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Demographic projections of the active population in Batna Province and its needs – prospects for 2050 using the spectrum program

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***Abstract*---**This study's main goal is to identify and predict future job needs by conducting demographic projections for Batna Province's active population. Without understanding the number of additional workers who will join the Batna labour market by 2050, this cannot be accomplished. In order to achieve this, a series of scenarios was created using the Spectrum Program to simulate future changes in demographic factors affecting population growth over the years 2008–2050. This is predicated on the knowledge that strategies based on data and information rooted in present realities and future predictions are the only way to achieve any progress in a country or region. Such strategies are essential to ensure the availability of employment opportunities for new job seekers in Batna Province.

***Keywords*---**Demographic projections, active population, needs, Spectrum Program.

1- Introduction

The process of development is all-encompassing and includes social, cultural, political, and economic facets. It seeks to implement a variety of reforms that guarantee the population's basic requirements are met, increase their options, and enhance their quality of life. Like other countries, Algeria aims to develop through an inclusive plan that addresses all parts of the country, considering local contexts and unique local characteristics. To achieve local development

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across all provinces, the country focuses on strengthening its weaknesses and enhancing its strengths.

A vital part of this national development plan is Batna Province. The demographic component, which forms the basis of all planning, must be carefully taken into account in order to achieve development in this area. Meeting the basic needs of the populace—a long and healthy life, a good level of education, and respectable living standards—is one of the primary objectives of development."

Without forward-looking planning based on anticipated future requirements, created through scenarios that foresee potential demographic changes, such results are not achievable. This involves conducting an effort to predict shifts in demographic phenomena (such as migration, fertility, and mortality) and connecting them to a range of fundamental social demands (such as food, work, education, and health). This method creates a foundation for future development initiatives and strategies that can successfully address these demands.

2- Problem Statement

The active population is the main driving force behind the economy and the engine of development in any country. It is the productive segment of society and the one responsible for supporting both the elderly and children. The youthful demographic structure of Algeria in general—and of Batna Province in particular—makes this group a critical element that must receive proper attention and be effectively utilised to achieve development in the region.

One of the main factors driving Batna's development is the employment sector. It does, however, face a number of difficulties, major among them being a notable deficiency in offering new job seekers permanent positions. This is mostly because more people are of working age as a result of demographic development. For instance, Batna's active population increased by 75% from 258,504 in 2001 to 452,448 in 2022. The labour market is under a lot of strain as a result of this expansion.

As a result, the unemployment rate has risen, reaching 19.34% in 2021, which is significantly higher than the national average of 11.4% recorded in May 2019. In this study, we aim to conduct projections regarding the needs of the active population in Batna Province looking ahead to 2050. This leads us to the central research question:

- **What will be the demand for labour in light of the demographic changes expected in Batna Province by 2050?**
  From this main question, the following sub-questions emerge:
  - ✓ What is the projected population size of Batna Province by 2050?
  - ✓ What are the employment forecasts for Batna Province by 2050?
  - ✓ What will be Batna Province's needs in terms of new job positions by 2050?

3- Methodology

We adopted the descriptive-analytical method as the main approach in our study, as it is one of the forms of organised scientific analysis and interpretation. It

involves describing a specific phenomenon or problem quantitatively by collecting, classifying, and analysing relevant data and information. It also leads to predicting the future development of the phenomena under study. We followed this approach to collect data specific to the Wilaya of Batna and its districts through various statistics and information related to the population, such as their distribution, density, movements, and age and gender composition.

The demographic projections software Spectrum, which performs population forecasts by establishing a variety of scenarios for future changes in the demographic factors governing population increase, was also used in this study. We predict the numerous social demands that the population will require from 2008 to 2050 based on the findings from these demographic projections.

4- Objectives

This study aims to achieve the following objectives:

- To examine the various changes that will occur in the active population of the Wilaya of Batna in terms of growth and size by the year 2050.
- To determine the future number of people of working age in the Wilaya of Batna by 2050.
- To highlight the importance of conducting forward-looking demographic studies at the local level, taking into account the specific characteristics of each region.
- To provide decision-makers with a set of data built on scientific foundations, based on scenarios that consider the evolution of the key components influencing demographic growth in the Wilaya of Batna.

