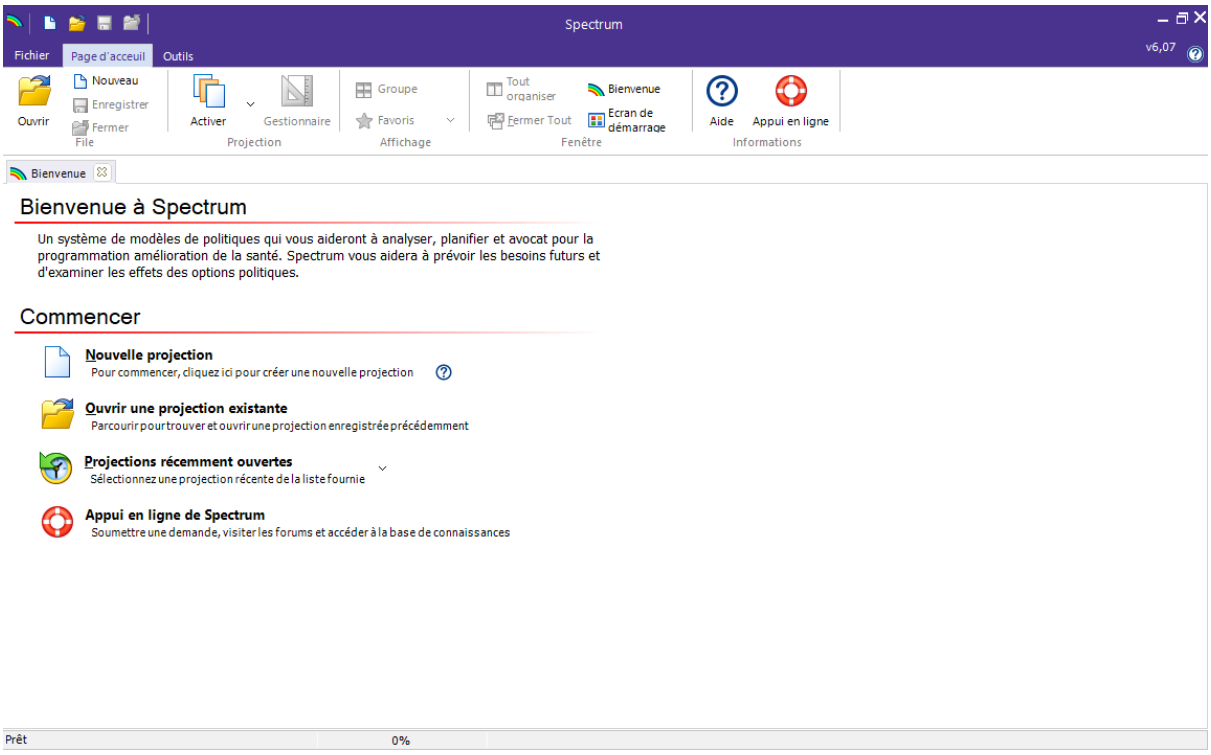

***Fig. 1**. Program interface*

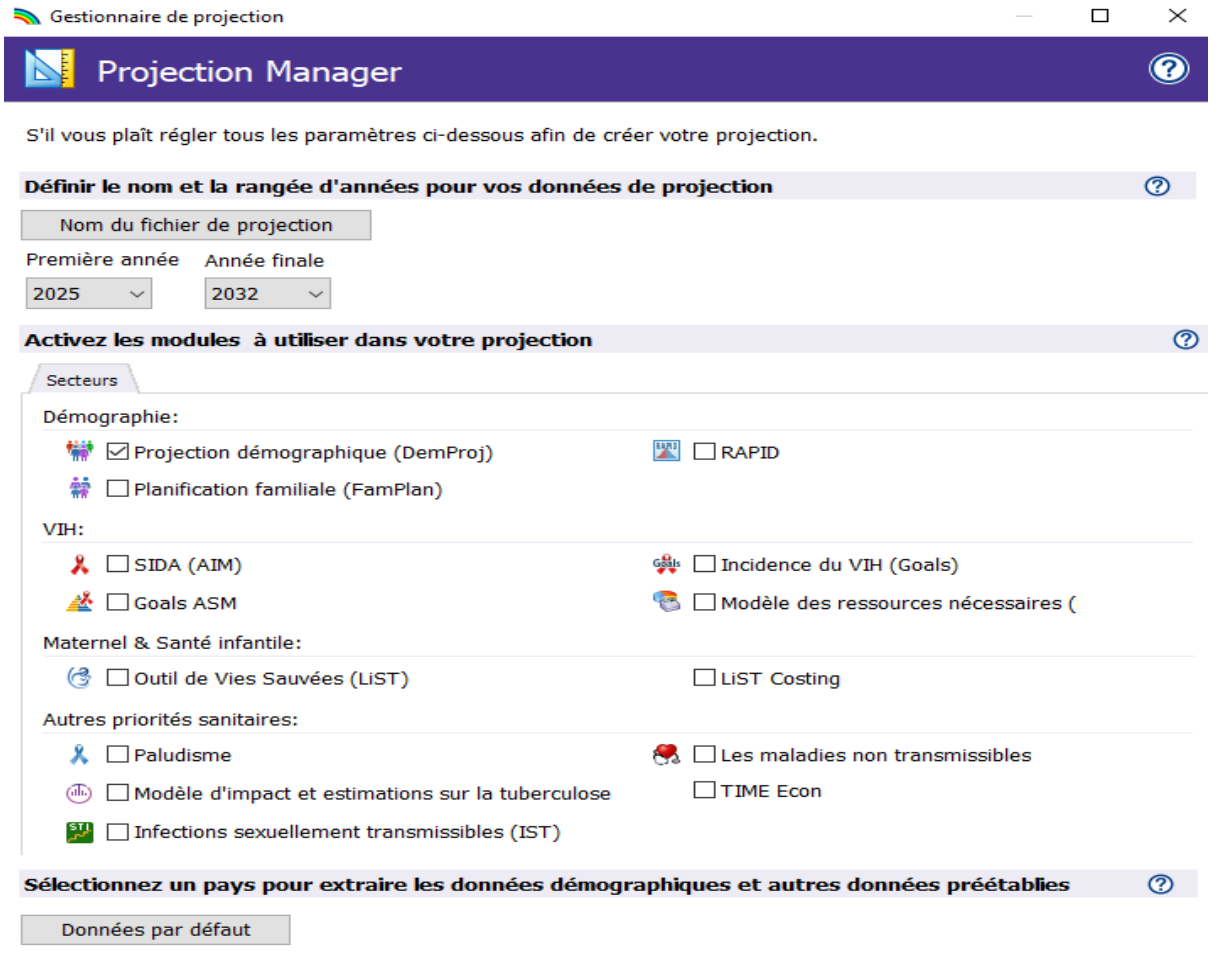

***Fig. 2.** Interface for inserting data into the program*

In this study, we designated the year 2019 as the starting point, considering it the most recent year for which detailed demographic data on the population of Algeria is available in terms of gender and age composition. The estimation of future population size and number is based on the availability of accurate data from official sources and assumptions. In this section, we relied on statistics from the National Statistics Office (ONS) in addition to the United Nations' programs and plans for the year 2050. It is also worth noting that population forecasts for size are made by setting assumptions and scenarios for the direct factors responsible for changing population size. As for the inputs of the Spectrum program, as the first step in monitoring the development of the Algerian population, we relied on the DemProj software and the following steps:

The population of Algeria was entered according to age groups and gender based on data published by the National Statistics Office (ONS).

Regarding the composite fertility index, after examining the trends in fertility levels in Algerian society thru retrospective observation and in addition to the United Nations' predictions for this trend worldwide by 2050, it is assumed that the fertility rate of women in Algeria will approach 2.12 children per woman by 2050.

Neglecting the net migration factor due to the absence of official and accurate statistics on it, because it is not possible to control the real number of illegal migration.

Life hope assumption is trending towards 80.7 years for men and 82.7 years for women in 2050.

3. Projection results:

A - The development of the age structure of the Algerian population, prospects for the year 2050

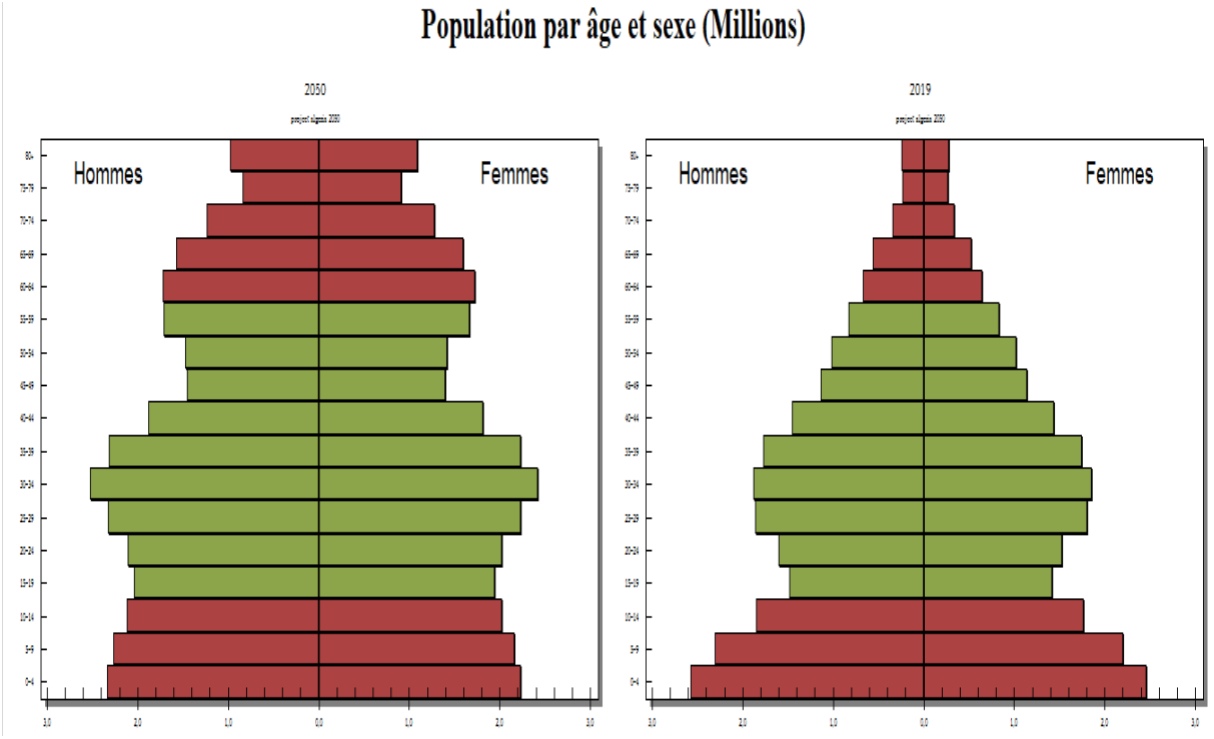

Fig. 3. *Population pyramid of Algeria's population 2019-2050*
Source: *Spectrum output*

