

Proper Management of Water Resources in the Context of Demographic Growth in Algeria: An Econometric Study for the Period 2000-2023

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Abstract:

Algeria faces growing challenges in managing its water resources due to the continuous increase in population and the escalating demand for water. This study aims to analyze the relationship between demographic growth and the decline in per capita water resources through an econometric model for the period 2000-2023, using the ARDL model. The results indicate that population growth negatively impacts per capita water availability, with a statistically significant inverse relationship between the two variables. In both the short and long terms, the study reveals that an increase in population leads to an immediate reduction in per capita water availability. Consequently, the study emphasizes the need for a comprehensive strategy for sustainable water resource management, considering demographic dimensions through diversifying water sources, developing consumption-saving technologies, and improving water sector governance at both the local and national levels.

Keywords: Water resources, Population growth, ARDL model, Algeria

Jel Classification Codes: Q 25, J11, C32, O55.

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1. INTRODUCTION:

Many researchers and economists are particularly interested in studying the relationship between economic and demographic variables to understand the impact of population growth on various economic resources and monitor and manage them efficiently and effectively.

Demographic growth is one of the most important variables related to natural resources, as it is a direct factor of production. Among the natural resources, water is crucial for all sectors, as it has many uses. Water resources are characterized by scarcity, high demand, and vulnerability to climate factors and drought crises. Ensuring water availability has become a significant objective for countries and international organizations through summits, conferences, and seminars, all aimed at guaranteeing this vital resource for national water security. One of the key indicators of water security is ensuring that each individual has access to water when needed. Therefore, guaranteeing individual water allocation has become one of the most difficult challenges, especially with the increasing population and the scarcity of resources.

Algeria is among the countries facing this challenge. To manage water resources effectively, it relies on a national water plan to ensure proper management through the construction of dams, seawater desalination plants, and the transfer of water from abundant regions to areas with high demand, all aimed at guaranteeing per capita water availability.

Study Problem: The central issue addressed in this study is to clarify the relationship between demographic growth in Algeria and its impact on per capita water resources, leading to the following research question: What is the impact of demographic growth on per capita water resources in Algeria?

Study Hypotheses: To answer this question, the following hypothesis is proposed:

There is an inverse relationship between demographic growth and per capita water resources, such that per capita water resources decrease as the population increases.

Study Objectives: The primary aim of this study is to examine the relationship between increasing population and its effect on per capita water availability and propose solutions for water distribution issues.

Previous Studies:

This research was initiated based on the following previous studies:

- Dr. Abdelmajid Bouzian's study (2018) titled "Demographic Change and Its Impact on Water Security in the Maghreb Countries," which discussed the relationship between population growth and the increasing demand for water, with a specific analysis of the Algerian case. The study showed that population growth in Algeria contributes to increased pressure on water resources, exacerbating the challenges of water security in the country. (Bouzian, 2018)
- Dr. Nawal Bouchama's study (2020) titled "Water Resources Management Policies in Algeria: Reality and Prospects," which provided a detailed analysis of Algeria's programs in mobilizing water resources to meet the increasing demand resulting from urbanization and population growth. The study concluded the importance of developing effective water policies

that keep pace with demographic changes and ensure the sustainability of water resources. (Bouchama, 2020)

- A Master's thesis from Constantine 2 University (2021) titled "The Impact of Demographic Changes on the Sustainability of Water Resources: A Case Study of the M'Zab Valley," which conducted field research in a semi-arid region, clearly linking population pressure to the depletion of groundwater, negatively impacting the sustainability of water resources in the region. (Author, 2021)

- Vörösmarty et al.'s study (2010) titled "Water Resources Management under Population Growth and Climate Change," which discussed how the state of water resources globally deteriorates due to population growth and climate change. The study showed that population growth directly contributes to increased water demand, posing a significant challenge to water resource management. (Vörösmarty, 2010)

- Peter H. Gleick's study (2014) titled "Population Growth and Sustainable Water Management: A Global Challenge," which provided insights into how water management policies can adapt to the increasing demographic pressures. It emphasized that countries need to adjust water management policies to address the challenges of population growth and its effects on the sustainability of water resources. (Gleick's, 2014)

- The report "Managing Water for All: An OECD Perspective on Pricing and Financing" (2009), which highlighted the impact of the growing demand for water due to population growth on financing and managing water projects. It also emphasized the necessity of fair water pricing to ensure its long-term sustainability. (report, 2009)

Through these studies, it is clear that demographic growth increases pressure on water resources, requiring the development of integrated water strategies that address current and future challenges.

Study Structure: To comprehensively address both theoretical and practical aspects, the study is divided into three main sections: the first section discusses demographic growth in Algeria, the second section focuses on water resources in Algeria, and the third section presents an econometric study to explain the relationship between these variables.