5- Significance

This study's significance comes from the importance of its subject, which is estimating the employment demands of the Wilaya of Batna's population by 2050. When creating development plans and programmes at different levels, the demographic dimension is a crucial component. Since the active population is thought to be the primary force behind development, a clear vision for future development can be established by tracking the structural changes that take place within this group over the projection period. This vision aims to provide sustainable job possibilities that satisfy the projected future demand of the region's population while taking into consideration the local context and the resources available in the Wilaya of Batna.

First: The Theoretical Aspect of the Study

1- Concepts of the Study

1.1- Projections

These are the statistical results of particular hypotheses about a variable's quantitative value, Projections show how measured circumstances have changed over time.(Adel, 2022, p 518)

Only through forward-looking research with scientific foundations and assumptions derived from the chronology of past and present occurrences can the future be planned. Since these assumptions are the most likely to come true in the future, they are utilised to create plans and strategies that help prevent crises in the future and advance all areas that improve the quality of life for people.

1.2- Population Projections

These refer to estimating the future population size — essentially predicting population numbers based on a range of scenarios involving anticipated changes in fertility, mortality, and migration rates. There are various statistical methods used to produce population projections. (Rashoud, 2010, p 26)

Such projections are used to identify and prepare for future needs. Without knowing the future size of the population, it is impossible to provide for their requirements in terms of agricultural production, economic goods production and distribution, and the implementation of various programmes. (Djamila, 2019, p 73)

1.3- The Active Population

This refers to the segment of the population that consists of productive individuals—those who are engaged in the production of various goods necessary to meet the basic needs of the population. This group comprises people who are either employed or unemployed but actively looking for work at a specific reference time. "Those engaged in economic activity in society" is how the UN defines the active population. "All individuals who were involved in an economic or commercial activity for at least one hour during the reference week and are looking for work" are considered to be part of the active population, according to the International Labour Office. (Aoufi, Salaheddine, 2015, p 66-77)

Introduction to the Wilaya of Batna

The Wilaya of Batna is found in eastern Algeria, between the 35th and 36th degrees of northern latitude and the fourth (4th) and seventh (7th) degrees of eastern longitude. The Wilaya is over 12,038.76 km² in size. Geographically, it is situated in a natural area where the Tell Atlas and Saharan Atlas mountains converge, which distinguishes it from other provinces and affects its biological diversity and quality of life. It shares borders with the Wilayas of Oum El Bouaghi, Mila, and Sétif to the north; Khenchela to the east; Biskra to the south; and M'sila to the west. In 2022, there were around 1,482,000 people living in the Wilaya. (D.P.A.T, 2022, p 6)

1.4- Needs

Since meeting human wants is one of the most important variables affecting human activity and social interaction, the term "needs" is used in a variety of fields. Food, drink, clothing, marriage, safety, education, a decent quality of living, occupational training, and physical and mental well-being are all necessities for human existence.

According to Robert Barker, needs are "the social, cultural, economic, psychological, and material demands required for survival, well-being, and achievement" in the Social Work Dictionary. (Abdelwahab, 2015, p 12-13)

1.5- Spectrum Program

Together with the Health Policy Initiative (HPI), the United States Agency for International Development (USAID) created the Spectrum program. It is a computer-based application made to assess demographic data and forecast the future. The Demographic Spectrum Program is a complete software program that enables social needs forecasting and demographic projections. These estimates are based on statistics from the United Nations, and the programme's main elements are as follows:

- **Demography (DemProj)**
  This module is used to forecast the population by gender and age at the national or regional level. It is predicated on assumptions about migration, mortality, and fertility. It allows us to run both urban and rural predictions and to provide demographic indicators for up to 100 years into the future. The United Nations Population Division database provides the basic data needed for population predictions.
- **Socioeconomic Impacts of High Fertility and Population Growth (RAPID):**
  The effect of population expansion on development is demonstrated in this module. By predicting the social and economic demands brought on by high birth rates and fast population expansion, it accomplishes this in important and delicate areas, including the labour market, education, health, urbanisation, and agriculture. (John, Sharon, 2007, p 1-2)

2- Data Sources

In this study, we relied on data provided by the National Office of Statistics, which supplies demographic information, including data from the most recent census conducted in 2008 as well as from previous censuses. For the Demographic Spectrum program, the age and gender composition for the year 2008 was entered as a baseline.

3- Projection Period

Using 2008 as the base year—the year of the most recent population census with published results—we decided to extend the projection up to 2050 in order to meet the projection's requirements and allow comparison of our study's findings with those of other studies on the same subject.