The last figure represents two population pyramids that show the distribution of the Algerian population according to age groups and gender for both 2019 and 2050. This figure clearly shows the development of the demographic structure in Algeria over time. At the level of 2019, the population pyramid appears to have a broad base, as a large percentage of the population is in the age group 0-15, which means high birth rates and young people in Algerian society In parallel, the working-age population groups 15-65 represent a broad and strong base of the economically active population, and in the end the base of the pyramid is narrow for the population over 60 years old. This is what confirms the youth of Algerian society once again, as we can say that during the year 2019 Algeria witnessed a rather large population growth This places it with a high demographic burden on the working groups due to the fact that the lower dependent age groups occupy the largest number of the population, While the

population pyramid during the year 2050 can be said to have changed radically, as it has become almost rectangular in shape, with a contraction occurring at its base for the first three age groups (0-4, 5-9 and 10-14), which means a decline in the number of births and a contraction of the young groups In contrast, the expansion of the upper layers of the pyramid by 60 years or more, i.e. the increase in the number of Algerian population members at advanced ages as a result of the improvement in the standard of living and health care services, which resulted in an increase in life expectancy. It is worth noting that according to the population projections we conducted, life expectancy is heading towards 82.7 years for women and 80.7 years for men during the year 2050 This indicates an advanced demographic transition in the demographic structure of Algerian society, as the features of its trend towards aging are clear, despite the fact that the largest percentages are among young groups, and in conclusion, in light of these changes, the guardian authorities must restructure various programs and policies to cover various population needs, especially in the field of securing Food and education, as well as creating job opportunities, and this is what we will discuss later.

B - **Estimating food needs for the year 2050**

The issue of food security is considered a very important issue, as it has become a concern for many officials of countries, governments and organizations, as the food problem and providing food to people is considered a basic need and one of the utmost necessities, especially with the growing global awareness of the dimensions of the food problem Below we will estimate the food needs in Algeria considering population changes. In this study, we focused on grains, considering that Algerian society depends primarily on grains of various types for its food, as they are classified as basic crops. As for the program's inputs in this regard, they are:

- **The area cultivated for grains in Algeria:** According to the Ministry of Agriculture, the area allocated for grain cultivation in 2019 was estimated at about 3.1 million hectares. As is currently known, the State of Algeria is working to push the wheel of agricultural investment and achieve self-sufficiency, especially in the field of grains of various types. It is likely that the agricultural area allocated to the latter will continue to rise. Accordingly, we have assumed that the area allocated for grains is heading towards about 3.5 million hectares in 2050.
- **Annual grain production:** According to the Ministry of Agriculture, it amounted to 5,633,285 tons during 2019.
- **Annual growth of grain production in Algeria (%):** Through fluctuations in the value of agricultural production of the main crops in Algeria and through statistics published on the website of the Ministry of Agriculture, which indicate that in less than 7 years, an annual growth of 26% was recorded, equivalent to an annual growth of 4% in one year, we assumed that the annual growth rate of grain production in Algeria would continue at about 5% Until 2050.
- **Per capita annual grain consumption in kilograms in Algeria:** In this regard, national statistics indicate that the Algerian per capita grain consumption reaches 251 kg during the year, and we assumed that this value would remain constant until the year 2050.

In this regard, we have reached the following outputs:

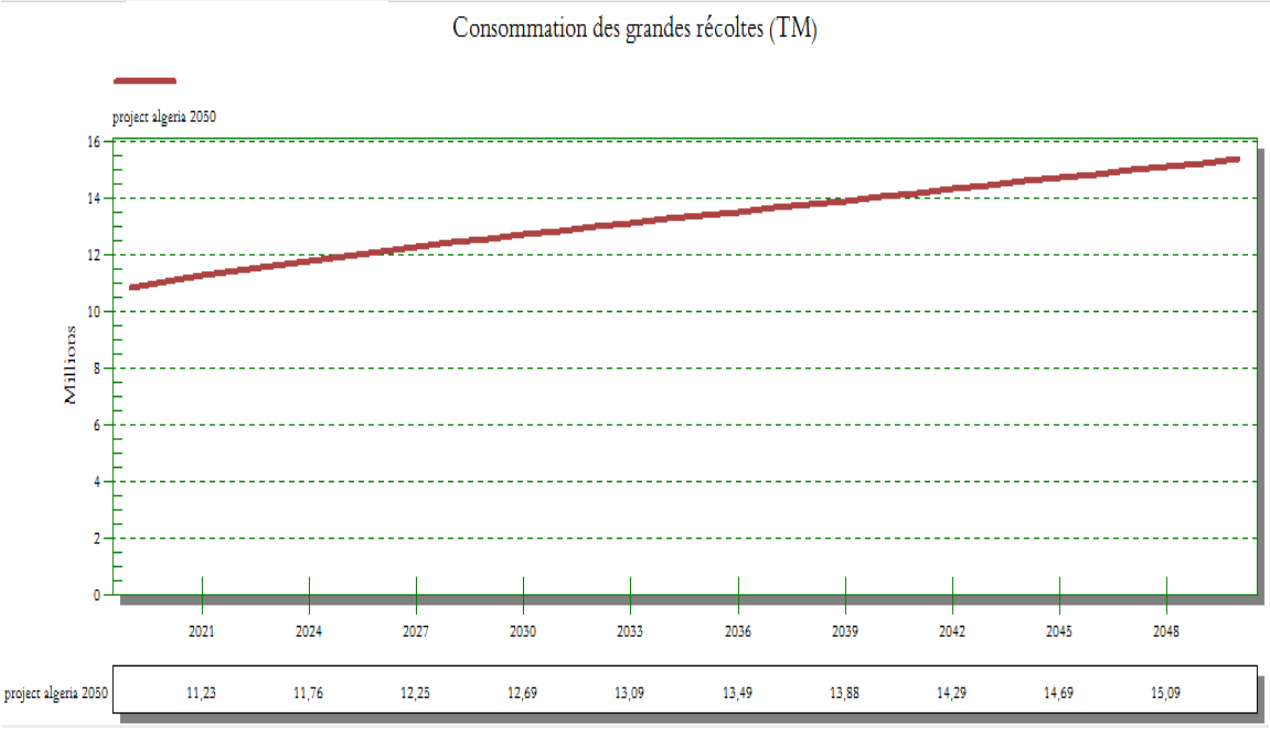

Fig. 4. *Evolution of grain consumption in Algeria 2019-2050*
Source: *Extracted from Spectrum Projections System*

It is clear that grain consumption in Algeria is witnessing a clear upward curve, moving from approximately 11.2 million tons in 2020 to more than 15 million tons in 2050. This trend reflects continued population growth and an improvement in the standard of living. From a socio-demographic perspective, this increase is linked to an increase in the size of the active population and an increase in life expectancy, which leads to a widening gap in national food demand We can say that the larger the population, the greater the demand for grain consumption in Algeria, considering the nature and culture of Algerian society in preparing food. Hardly any meal is devoid of grains, whether soft or hard wheat, pasta, or the rest of the grains Assuming that the Algerian individual remains at half the annual rate of wheat consumption, estimated at 251 kg per capita, the increase in the number of individuals will inevitably reflect negatively on the value of production, which will require an increase or it will be impossible for individuals to obtain the required share.

From an economic perspective, this development poses major challenges related to achieving national food security and reducing dependence on imports, especially in light of the limited local grain production. To confront these challenges, the need arises to improve agricultural productivity, rationalize the use of water resources, and value national production capacities to ensure a sustainable food balance by 2050.

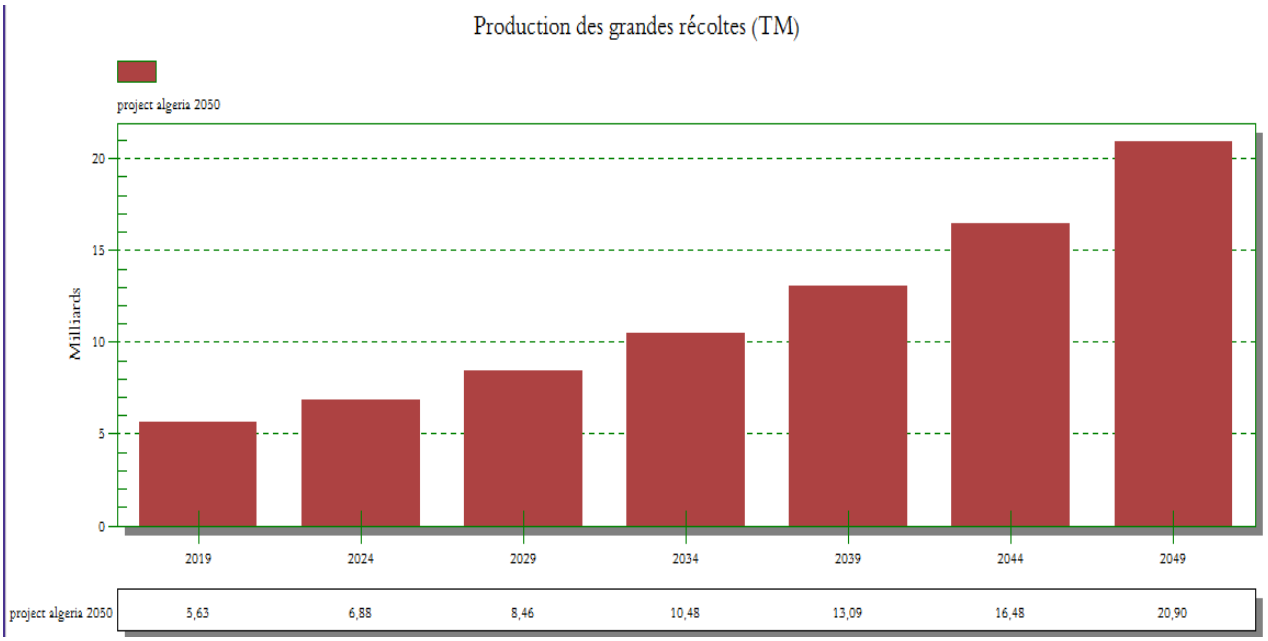

Fig. 5. *Value of grains to be produced 2019-2050:*
Source: *Extracted from Spectrum Projections System*