2. Demographic Growth in Algeria:

Population studies are among the most important research areas linking population development and economic phenomena. These studies focus on the relationship between population and economic factors, given the depletion of natural resources compared to the growing population.

2-1: The Concept of Population Economics:

Population economics is defined within the demographic sciences as a subfield that includes all the foundational principles and methodologies for studying the relationship between population growth and societal development, particularly economic development within an economic-social framework. (Younis, p. 13)

Population economics is crucial for linking population issues with development concerns, as the world's population has doubled, leading to unprecedented population growth that has resulted in environmental degradation. The first population explosion occurred in stages, starting with the Agricultural Revolution around 6000 BCE, which increased production beyond population needs, followed by the Urban Revolution, introducing market economies that created population centers seeking to meet growing demands. This was

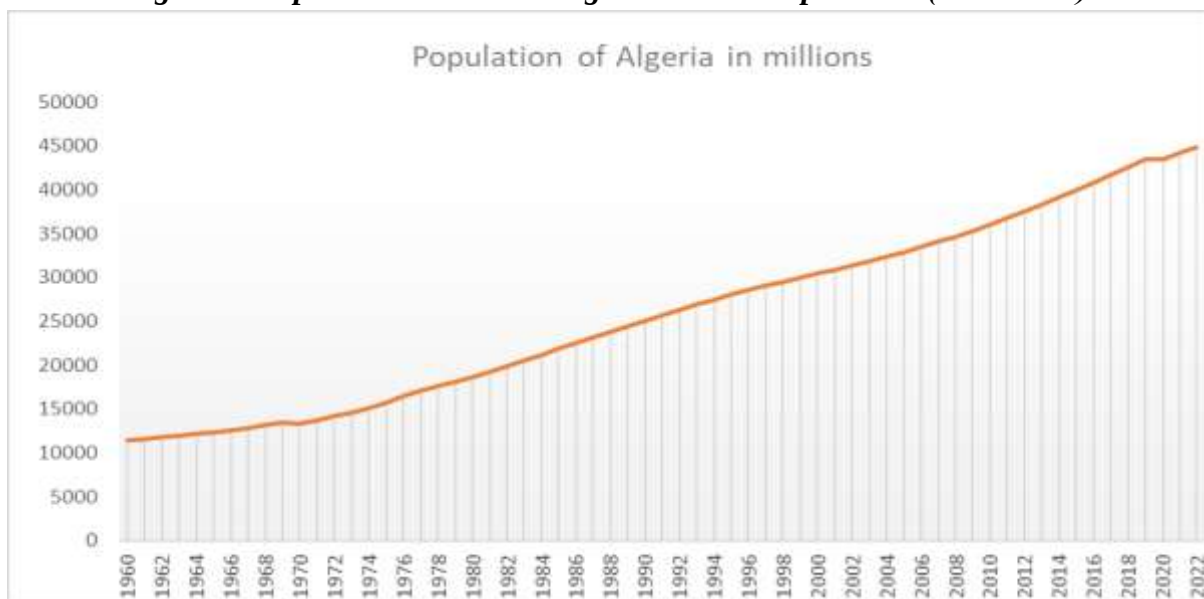
followed by a third population explosion during the rise of ancient empires (Egyptian, Roman, etc.), with population growth slowing during the following 16 centuries, then resuming with the Industrial Revolution, which enhanced resource exploitation and production. It is estimated that by 2050, the global population will reach 11.2 billion people .2050(Al-Bayati, 2011, pp. 20-24)

2-2: Population Growth in Algeria Since Independence (1962-2022):

Algeria has undergone several population censuses, starting with the first census conducted during the colonial period in 1843, which estimated the population at approximately 3 million. After independence, the first official census was conducted in 1966, estimating the population at 11.8 million. Subsequent censuses occurred in 1977, 1987, 1998, and the most recently in 2008. Since 1966, Algeria's population has tripled, growing from 11.8 million to approximately 34 million by 2008.

This population increase occurred after Algeria's independence and during the 1970s, a period of recovery from the demographic losses sustained during colonization. Algeria's ideological stance in the 1970s encouraged higher birth rates, resulting in a natural growth rate of 3.2%, which gradually declined to 1.53% by 2002, making it one of the lowest growth rates in Africa .(Saad, 2016-2017, p. 77)

Figure 1: Population Growth in Algeria Since Independence(2023-1962)



.Source: National Office of Statistics and the World Bank

From the population growth curve in Algeria above, which shows a steady increase in the population since independence until 2022, this increase is attributed to several factors, including the improvement of the economic situation, a higher birth rate due to better health and living conditions, along with a decrease in the death rate. With the World Bank's projection of a population increase in Algeria by 2050 to around 50 million people, the population growth in Algeria is expected to accelerate, which requires efficient management of economic resources, especially non-renewable resources or those that renew slowly.