4- Population Structure of the Wilaya of Batna (2008–2050)

One of the most crucial categories of information needed for strategic planning and projections in all sectors is the population's age and gender distribution. Because population structure aids in comprehending the different aspects of the culture being studied, it aids in determining future demands. (Rashoud, 2010, p 186)

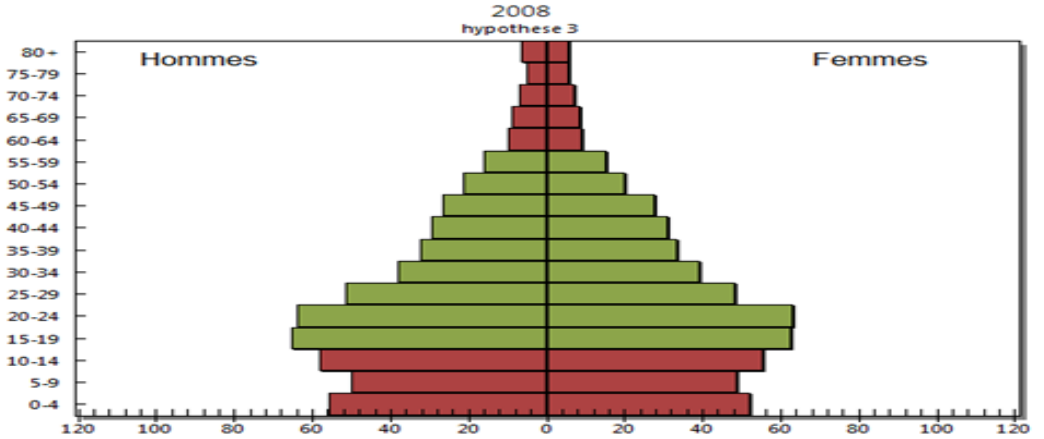


Figure 01: Population Pyramid of the Wilaya of Batna in the year 2008.
Source: Prepared by the researchers using the Spectrum Program.

We can see from the Wilaya of Batna's 2008 population pyramid that its base is rather small, especially for the 0–4 and 5–9 age groups. This is because the nation's fertility rates were low at the start of the new millennium. With a Total Fertility Rate (TFR) of 2.4 children per woman in 2002, the nation actually saw its lowest fertility rate in history during this time. This happened while Algeria was coming out of the "Black Decade", a time of civil war that caused marriage rates to drop, which in turn affected fertility rates.

From the pyramid, It is clear that 29.64% of the population was in the dependent age group, which is 0–14 years old. In contrast, 65.28% of the population was in the working and economically active age range of 15–65. This group is the productive sector of society that propels development and makes up the majority of the population. Before this working-age group enters the older, dependent categories and causes a demographic shift that could result in ageing, it is imperative to take advantage of this population. The so-called "window of opportunity" or demographic dividend essentially expires when this change takes place.

The proportion of those 65 and older was 5.06% of the total population. This suggests that Batna's population is still very young, with a young age distribution. The population pyramid is almost symmetrical in terms of gender distribution, with no discernible variation between males and females throughout age categories. This symmetry shows that population increase is balanced by gender.

Table 01: Crude Birth Rate, Crude Death Rate, and Natural Increase Rate in the Wilaya of Batna (1998–2020)

Year	**1998**	**2003**	**2008**	**2013**	**2018**	**2020**
Crude Birth Rate %	23.61	21.23	25.11	27.09	26.62	24.45
Crude Death Rate %	04.35	3.76	4.12	3.98	4.66	5.83
Natural Increase Rate %	1.92	1.74	2.09	2.31	2.19	1.86

Source: *Monograph of the Wilaya of Batna, 2014, Ministry of Health, 2020.*

From **Table 01**, which shows the development of the crude birth rate, crude death rate, and natural increase rate in the Wilaya of Batna between 1998 and 2023, we observe the following trends:

- **Crude Birth Rate:** The crude birth rates were 23.61‰ in 1998 and 21.23‰ in 2003. The security crisis, the population's declining standard of living, and the postponement of marriage age were the causes of this. However, beginning in 2008, there was a discernible spike, with the rate rising to 25.11‰ and then to 27.09‰ in 2013. This gain was ascribed to increased growth rates, an increase in the national treasury from oil earnings, and improvements in the security situation. Additionally, even though the people of Batna were from other provinces, the Wilaya observed a surge in recorded births due to the influx of patients from nearby districts. The crude birth rate, however, started to decline once more, hitting 26.62‰ in 2018 and 24.45‰ in 2020. Widespread use of contraceptive methods, higher levels of education among women, later marriage ages for both sexes, and Algeria's political and economic crisis brought on by declining oil prices—, which resulted in changes to the country's governmental system—were the causes of this reduction.
- **Crude Death Rate:** Additionally, there was a noticeable decrease in the crude death rate, which recorded rates of 4.35‰ and 4.66‰ between 1998 and 2018. This suggests that the Wilaya's health status has improved, with better medical treatment and fewer infectious diseases. However, because of the substantial rise in deaths brought on by the global COVID-19 pandemic, the death rate increased in 2020 to 5.83‰.
- **Natural Increase Rate:** In 1998, the natural increase rate—, which captures the difference between births and deaths and indicates population growth overall—was 1.92%. Due to a reduction in fertility rates brought on by the economic and security difficulties of the time, it fell to 1.74% in 2003. After that, the natural rise rate increased to 2.09% in 2008 and 2.31% in 2013. Better social, economic, health, and security situations were associated with these increases. But in 2018, the rate started to decline once more, reaching 2.19%, and it continued to decline in 2020, reaching 1.86%. This decline was due to lower birth rates resulting from the widespread use of contraceptives, the economic and political crises in Algeria, higher marriage ages for both genders, and increased deaths due to the COVID-19 pandemic.

5- The Active Population in the Wilaya of Batna

Any nation's economy and development are thought to be mostly propelled by its active populace. In addition to being productive, this group is in charge of looking after the elderly and young people. This active population is an essential component that needs attention and efficient use in order to achieve development in the region, especially considering Algeria's youthful demographic structure in general and the Wilaya of Batna in particular.

Table 02: Development of the Active Population (Employed and Unemployed Population) in the Wilaya of Batna (2001–2022)

Year		2001	2004	2008	2012	2016	2020	2022
Indicators								
Active Population	#)	258504	278089	290959	340921	486162	465942	452448
	%)	24.87	25.02	25.52	28.90	37.82	33.31	32.35
Employed Population	#)	158014	210680	254253	313034	442301	409878	319852
	%)	61.12	75.75	87.38	91.82	90.97	87.96	7.69
Unemployed Population	#)	100490	67409	36706	27887	43861	56064	132596
	%)	38.88	24.25	12.61	8.17	9.02	12.03	29.30

Source: Monograph of the Wilaya of Batna (2001, 2004, 2008, 2012, 2016, 2020, 2022).

Table 02, which shows the growth of the active population (employed and jobless) in the Batna Wilaya between 2001 and 2022, shows that the number of active people has been steadily rising. There were 258,504 people in the active population in 2001, which accounted for 24.87% of the total population. This figure increased steadily until it reached 452,448 people in 2022, or 32.35% of the entire population, having reached 340,921 in 2012, or 28.90% of the overall population.

There were 158,014 employed people in 2001, which accounted for 61.12% of the total population. This number kept increasing, reaching a peak of 442,301 people, or 90.97%, in 2016. This resulted from the extensive development initiatives that the Wilaya saw through a number of development programmes. By 2022, though, the number had started to drop, reaching 319,852 people, or 70.69% of the active population. This is a 9.27 percentage point rise from 2001, which is indicative of the government's efforts to expand different sectors and generate new job possibilities.

Additionally, Table 02 shows that 100,490 people, or 38.88% of the active population, were unemployed in 2001. Due to a number of development initiatives, such as the economic recovery programme and local development

initiatives (PSD, PCD), this number dropped to 27,887, or 8.17%, by 2012. However, in 2022, the number increased once more to 132,596 people, or 29.30% of the active population. The President of the Republic's introduction of the unemployment compensation registration scheme was the main cause of this surge. The number of unemployed people increased significantly in 2022 as a result of many of them taking advantage of the possibility to register.

Table 03: Unemployment Rate in Batna Governorate (2001-2021)

Years	**2001**	**2004**	**2008**	**2012**	**2016**	**2021**
Unemployment %	32	17	13	8	9.02	19.34

Source: Monograph of Batna Province (2001, 2004, 2008, 2012, 2016, 2021).