The latest graph shows that to meet the food needs of the Algerian population and achieve food security, grain production in Algeria must follow an upward curve, rising from approximately 5.63 million tons in 2019 to more than 20.9 million tons in 2049, an increase of more than 270% over thirty years. This increase in production is mainly due to continued demographic growth According to the hypothesis of our study, which assumes a fertility trend of about 2.12 children per woman in 2050; we have reached that the population of Algeria during this year will reach the threshold of 61 million people. With the improvement of the standard of living and the change in consumption patterns, the demand for basic foodstuffs will increase, most notably grains, which represent the main component of the Algerian diet There is no doubt that based on population increase and future population figures, the volume of production must be adapted to meet the requirements and needs of the population, especially in light of the continuous population increase. Therefore, grain production needs must also expand with the increase in population. Grain production is greatly affected by demographic changes, and the greater the population, the more grain production of various types is required to meet the nutritional needs of the population in the future.

In conclusion, the socio-demographic transformations expected in Algeria by 2050, represented by a growing population, rising life expectancy, and declining fertility rates, will bring about fundamental changes in the social and economic structure, particularly in the area of food demand. In this context, the increase in grain consumption is a direct reflection of these population dynamics, which requires the adoption of integrated policies that combine demographic planning with agricultural and economic policies, with the aim of achieving a sustainable balance between population growth and food production Ensuring food security in light of these transformations will only be achieved through a long-term strategic vision based on sustainability, innovation, and good governance of resources, such as relying on:

Expanding agricultural areas allocated to grains while improving land fertility and increasing its yield.

Employing modern agricultural technologies (such as smart irrigation and precision agriculture) to increase productivity and reduce water waste.

Encouraging investment and agricultural partnerships between the public and private sectors to support sustainable growth of the agricultural sector.

Implementing these strategic directions will enable Algeria to meet the upcoming demographic challenges and ensure its sustainable food security, while achieving an effective balance between population growth and economic and social development by 2050.

C - Estimating education needs

Education is considered the cornerstone of the development process. It is a fundamental axis for all development plans and an important pillar of sustainable development. The latter is linked to the population in a relationship characterized by mutual influence. The more education spreads and becomes accessible to a greater number of members of society, the better the population indicators such as (fertility and death rates), the more the population's life develops socially and economically, and the more members of society are able to participate effectively politically, economically, and culturally There is no doubt that when population indicators improve and population growth rates decline, it is possible to provide educational services to the largest number of community members and improve the quality of educational outcomes. To estimate educational needs, we relied on the RABID program within the Spectrum program, in addition to adopting statistics from the Ministry of National Education. We conducted a study as a secondary stage model, where we entered the following inputs:

- ✓ High school enrollment age, which is estimated at 15 years
- ✓ Number of years studied in secondary school, which is estimated at 3 years
- ✓ The schooling rate for secondary school in 2019 was estimated at 62.68%, with the hope that it will reach 70% in 2050
- ✓ The number of students per teacher in the secondary stage is 35, assuming that there will be 25 students per teacher in 2050
- ✓ Number of students per secondary school: Estimated at 700 students per school, assuming 500 students per school in 2050
- ✓ The amount of financial expenditure per student during the year was estimated in 2019 at 84,349 Algerian dinars, assuming it becomes 100,000 Algerian dinars in 2050

As for the outputs, they were as follows:

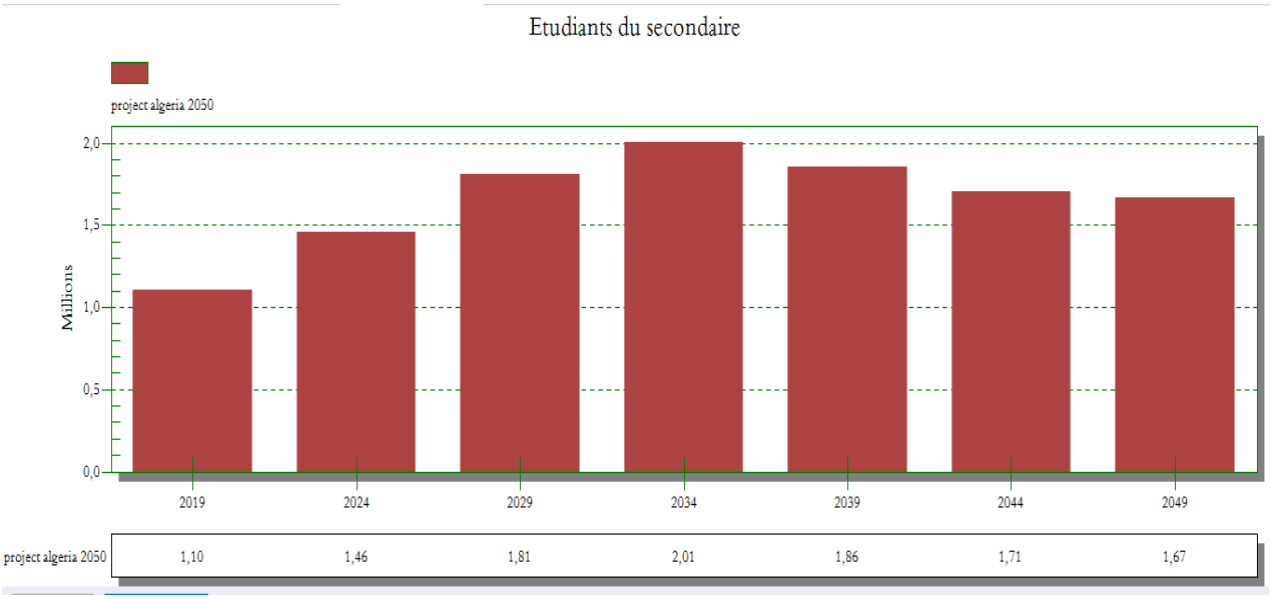

Fig. 6. *Evolution of the number of students enrolled in secondary school 2019-2050*
Source: *Extracted from Spectrum Projections System*