2-3- Population Distribution in Algeria:

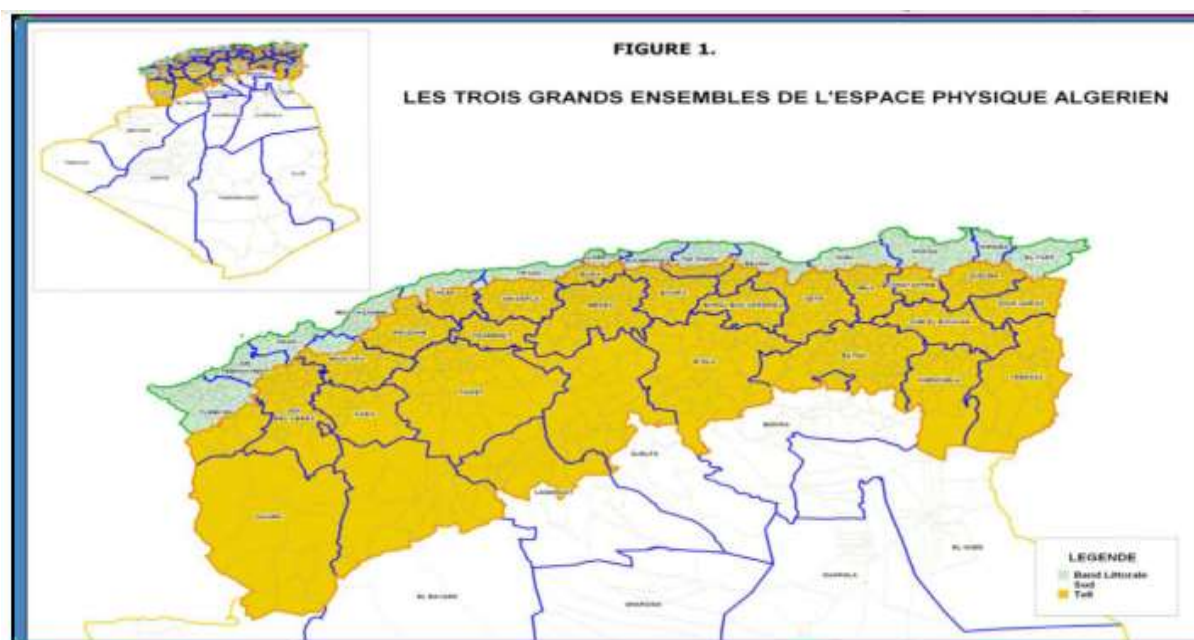
Algeria covers an area of 2,381,741 km², and population distribution is closely linked to rainfall, or more precisely, to water distribution. The highest population density occurs where dry farming and irrigated agriculture are practiced. Therefore, the population density is higher

in the Tell region, which exceeds 60 people per km². Algeria's most densely populated region is the coastal plain, which hosts urban centers.

Population density decreases as we move southward from the coastal line, with the lowest density in the southern desert areas. However, oases represent concentrated areas where small numbers of settled farmers reside. Algeria is among the countries with the lowest population density in the Arab world, with a general population density of only 13 people per km², one of the lowest in Africa, surpassed only by Mauritania, Somalia, and Libya, with densities of fewer than 5 people per km². Saudi Arabia and Jordan, in Asia, have fewer than 10 people per km². This highlights the lack of homogeneity between the large land area of Algeria and its relatively small population (Manoubi, 2015-2016, p. 58)

The coastal strip, which spans 45,000 km² (equivalent to 1.9% of the total area), is home to approximately 36% of the population. It had a medium population density of 274 people per km² in 2008, fertile agricultural lands, and infrastructure and transportation facilities essential for industrial and technological activities. The second area, known as the Hills region, lies immediately south of the coastal strip and includes the high plains and western steppe regions, covering an area of 255,000 km², about 10.7% of the total area. It houses 53% of the population, with a medium density of 70.6 people per km². This area is primarily pastoral and produces cereals. The third area, the southern region, is vast, covering over two million km² (87% of Algeria's total area). According to the 2008 census, its population is 3.7 million, or 10.9% of the total population, with a very low density of fewer than 18 people per km², as shown in Figure 2 .(Saad, 2016-2017, pp. 74-75)