According to Table 03, which charts the development of Batna Province's unemployment rate from 2001 to 2021, the rate hit 32% in 2001. The "Black Decade" had ruined every facet of life at the time, and the province was dealing with social, economic, and security difficulties. The percentage then decreased to 17% in 2004 as a result of a number of state-sponsored development initiatives, which were made feasible by the nation's substantial foreign exchange reserves as a result of the increase in oil prices. Higher growth rates, as well as lower rates of unemployment and inflation, were all influenced by this rise in oil money. Up until 2016, when it hit 9.02%, the jobless rate kept falling. However, the lack of development projects, the crisis the nation experienced as oil prices fell, and the political upheaval that resulted in a change in the ruling regime caused the unemployment rate to rise once again to 19.34% in 2021, which had detrimental effects on a number of sectors.

Second: The Applied Aspect of the Study

1- Hypotheses for Projections
1.1- Hypotheses Related to Population Growth

Since 2008 was the year of Algeria's most recent census, the results of which were released, we shall start this study in that year. Regarding changes in demographic trends, we will formulate the following three hypotheses or scenarios for the year 2050:

1.1.1- Fertility
The Total Fertility Rate (TFR) is the basis for fertility in the Spectrum programme. Beginning with the base year 2008 and continuing through 2050, we have therefore projected that fertility will rise in the first scenario, remain stable in the second, and fall in the third. The following table provides a summary of these presumptions:

Table 04: Fertility Assumptions in Batna Province between 2008 and 2050

Year	2008	2013	2018	2023	2028	2033	2038	2043	2048	2050
Low Scenario (H1)	2.93	2.86	2.80	2.73	2.67	2.61	2.55	2.49	2.42	2.40
Constant Scenario (H2)	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93
High Scenario (H3)	2.93	2.97	3.02	3.06	3.11	3.15	3.19	3.24	3.28	3.30

Source: Prepared by the researchers based on the Spectrum programme.

In Batna Province, the Total Fertility Rate (TFR) for fertility in the base year was 2.93 children per woman. Given that fertility has been at its lowest national level of 2.4 children per woman since 2002, we predicted that it would rise to 3.30 children per woman in the high scenario. The nation's economic and security crises at the time were to blame for this. With a TFR of 3.1 children per woman in 2015, the highest rate ever observed following this reduction has stayed largely constant. We predicted that the TFR would reach 3.30 children per woman by 2050 due to the challenge of having more than four children per woman in the future.

In the second scenario, we assumed that the TFR would remain constant at 2.93 children per woman throughout the projection period until 2050. Regarding the low scenario, we projected that by 2050, fertility will drop to 2.40 children per woman. This is predicated on the idea that it is unlikely to go below this level since Algerian culture cherishes having children and is firmly rooted in customs and cultural norms that have been passed down through the centuries. In 2002, Algeria also recorded its lowest TFR, 2.40, which is regarded as the lowest result ever recorded.

1-2- Mortality

As had been noted previously, the life expectancy at birth indicator is used by the Spectrum programme to address the mortality phenomena. In Batna Province, the average life expectancy at birth was 75.73 years for men and 77.56 years for women in 2008. We will use a single case for this aspect, which is summed up in the table below:

Table 05: Mortality Assumption in Batna Province between 2018 and 2050

Year	2008	2013	2018	2023	2028	2033	2038	2043	2048	2050
Males	75.7	76.5	77.4	78.2	78.6	78.9	79.3	79.7	80.1	80.2
Females	77.5	78.7	79.8	81.0	81.4	81.7	82.1	82.5	82.9	83.0

Source: Prepared by the researchers based on the Demographic Spectrum Program

Based on Algeria's historical growth of life expectancy at birth, we found that, between independence and 2008, both sexes experienced a notable increase. Because both genders' economic, security, and health conditions improved, this increase was more noticeable for women than for men. As a result, life expectancy is not likely to increase or decrease in the future.

Male life expectancy was 71.5 years in 2000, while female life expectancy was 73.4 years. It increased by about 2 years for both sexes by 2008, reaching 74.9 years for men and 76.8 years for women (Démographie Algérienne, 2011, pp. 3–6) It is expected to increase by 3.3 years for men and 4.2 years for women between 2008 and 2023, reaching 78.2 years for men and 81 years for women by 2023 (Démographie Algérienne, 2023, p 7)

From 2023, we assume that life expectancy will increase again, but more moderately, by two years for both sexes. It is anticipated that it will reach 80.2 years for men and 83 years for women by 2050. As for migration, we assumed that it would be non-existent across all scenarios due to the lack of available data on this phenomenon.