The last figure represents the development of the number of students in secondary school over the next 30 years, as it is clearly evident that the number of students is proceeding according to an upward curve of 1.10 million students during the year 2019 to reach its peak in the year 2034, which was estimated at 2.01 million. This increase is explained by the high fertility factor. As we mentioned previously in the analysis of the population pyramid, Algerian society tended towards a somewhat rapid population increase, and this can be observed during the year 2034 in the enrollment in secondary schools this year, they are most likely born in 2019. Immediately after 2034, we notice a downward trend in the number of secondary school students. This is also linked to the fertility factor, which has declined since 2019.

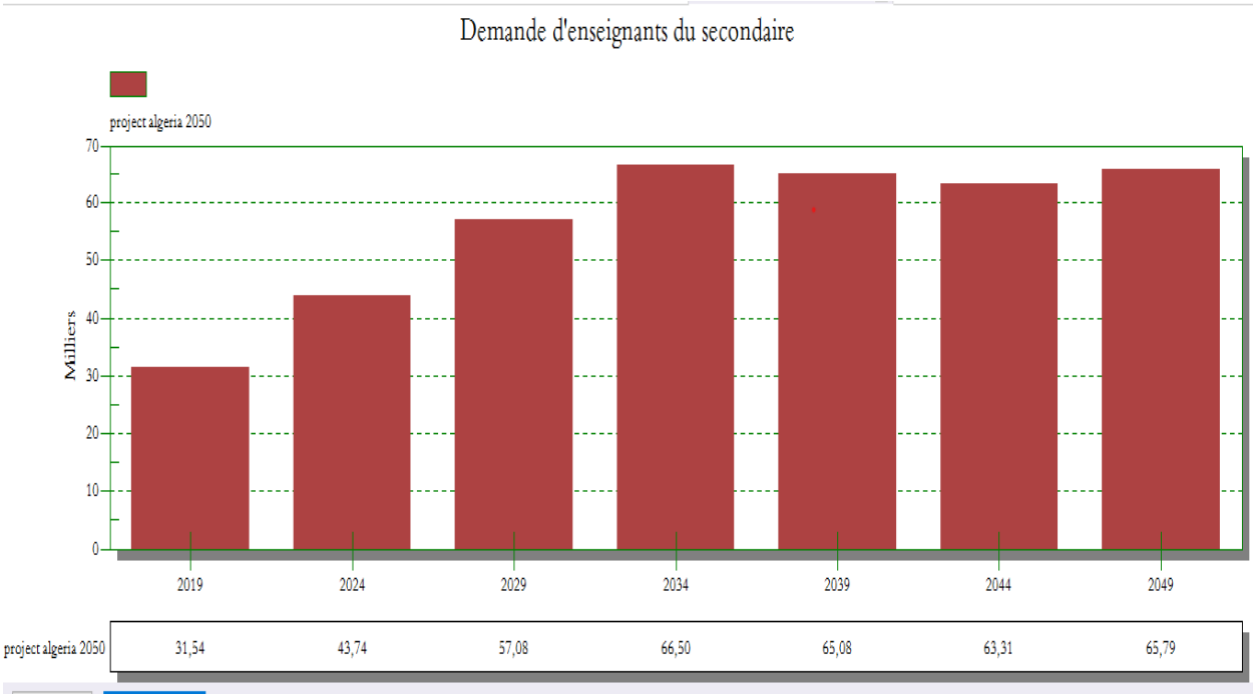

Fig. 7. *Demand for secondary school teachers 2019-2050*
Source: *Extracted from Spectrum Projections System*

From Figure 7 which shows the demand for secondary school teachers, in parallel with the previous figure, it is clear that the number of secondary school teacher positions required to be provided is in line with the trend in the number of secondary school students, as in 2019 it was approximately 31,540 new positions to cover students, and this number continued to increase to reach its peak in 2034, as it reached approximately 66,500 positions, immediately after which it witnessed a gradual decline until 2044, then it returned The increase then reached 65,790 new positions in 2049. What can be concluded from the last figure is that the number of teacher positions that must be provided is affected by the number of students, so the greater their number, the more the guardian authorities must increase the number of teacher positions in light of achieving coverage and sustainable development in the education sector.

Table 1. Number of secondary schools to be provided 2019-2050:

Years	**2019**	**2024**	**2029**	**2034**	**2039**	**2044**	**2049**
Application for secondary schools	1577	2287	2854	3324	3253	3165	3289

Source: Extracted from Spectrum Projections System

The last table represents the number of secondary schools that the Algerian authorities must provide to cover secondary education. We note a continuous increase from 2019 to 2034 from 1577 new secondary schools to 3324 new secondary schools, an increase of more than 110% over 15 years. This increase is due to the natural growth of the population, especially the age group between 15 and 18 years. We previously indicated that Algerian society witnessed a relatively rapid growth in 2019 On the other hand, there was relative stability until 2049, but it remained almost high. This is not related to population growth, but rather, after reaching the peak of demographic growth, the focus shifts from universalizing education to improving its quality and suitability to the requirements of the digital age and the labor market.