Figure 2: Population Distribution across Major Regions of Algeria

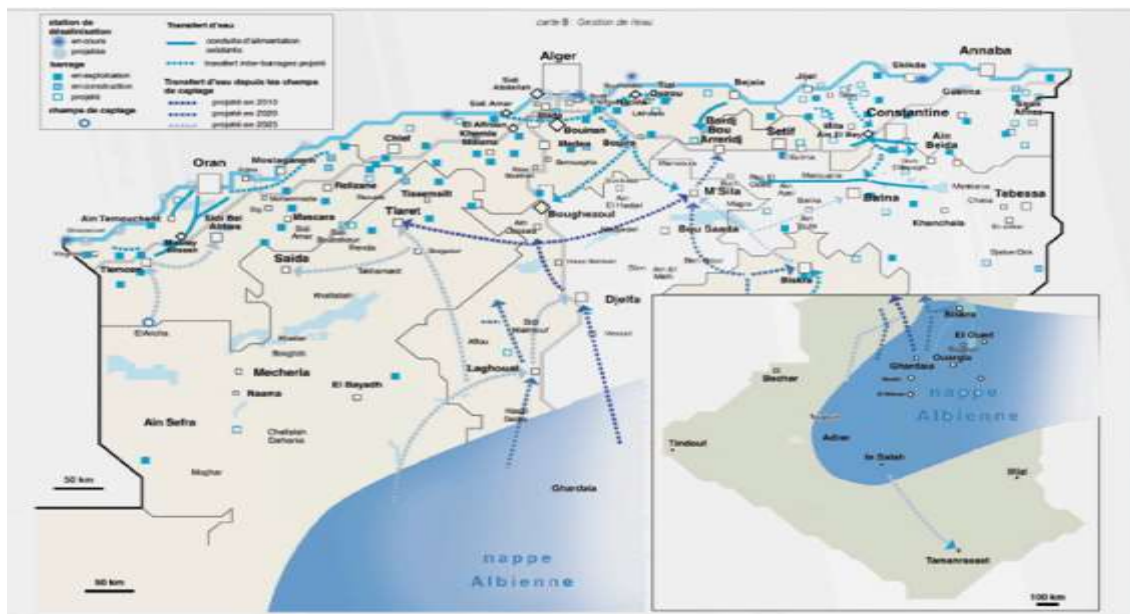


Source: ONS, 2013, *Collection statistiques N° 177, serie C, Statistiques Régionales et Cartographies, Statistiques sur l'Environnement, p5*

It is noticeable that the population distribution in Algeria is divided into three major regions: the north, which represents the coastal strip of the country; followed by the central region, represented by the steppe and the high plateaus; and finally, the south, which the Sahara Desert represents. This distribution is primarily based on the availability of water resources. Precipitation rates – the most exploited and easily accessible source – are higher in

the north compared to the central and southern regions, where they decrease as we move southward. Despite the presence of groundwater in the Ghardaïa region in the south, where groundwater distribution is contrary to the population distribution (see Figure 3), the inability to exploit groundwater due to high costs on the one hand and its shared use with neighboring countries on the other hand, Algeria is working to utilize it strategically through the National Water Plan projects. These projects include transferring water from the south to the areas in need, which is one of the major water-related projects.

Figure 3: Groundwater Distribution in Algeria



Source: JORADP, "Loi n° 10-02 du 16 Rajab 1431 correspondant au 29 juin 2010 portant approbation du Schéma National d'Aménagement du Territoire N° 61", Journal Officiel De La République Algérienne, 2010, Alger, P 04 et 75.

The groundwater resource in the Algerian Sahara is considered one of Algeria's most important water reserves. It is a key source of water supply in the south, especially since northern regions have become dependent on seawater desalination plants to meet their water needs.

3. Water Resources and Their Uses:

Water is one of the most important natural resources used in most sectors. Worldwide, water is classified into freshwater, suitable for consumption, and saline water. Freshwater accounts for 3%, while saline water represents 93% of the total water, constituting 71% of the earth's surface.

3-1 Global Water Uses:

The water demand varies significantly among the world's population, considering living standards, population size, social differences, and the level of economic development between developed and developing countries.

Despite the differences in water use worldwide, there are common uses, including agriculture, industry, and households. Agriculture is the largest consumer of freshwater, accounting for about 69% of global water consumption, followed by industry with 23%, and household use with 8%, as shown in the following table:

Table 1: Annual Distribution of Water Uses Across Different Economic Sectors.

Country	Agriculture (%)	Industry (%)	Households (%)
World	69	23	8
Developed Countries	39	47	14
Developing Countries	91	5	4
Arab Countries	91	4	5

Source: Mahmoud Al-Ashram, *Water Economics in the Arab World and the World*, 1st edition, Center for Arab Unity Studies, Beirut, 2001, p. 31.