1-2- Hypothesis for the Active Population Category

To make projections related to the active population category in the Spectrum programme, the following data must be included:

- **Labour Force Participation Rate** (for males aged 15–64)
- **Labour Force Participation Rate** (for females aged 15–64)
- **Gross Domestic Product (GDP) for the base year** in millions (PIB).
- **Annual Growth Rate** of GDP (PIB).

It is necessary to establish a hypothesis for the evolution of these indicators from the base year until the end year of the projection. We will set one hypothesis for the development of these indicators up to 2050, as follows:

- In Batna Province, the rates of activity for men and women were 72.4% and 11.8%, respectively, in 2008. By 2050, we'll assume that activity rates will have risen to the average levels seen in industrialised nations like Germany, Spain, and Portugal by 2023. It is anticipated that the rates will rise to 74% for women and 81% for men.
- As for the Gross Domestic Product (GDP), we'll assume that it stays at the 2008 level until the projection's conclusion in 2050. It would be projected that the GDP growth rate will reach the 3.8% peak recorded in 2014. The following table displays the summary hypothesis:

Table 06: Hypothesis for the Active Population Category in Batna Province (2008–2050)

Indicators	**2008**	**2050**
Labor Force Participation Rate (for males aged 15-64)	72.4%	81%
Labor Force Participation Rate (for females aged 15-64)	11.8%	74%
Gross Domestic Product (GDP) PIB (Million Algerian Dinars)	11,043,703.5	/
Annual Growth Rate (%) of GDP PIB	2.4%	3.8%

Source: Prepared by the researchers based on data from ONS.

Table 07: Summary of Hypotheses Related to the Employment Sector

Hypothesis	Description
Low Scenario (H1)	Low fertility + Mortality hypothesis + Active population hypothesis
Constant Scenario (H2)	Constant fertility + Mortality hypothesis + Active population hypothesis
High Scenario (H3)	High fertility + Mortality hypothesis + Active population hypothesis

2- Projection Results

After entering the data into the system, we obtained the following results:

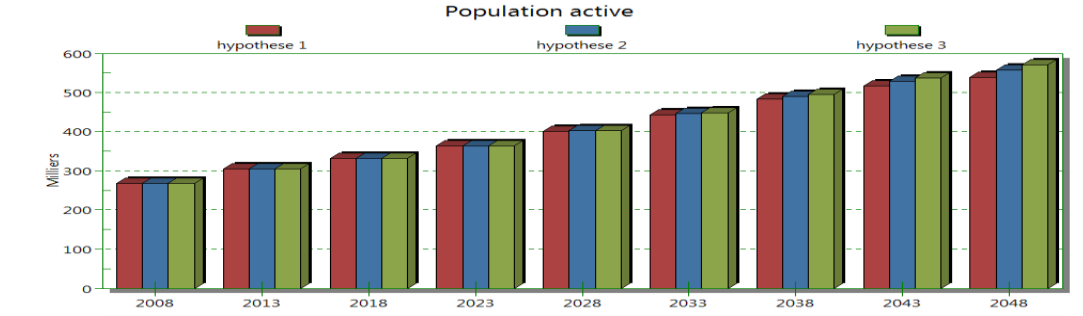
Table 08: Population Growth in Batna Province between 2008–2050

Year	Low Scenario (H1)	Constant Scenario (H2)	High Scenario (H3)
2008	1,119,630	1,119,630	1,119,630
2013	1,196,832	1,198,591	1,199,940
2018	1,323,397	1,330,367	1,335,708
2023	1,452,699	1,468,576	1,480,760
2028	1,573,985	1,602,112	1,623,607
2033	1,683,697	1,727,431	1,760,634
2038	1,786,625	1,850,766	1,899,229
2043	1,888,995	1,980,860	2,050,218
2048	1,992,006	2,121,044	2,218,836
2050	2,032,569	2,179,321	2,290,829

Source: Prepared by the researchers using the Spectrum Program.

We can see from the table that displays Batna Province's population growth from 2008 to 2050 that, under all three scenarios, the population will double by the conclusion of the projection in 2050. By 2050, there will be more than 2 million people living there, up from 1,119,630 in 2008, the base year for the forecasts. Because of this trend, decision-makers must offer the social services that this sizable population demands.