In conclusion, population growth in Algeria poses both a challenge and an opportunity for the education sector. The challenge lies in expanding the educational infrastructure and developing human resources and curricula to keep pace with the growing demand. The opportunity lies in investing young human capital to

achieve sustainable economic and social development through quality, digital, and vocational education that keeps pace with future needs.

D - Estimating the needs of the labor sector

Population growth in Algeria is a major factor affecting the labor market with the continuous increase in population, especially young groups, and in order to build future projections in the labor sector, we have entered the following data that we obtained from data and publications of the National Bureau of Statistics:

- The contribution to the labor force for males aged 10-14 is non-existent
- The labor force contribution rate for males aged 15-64 is 66.8%, assuming it reaches 70% by 2050.
- The contribution to the labor force for females aged 10-14 is non-existent
- The contribution rate to the labor force for females aged 15-64 is 17.3%, assuming it reaches 19.5% in 2050
- GDP for the base year (2019) was estimated at $193.5 billion
- Annual GDP growth rate: It is worth noting that this rate fluctuates between decline and rise, as it witnessed a decline in 2019, estimated at 0.8%, assuming it reaches 4% in 2050.

As for the sector's outputs, they were as follows:

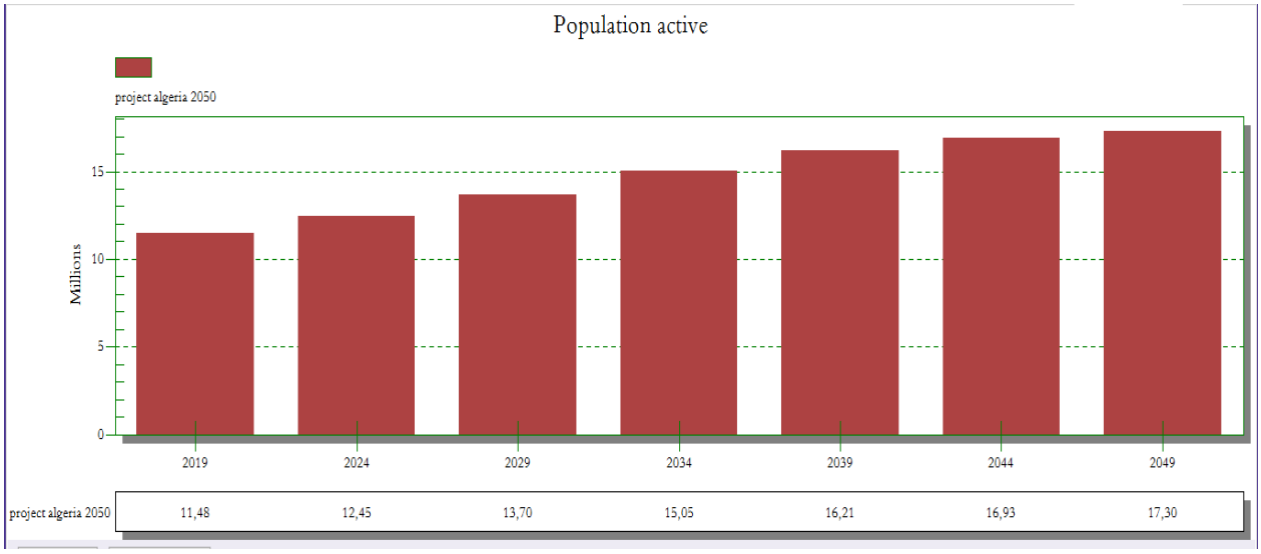

Fig. 8. *Evolution of the active population:*
Source: *Extracted from Spectrum Projections System*

The last figure shows the evolution of the active population in Algeria during the period from 2019 to 2050, which will witness clear and continuous growth, as this number is expected to rise from approximately 11.48 million people in 2019 to approximately 17.30 million people in 2049. This positive trend reflects an important demographic shift represented by the expansion of the age group capable of working, which is an indicator of the increasing productive capacity of Algerian society in the future.

From a socio-demographic perspective, this growth reflects continued population dynamism and a high proportion of young people in society, creating a qualified human base to contribute to economic development. From an economic perspective, this expansion of the active population represents a significant development opportunity if exploited through effective policies in the areas of employment, education, vocational training, and diversification of the national economy.

However, this growth in the labor force may also pose an economic and social challenge if it is not accompanied by sufficient job creation and improved productivity, which may exacerbate unemployment rates and put pressure on public services. Therefore, the Algerian state must adopt comprehensive strategies for human and economic development that ensure that this demographic growth is transformed into a real lever for economic and social progress by 2050.