The demand for freshwater required for drinking, household, and industrial purposes is expected to increase. In 2000, it was estimated at 124 m³ per capita, and it is projected to reach 180 m³ per capita by 2030, an increase of 45.2%. The demand for water for agriculture was estimated at 600 m³ per capita in 2000, and it is expected to reach 700 m³ per capita by 2030, an increase of 16.7% .(Ti, 2019, pp. 20-22)

3-2 Overview of Water Resources in Algeria:

Algeria's water resources are diverse due to its vast area. Its geographical location has helped diversify its water sources, including rainfall, groundwater, and coastal water, which has provided both conventional and non-conventional water resources.

3-2-1 Conventional Water Resources in Algeria:

Conventional sources consist of two main types: surface water and groundwater.

Surface Water: The National Agency for Water Resources oversees more than 160 stations that measure water levels across the country. Surface water resources include 17 water basins classified into three major groups: the Atlas Mountains, High Plateaus, and desert basins. Total surface water flows account for 12.4% of the country's water.

Groundwater: The technical estimates of the National Agency for Water Resources and the Directorate of Major Infrastructure Development suggest that the groundwater reserves in the north are estimated at 2 billion m³ per year, while in the south, the estimate is 5 billion m³ per year .(Saadi, 2006, pp. 30-31)

3-2-2 Non-Traditional Water Resources:

Due to the scarcity of resources caused by climate changes and frequent drought crises worldwide, Algeria has turned to alternative, non-traditional potable water sources. These include seawater desalination plants, dam water use, and water transfer from the south via pipelines as part of the National Water Plan. These measures aim to increase per capita water supply by 2030 as part of Algeria's integrated water resource management approach.

Bani Haroun Dam System: The management of the Bani Haroun Dam aims to provide drinking water to 41 municipalities across 6 provinces (Jijel, Mila, Constantine, Batna, Khenchela, and Oum El Bouaghi) and irrigate 40,000 hectares, considering the population in these areas will reach 4 million by 2030.

Ain Salah—Tamanrasset Water Transfer: The goal of the water transfer operation from Ain Salah to Tamanrasset is to supply drinking water to local communities along the pipeline. By 2050, an expected population of around 400,000 will benefit from this water transfer, with a production capacity of 100 m³ per day.

Seawater Desalination: Seawater desalination is one of Algeria's most invested projects, which has yielded positive results. Over 1,160 km of pipelines have been implemented, with a total capacity of 521,000 m³ and 25 pumping stations with capacities ranging from 200 m³/hour to 8,330 m³/hour.

Providing safe drinking water to the population in adequate quantities and required quality is essential to the national water policy, as stipulated in Article 2 of Law No. 05-12 of 28 Jumada al-Thani 1426, corresponding to August 4, 2005, on water. Water supply development aims to address the challenge of water scarcity and sensitivity to climate change while meeting the increasing demand for water linked to urban expansion and the growth of economic activities (agriculture, industry, and tourism) .(Ministry of Water Resources, Algeria, 2023)

3-2-3 Water Resource Management in Algeria:

Algeria relies on several commercial institutions under the Ministry of Water Resources to manage water resources and ensure the availability of potable water.

A-Algerian Water Company: The Algerian Water Company is a national public industrial and commercial institution created under Executive Decree No. 01-101, dated 27 Muharram 1422 (April 21, 2001). It operates under the Ministry of Water Resources and aims to supply drinking water and ensure availability under acceptable quality and timely delivery conditions.

B-National Sanitation Office: This public institution, which is also industrial and commercial, is under the Ministry of Water Resources. It is responsible for maintaining the water environment throughout the country, implementing sanitation policies, and valorizing derived water materials.

C-National Agency for Dams and Water Transfers: This administrative agency was created under Decree No. 163-85, dated June 11, 1985. It is responsible for the production and supply of water to institutions, including inspections and monitoring, ensuring the application of water pricing, regulating water reserves, and implementing immediate measures to monitor water.

D-Hydrographic Basin Agencies: There are five national hydrographic basin agencies: the Sahara Basin Agency, the Chlef Basin Agency, the Oran Basin Agency, the Constantine Basin Agency, and the Algiers Basin Agency. Their tasks include monitoring water areas within the basins, preparing plans for water distribution (Issa, 2021, pp. 161-166)

The goal of regulating and managing water resources is to preserve this vital resource, especially in light of climate change and drought crises, which threaten per capita water availability. Population growth, along with other factors influencing water scarcity, is one of the main variables that impact per capita water allocation, which can be explained through the econometric model for the effect of population growth on per capita water resources.