The province's population was 1,328,000 in 2018 and 1,506,000 in 2023, according to the Planning Directorate's statistics, which we compare with the forecast results. This shows that the projection results closely match the data from the Planning Directorate, since it is consistent with the second scenario in 2018 and the third scenario in 2023. This strengthens the results' legitimacy and supports their application as projections for the province's future planning.

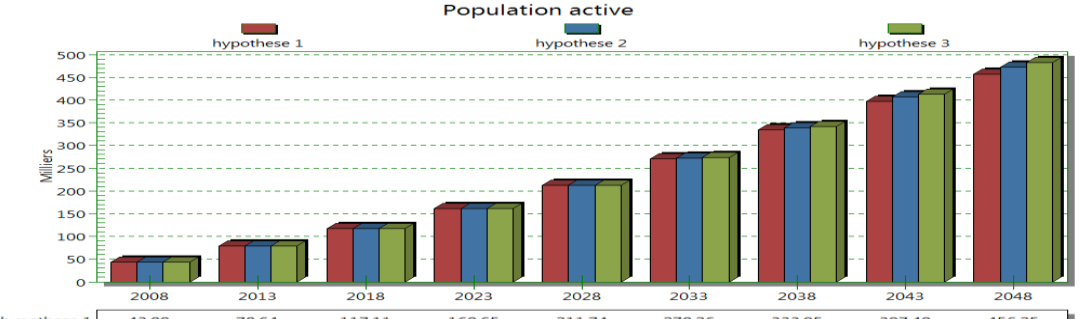


	2008	2013	2018	2023	2028	2033	2038	2043	2048
hypothese 1	267,11	304,80	332,21	363,10	401,10	442,79	483,65	516,69	538,67
hypothese 2	267,11	304,80	332,21	363,10	401,82	445,64	490,20	528,40	557,08
hypothese 3	267,11	304,82	332,27	363,22	402,53	448,00	495,35	537,39	571,00

Figure 02: Development of the Active Population (Males) in Batna Province, 2008–2050

Source: Prepared by the researchers using the Spectrum Program.

The actual entry age for males into the active population began in 2023 when they turned 15, according to the figure that shows the growth of the active male population in Batna Province between 2008 and 2008–2050. From the base year until the end of the projection period, the number of employed people showed an upward tendency and did not vary in any scenarios. Between 2008 and 2013, the workforce grew from 267,110 to 304,800. The number of employees reached 332,210 by 2018, and under the low and constant scenarios, it rose to 363,100 in 2023, while in the high scenario, it reached 363,220. In 2028, the low scenario reached 401,100 workers, the constant scenario reached 401,820, and the high scenario reached 402,530. The number kept increasing. The number continued to increase in all scenarios, reaching 483,560 in the low scenario in 2038, 490,200 in the steady scenario, and 495,350 in the high scenario. With the low scenario reaching 545,010 workers, the constant scenario reaching 566,690 workers, and the high scenario reaching 583,000 workers, this upward trend persisted in 2050.



	2008	2013	2018	2023	2028	2033	2038	2043	2048
hypothese 1	43,09	78,64	117,11	160,65	211,74	270,26	333,95	397,40	456,25
hypothese 2	43,09	78,64	117,11	160,65	212,10	271,97	338,42	406,31	471,71
hypothese 3	43,09	78,64	117,11	160,65	212,37	273,22	341,68	412,82	483,02

Figure 03: Development of the Active Female Population in Batna Province, 2008–2050

Source: Prepared by the researchers using the Spectrum Program

According to the figure that shows the growth of the active female population in Batna Province from 2008 to 2050, ladies really enter the active population at the same age as boys, beginning in 2023 when they turn 15. From the base year until the end of the projection period, there was an upward tendency in the number of

employed women, which did not alter in any scenarios. There were 78,640 female employees in 2013 compared to 43,090 in 2008. There were 117,110 female employees by 2018, and in 2023, there were 160,650 employees across all situations. In 2028, the number of female workers increased further, reaching 211,470 in the low scenario, 212,100 in the stable scenario, and 212,370 in the high scenario. The number continued to increase in all scenarios, reaching 333,950 in the low scenario in 2038, 338,420 in the constant scenario, and 341,680 in the high scenario. With the low scenario reaching 478,030 female workers, the constant scenario reaching 496,890, and the high scenario reaching 510,700, this increased trend persisted in 2050.