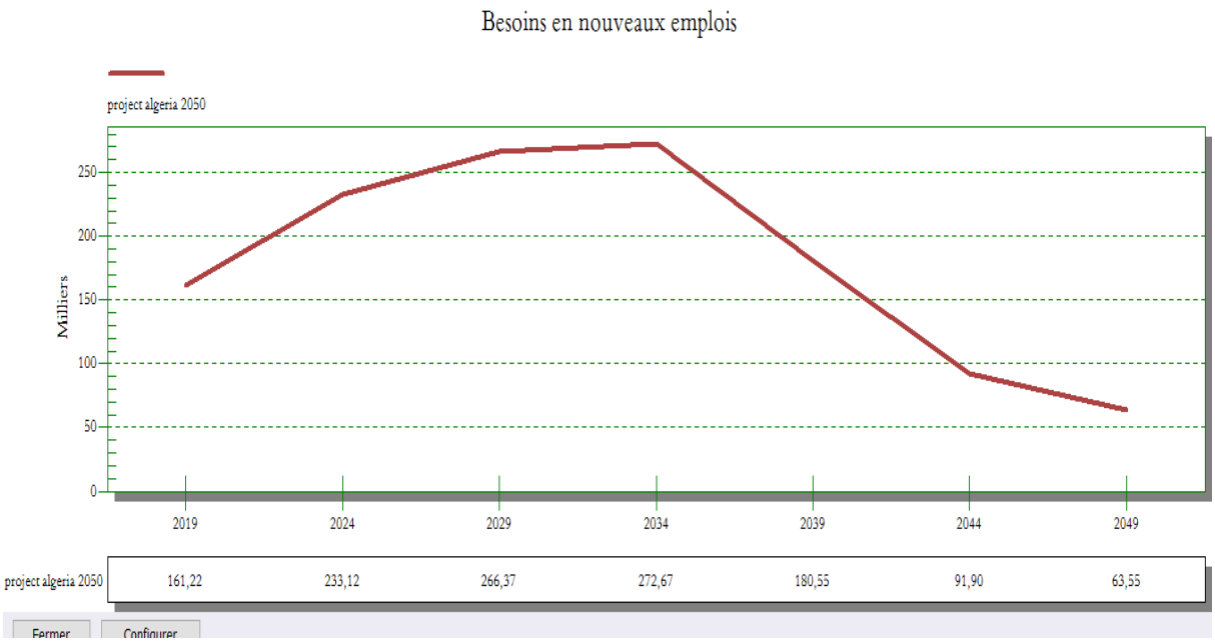

Fig. 9. *Number of jobs needed to be provided 2019-2050*
Source: *Extracted from Spectrum Projections System*

Figure (10) shows the development of the number of positions that must be provided in Algeria with a view to the year 2050 to eliminate unemployment among individuals of working age, or what is called the active population, as demographically this category represents individuals aged between 15 and 65 years It is clear that to achieve sustainable development in the labor sector between 2019 and 2050, the number of positions to be opened will increase from 161,000 in 2019 to approximately 273,000 in 2034, then gradually decrease to 63,000 in 2049. This reflects the rapid increase in the active population during the first two decades, which creates significant pressure on the labor market and requires effective employment policies and economic diversification.

After 2039, the decline in the need for new jobs indicates the beginning of demographic and economic stability, where the focus can be on improving the quality of work and productivity instead of quantity. Therefore, the period 2020–2035 represents both a challenge and an opportunity to build an economy capable of absorbing human energies and ensuring sustainable development by 2050.

In conclusion, population growth in Algeria is a major factor affecting the labor market. With the continuous increase in population, especially young groups, the labor force supply increases significantly, which poses major challenges for the state to provide sufficient job opportunities. If these opportunities are not available, unemployment rates rise, especially among young people. Reliance on informal or seasonal employment also increases, and pressure increases on major cities in search of job opportunities. to meet the job needs in Algeria, we recommend:

Conclusions:

Facts related to changes in population size and its basic components are among the most important facts if sufficient demographic information and indicators are available that can be adopted to reveal the pace of population growth with the aim of estimating the population during the two census years or predicting the population size outside the census period to benefit from them for future planning purposes and developing short- and long-term development programs and plans Demographic projections indicate that Algeria will witness fundamental changes in population size and age composition by 2050.

Undoubtedly, the rapid population growth poses a major challenge to achieving sustainable development, especially with regard to meeting the basic needs of society such as education, food, and work. In light of the population increase that Algerian society will reach within the next 30 years, as the total population will approach approximately 61 million people, population pressures will increase significantly, which requires effective strategies for managing resources and achieving a balance between population growth and development requirements It is worth noting that confronting these challenges requires comprehensive

policies aimed at enhancing education, ensuring food security, and creating sustainable job opportunities, with attention to protecting the environment and the sustainability of natural resources. Success in this path will not be limited to improving current conditions, but will pave the way for future generations to live in a society capable of adapting to population growth and achieving comprehensive development. As for the recommendations we propose:

- Working to build the foundations for sustainable development that considers the current and future size of the population, their qualitative and age structures, and their changing needs.
- Population growth is an important issue that must be taken into consideration within sustainable development indicators due to the importance of the human element in achieving economic growth.
- Improving demographic planning to keep pace with the development of the active population and ensuring a balance between supply and demand for work.
- Sustainable development and population growth are not inevitable conflicts. Rather, population pressures can be transformed into opportunities for economic and social progress if early planning and appropriate action are taken before 2050
- Strengthening employment policies by supporting small and medium enterprises and creating a suitable environment for entrepreneurship among young people.
- Diversifying the national economy to reduce dependence on the hydrocarbons sector, and expanding job opportunities in the fields of industry, agriculture, technology and services.
- Improving demographic planning to keep pace with the development of the active population and ensuring a balance between supply and demand for work.

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