4- .Modeling and Testing the Cointegration Relationship Between Population Growth and Per Capita Water Resources for the Period 2000/2023 Using the ARDL Model:

In this section, we will attempt to build a model that explains the effect of demographic growth on per capita water resources for the period 2000-2023, according to the following model:

$$Per_water = b_0 + b_1 * Popul \dots \dots \dots (01)$$

Where:

Per_water :Per capita water resources;

Popul :Population growth;

4-1 Pre-conditions:

After formulating the model, it is essential to study its series stability and determine the optimal lag periods.

4.1.1 Model Construction:

The ARDL test can be applied, and the study model can be written as follows:

$$\Delta Per_Water_t = \beta_0 + \sum_{i=1}^p \beta_1 \Delta Per_Water_{t-i} + \sum_{t=0}^q \beta_2 \Delta Popul_{t-i} + \alpha_1 Per_Water_{t-1} + \alpha_2 Popul_{t-1} + \varepsilon_t$$

4.1.2 Unit Root Test:

The degree of integration for the model variables must be either I(0) or I(1), as shown in Table 02. Based on the Phillips-Perron test, it is observed that the variables are stationary at the first degree.

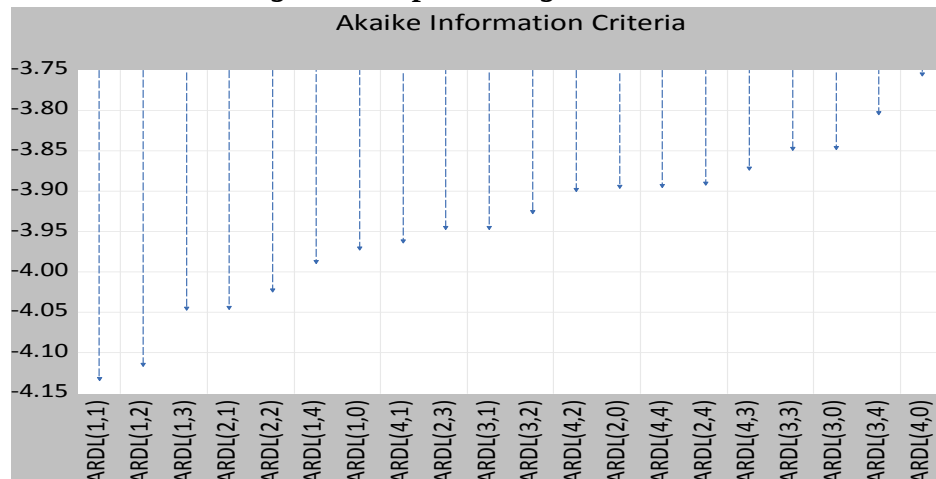
Table 02: Time Series Stationarity Test Results

UNIT ROOT TEST RESULTS TABLE (PP)			
Null Hypothesis: the variable has a unit root			
	At Level	PER_WAT	POPUL
With Constant	t-Statistic	-1.0473	0.4922
	Prob.	0.7181	0.9825
		n0	n0
With Constant & Trend	t-Statistic	-2.6844	-1.5926
	Prob.	0.2510	0.7643
		n0	n0
Without Constant & Trend	t-Statistic	-3.8049	14.0554
	Prob.	0.0005	1.0000
		***	n0
	At First Difference		
	d(PER_W)		d(POPUL)
With Constant	t-Statistic	-6.1748	-3.2443
	Prob.	0.0000	0.0308
		***	**
With Constant & Trend	t-Statistic	-5.9940	-3.4664
	Prob.	0.0004	0.0683
		***	*
Without Constant & Trend	t-Statistic	-4.5631	-0.9867
	Prob.	0.0001	0.2800
		***	n0
Notes:			
a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant			
b: Lag Length based on SIC			
c: Probability based on MacKinnon (1996) one-sided p-values.			
This Result is The Out-Put of Program Has Developed By:			
Dr. Imadeddin AlMusabbeh			
College of Business and Economics			
Qassim University-KSA			

Source : EViews 13 Output

4.1.3. Optimal Lag Periods for the Model:

Figure 04 shows the total possible models when changing the lag periods based on the Schwarz Information Criterion (SIC). This indicates that the ARDL (1.1) model is optimal as it has the lowest value according to the Akaike Information Criterion (AIC), as demonstrated in the following figure:

Figure 04: Optimal Lag Period Test

Source : EViews 13 Output

4.2 Residual Diagnostics:

After determining the ARDL (1.1) model for studying the short-term and long-term effects, it is essential to confirm its validity and quality through the following tests:

Table 03: Model Quality Tests

Statistic	Value	Significance
Normality Test		
Jarque-Bera	5.74	0.06
Serial Correlation		
LM Test	0.100	0.95
Heteroskedasticity Test		
Obs*R-squared	0.036	0.85