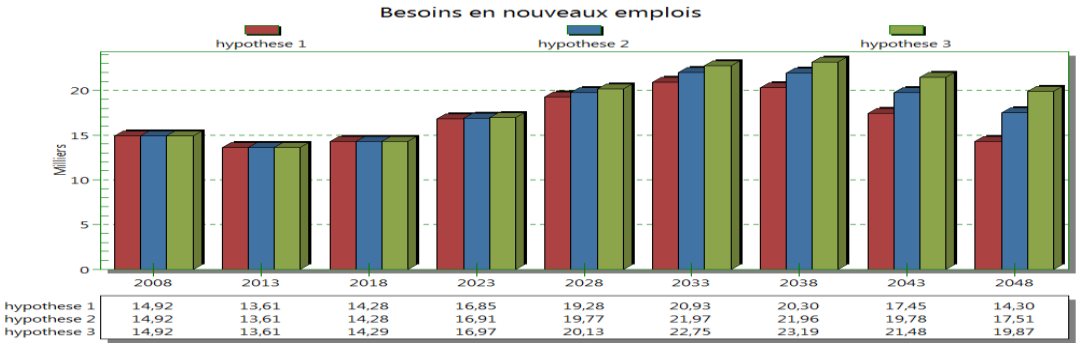


Figure 04: Development of Demand for New Job Positions in Batna Province, 2008–2050

Source: Prepared by the researchers using the Spectrum Program.

The need for employment positions will decline in the future due to the decreasing growth of the working-age population and the increase in the number of individuals over 65, as can be seen from the figure that illustrates the evolution of the demand for new job posts in Batna Province between 2008 and 2008–2050.

The required number of job positions was 14,920 in 2008, 13,610 in 2013, and 14,280 in 2018. As previously stated, the projected outcomes start in 2023, when the population turns 15. The number of positions needed in 2023 was 16,850 in the low scenario, 16,910 in the constant scenario and 16,970 in the high scenario. With the low scenario recording 20,930 spots, the constant scenario reaching 21,970, and the high scenario reaching 22,750 positions, this rising trend persisted until 2033.

Due to the decreasing expansion of the working-age population, the number of jobs required started to decline in 2038. This number decreased to 20,300 in the low scenario, 21,960 in the constant scenario, and 23,190 in the high scenario. Until 2050, when the number was 13,400 in the low scenario, 17,070 in the constant scenario, and 19,780 in the high scenario, this fall persisted across all scenarios. Decision-makers ought to implement an economic strategy that permits the future establishment of these job positions in light of these findings.

3- Study Results

- Under all circumstances, Batna Province's population will surpass two million by 2050. The population will grow to 2,032,569 in the low scenario, 2,179,321 in the constant scenario and 2,290,829 in the high scenario.
- Under the low scenario, Batna's active population in 2050 will be 1,023,050 workers; under the constant scenario, it will rise to 1,063,580 workers; and under the high scenario, it will rise to 1,093,710 workers.
- In 2050, there will be 545,010 active men in Batna under the low scenario, 566,690 under the constant scenario, and 583,000 under the high scenario.
- In 2050, there will be 478,030 working women in Batna under the low scenario, 496,890 under the constant scenario, and 510,700 under the high scenario.
- The slower growth of the working-age population and the rise in the population over 65 will result in a decline in the demand for future job openings in Batna. The number of jobs needed in 2050 reflects this, with 13,400 jobs needed in the low scenario, 17,070 jobs in the constant scenario, and 19,780 jobs in the high scenario.
- In 2008, Batna's old (65+) dependence ratio was 18%, which means that for every 100 people of working age, there were 18 elderly people. Because life expectancy has increased and the percentage of old people has increased since 2008, this ratio will double to 36% by 2050.

4- Conclusion

From the previous analysis, with a rise in the percentage of people 65 and older and a decline in the working-age population (15–64), it is clear that Batna's population is progressively ageing by 2050. When making plans for future development, this should not be disregarded. Any upcoming development initiatives must be built on the demographic component. Future development efforts will be hampered if a developmental plan is relied upon without taking into account demographic variables or the future structure of the population. Unless they are based on high-quality demographic data, the prediction results are still relative.

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