Source: See Appendices 01-03

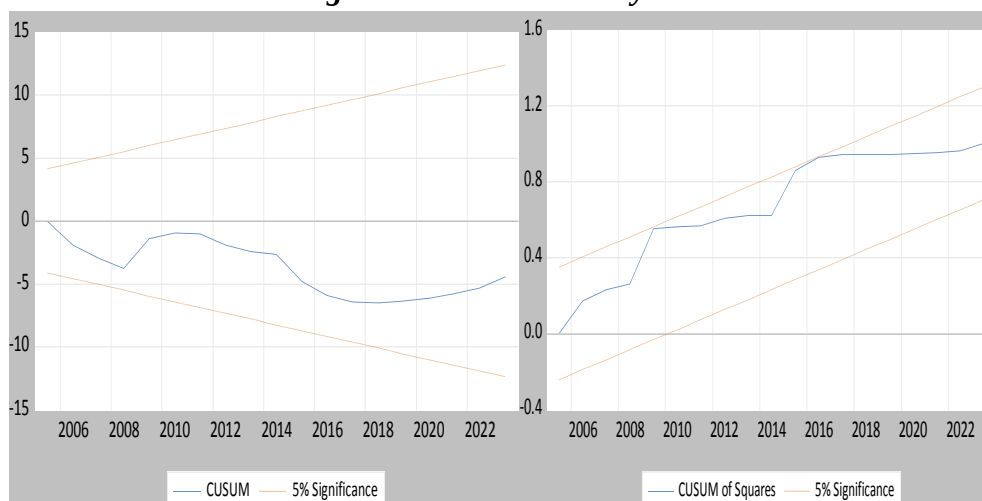
From the table, we observe:

- **Normality Test:** According to the J-B value of 5.74, which is less than $\chi^2 = 5.99$ (and α is not significant (>0.05)), the model's residuals follow a normal distribution.
- **Autocorrelation of Errors:** According to the LM test, the chi-square probability is greater than 0.05; thus, we accept the null hypothesis, which states no autocorrelation among the errors.
- **Heteroscedasticity Test:** According to this Test, the chi-square probability is greater than 0.05, so we accept the null hypothesis, which indicates homoscedasticity and stability of variance over time.

Stability Test:

To study the structural stability of the estimated model, it is essential to track the residuals of the model and their squared residuals, as shown in the following figure:

Figure 05: Model Stability Test



Source : EViews 13 Output

Since the graphical representation in the CUSUM Test and CUSUM of Squares Test stays within the optimal bounds, this confirms the model's structural stability.

4.3. Testing the Model Estimates in the Short and Long Term:

To determine the estimated relationship and to identify the effects in the short and long term, the existence of cointegration between the model variables must be studied.

4.3.1 Cointegration Test Using the Bounds Test Method:

The following table shows the results of the cointegration test using the Bounds Test methodology:

Table 04: Bounds Test

Null hypothesis: No levels relationship
Number of cointegrating variables: 1
Trend type: Rest. constant (Case 2)
Sample size: 23

Test Statistic	Value
F-statistic	4.382863

	10%		5%		1%	
Sample Si	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
30	3.303	3.797	4.090	4.663	6.027	6.760
Asymptotic	3.020	3.510	3.620	4.160	4.940	5.580

* I(0) and I(1) are respectively the stationary and non-stationary bounds.

Source : EViews 13 Output

According to the table results, the computed F-statistic is greater than the critical values at most significance levels. Therefore, we reject the null hypothesis, which states no cointegration between the variables, confirming a long-term equilibrium relationship.

4.3.2 Study of the Short-Term Relationship:

Appendix 04 shows:

Population growth negatively affects per capita water resources in the short term, with a statistically significant impact. This aligns with economic theory, as each unit increase in population reduces 2.62 units in per capita water resources. This is due to the increasing

pressure on limited water resources resulting from higher demand and expanded consumption without adequate development of water sources or improvement in their use.

There is a dynamic short-term relationship between population growth and per capita water resources, as indicated by the statistically significant negative coefficient of the error correction term ($CointEq(-1) = -0.68$). This term measures the extent of disequilibrium in the dependent variable that can be corrected from one period to the next. The negative sign supports a long-term equilibrium relationship between the variables.

4.3.3 Study of the Long-Term Relationship:

Appendix 05 shows:

Population growth negatively affects per capita water resources in the long term, with a statistically significant negative impact. This aligns with economic theory, as each unit increase in population reduces 1.003 units in per capita water resources. This negative impact is attributed to population growth increasing the total water consumption for drinking, agriculture, and industry, gradually diminishing per capita water availability in the absence of parallel expansion in water sources or improvements in efficiency.

5. Conclusion:

The econometric study results demonstrate the negative impact of population growth on water security, necessitating urgent interventions to prevent future exacerbation of the water gap. Given these results, an urgent need is to adopt integrated and sustainable water policies based on proper planning and population projections, alongside the necessary investment in modern technologies for water production and improving water usage methods. Moreover, raising societal awareness of the importance of water conservation and enhancing the role of civil society are crucial factors in ensuring the sustainability of water resources for future generations. In conclusion, the study recommends deeper integration of demographic factors into water policies and continuing econometric studies to assess the effectiveness of future interventions and align them with the sustainable development requirements in Algeria.

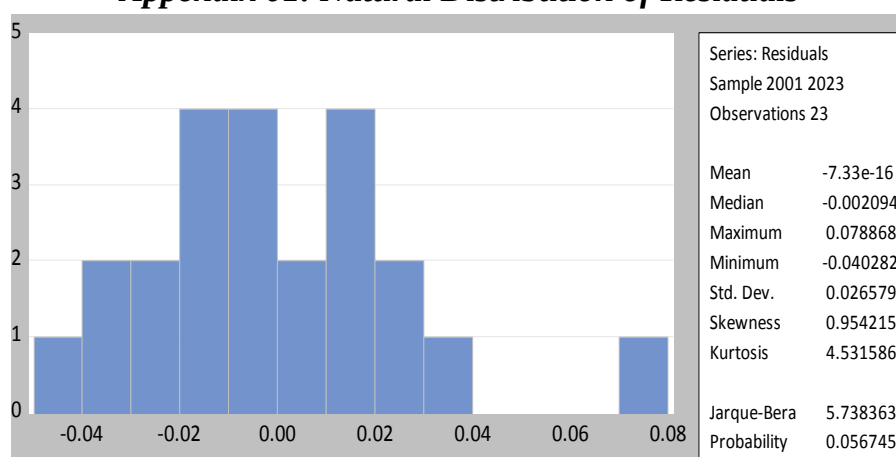
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7. Appendices:

Appendix 01: Natural Distribution of Residuals



Source : EViews 13 Output

Appendix 02: Autocorrelation of Errors Test

Breusch-Godfrey Serial Correlation LM Test:			
Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	0.037223	Prob. F(2,17)	0.9635
Obs*R-squared	0.100281	Prob. Chi-Square(2)	0.9511
Test Equation:			
Dependent Variable: RESID			
Method: ARDL			
Date: 04/26/25 Time: 00:50			
Sample (adjusted): 2001 2023			
Included observations: 23 after adjustments			
Presample missing value lagged residuals set to zero.			

Source : EViews 13 Output

Appendix 03: Homoscedasticity Test

Heteroskedasticity Test: ARCH			
F-statistic	0.033012	Prob. F(1,20)	0.8577
Obs*R-squared	0.036253	Prob. Chi-Square(1)	0.8490
Test Equation: Dependent Variable: RESID^2 Method: Least Squares Date: 04/26/25 Time: 00:52 Sample (adjusted): 2002 2023 Included observations: 22 after adjustments			

Source : EViews 13 Output

Appendix 04: Error Correction and Short-Term Estimation Parameters

Dependent Variable: D(PER_WATER)
Method: ARDL
Date: 04/26/25 Time: 00:26
Sample: 2001 2023
Included observations: 23
Dependent lags: 4 (Automatic)
Automatic-lag linear regressors (4 max. lags): POPUL
Deterministics: Restricted constant and no trend (Case 2)
Model selection method: Akaike info criterion (AIC)
Number of models evaluated: 20
Selected model: ARDL(1,1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ*	-0.685865	0.179914	-3.812171	0.0010
D(POPUL)	-2.621170	0.486067	-5.392610	0.0000
R-squared	0.464406	Mean dependent var	-0.019248	
Adjusted R-squared	0.438902	S.D. dependent var	0.036318	
S.E. of regression	0.027205	Akaike info criterion	-4.287925	
Sum squared resid	0.015542	Schwarz criterion	-4.189187	
Log likelihood	51.31114	Hannan-Quinn criter.	-4.263093	
F-statistic	18.20884	Durbin-Watson stat	1.930537	
Prob(F-statistic)	0.000343			

* p-values are incompatible with t-Bounds distribution.

Source : EViews 13 Output

Appendix 05: Long-Term Estimation Parameters

Deterministics: Rest. constant (Case 2)				
CE = PER_WATER(-1) - (-1.003378*POPUL(-1) + 9.381490)				
Variable *	Coefficient	Std. Error	t-Statistic	Prob.
POPUL(-1)	-1.003378	0.071821	-13.97048	0.0000
C	9.381490	0.253105	37.06555	0.0000
Note: * Coefficients derived from the CEC regression.				

Source : EViews 13 Output