

# The Impact of External Trade Liberalization Policies on Sustainable Development in Algeria

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## Abstract

This study examines the impact of foreign trade liberalization policies on sustainable development in Algeria, with particular emphasis on their environmental implications. It analyzes the evolution of Algeria's foreign trade policies, the relationship between trade liberalization and sustainable development, and key economic, social, and environmental indicators. The findings show that trade liberalization has contributed to economic growth and supported a gradual improvement in human development. However, these gains remain strongly dependent on hydrocarbons and have not resulted in sufficient economic diversification. Socially, significant labor-market inequalities persist, particularly the high level of female unemployment. From an environmental perspective, the results reveal major challenges. Algeria's energy system remains overwhelmingly dependent on fossil fuels, with natural gas and oil accounting for almost all primary energy supply, while renewable energy represents only a marginal share. The study also highlights persistent greenhouse-gas emissions, industrial water pollution, forest and biodiversity degradation, and continued depletion of natural resources. Therefore, trade liberalization has produced mixed and asymmetric effects on sustainable development. The study concludes that trade openness alone cannot guarantee sustainable development. Its positive effects depend on complementary domestic policies aimed at economic diversification, environmental protection, renewable-energy development, cleaner production, and reducing social inequalities.

**Keywords:** Trade Liberalization; Sustainable Development; Foreign Trade; Environmental Protection; Algeria; Hydrocarbons; Renewable Energy; Environmental Degradation.

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## Introduction

The simultaneous pursuit of economic growth and environmental sustainability has become a central concern in international economic policy and academic research. Conventional development strategies based on intensive resource exploitation and rapid industrial expansion have generated substantial economic gains while contributing to environmental degradation, resource depletion, and rising greenhouse-gas emissions. These outcomes have reinforced the shift toward the sustainable development paradigm, defined in the 1987 Brundtland Report as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development therefore requires the balanced integration of economic efficiency, social inclusion, and environmental integrity.

Alongside this conceptual evolution, progressive trade liberalisation—supported by the GATT, WTO, IMF, and World Bank—has sought to reduce tariff and non-tariff barriers and facilitate the cross-border movement of goods, services, capital, and technology. Greater openness can stimulate growth through expanded markets, specialisation, improved resource allocation, foreign investment, and technology transfer. However, its implications for sustainable development remain ambiguous. Trade may promote efficiency and cleaner technologies, yet it may also intensify resource extraction, energy consumption, and pollution, particularly in economies whose production remains concentrated in natural resources and carbon-intensive activities.

This ambiguity is especially relevant for resource-dependent developing economies. Algeria provides a pertinent case. Since independence, its trade policy has evolved from extensive state control through gradual liberalisation in the 1990s and deeper integration under the EU Association Agreement, toward a more recent combination of selective openness and managed protectionism. Despite these shifts, the economy remains heavily reliant on hydrocarbons, exposing it to commodity-price volatility and constraining diversification. Persistent labour-market imbalances, fossil-fuel dominance of the energy mix, limited renewable energy deployment, greenhouse-gas emissions, water stress, and biodiversity loss continue to challenge the country's sustainable development trajectory.

### Research Problem Statement:

The core research problem addressed in this paper is articulated through the following main question:

- **How do foreign trade liberalization policies impact sustainable development in Algeria?**

To address this primary issue, the study investigates the following sub-questions:

- Does trade liberalization promote environmental protection or exacerbate ecological degradation?
- Are environmental standards and policies utilized as protectionist measures against international trade?
- What are the implications of trade liberalization policies for sustainable development outcomes in Algeria?

### Importance of the Study:

The importance of this study lies in its examination of one of the most significant contemporary issues within the global trading system, relevant to both developed and developing countries. It addresses the critical relationship between the environment and foreign trade, given that natural resources constitute a primary foundation for commercial exchanges, as well as the implications of these dynamics for sustainable development. This is particularly relevant in the context of Algeria's efforts to liberalise its external trade and pursue accession to the World Trade Organization.

### Objectives of the Study:

This study aims to achieve the following main objectives:

- Analyse the relationship and interlinkages between trade and the environment.
- Identify the growing importance of environmental issues and the policies adopted for their protection.

### Structure of the Study:

The study is organised around the following main sections:

- First: The Conceptual Framework of Sustainable Development
- Second:- Trade Liberalization Policies
- Third: The Relationship Between Trade and Sustainable Development
- Fourth: Evaluating the Contribution of Trade Liberalization Policies to Sustainable Development in Algeria

### **First: The Conceptual Framework of Sustainable Development:**

The accelerating environmental degradation observed since the early 1980s has intensified global concern regarding ecological issues, as their cumulative impacts now constitute a substantive threat to the long-term sustainability of human systems and developmental trajectories. This deterioration is largely attributable to prevailing development paradigms that prioritized rapid economic expansion and intensive natural-resource extraction while systematically neglecting environmental externalities. Consequently, these models have precipitated elevated levels of pollution, progressive resource depletion, and widespread ecological disequilibria.

In response, the paradigm of sustainable development emerged as an integrative framework designed to reconcile the imperatives of economic growth with the necessity of environmental conservation, thereby safeguarding the resource entitlements of future generations. The concept attained formal international recognition through the 1987 report of the World Commission on Environment and Development, *Our Common Future*, which articulated its foundational principles in contemporary form. Ultimately, sustainable development arose as a normative and analytical response to intersecting global challenges, foremost among them persistent poverty and the ongoing degradation of natural systems, both of which exert adverse effects on economic and social development pathways.

#### **1-1 Definitions of Sustainable Development :**

One of the most quoted definitions of sustainable development is that of the Brundtland Report which defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” The report further asserts that sustainable development contains:

- The concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given and .
- The idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs **(ABUBAKAR JIBRIL, 2011, p. 3).**

#### **1-2 The Sustainable Development Goals :**

Sustainable development seeks to achieve the following objectives:

- Eradicate poverty and hunger, guaranteeing a healthy life
- Universalize access to basic services such as water, sanitation and sustainable energy.
- Support the generation of development opportunities through inclusive education and decent work.
- Foster innovation and resilient infrastructure, creating communities and cities able to produce and consume sustainably.
- Reduce inequality in the world, especially that concerning gender
- Care for the environmental integrity through combatting climate change and protecting the oceans and land ecosystems.
- Promote collaboration between different social agents to create an environment of peace and ensure responsible consumption and production **(Mensah Justice, 2019, p. 19).**

### 1-3 How to promote sustainable development

There are several ways to Promote Sustainable Development and overcome its challenges (**Augustina Ogbu Nneamaka, 2025, p. 815**) :

- **Frameworks for Policies:** Strong policies that encourage sustainable behaviour across industries must be developed by governments. This includes laws that support the use of renewable energy sources, programs to reduce waste, and sustainable farming methods.
- **Awareness and Education:** It is essential to increase public knowledge of sustainability issues. Programs for education can empower people by educating them about their environmental impact and promoting sustainable practices.
- **Innovation in Technology:** Technological developments can be very helpful in advancing sustainability. Innovations that boost economic growth and lessen environmental impact include waste management systems, smart agriculture solutions, and renewable energy technologies.
- **Participation of the Community** Involving local communities in sustainability initiatives encourages responsibility and ownership. Initiatives led by the community can successfully tackle regional issues while advancing more general sustainability objectives.

#### **Second: Trade Liberalization Policies:**

Trade liberalization refers to the process by which governments reduce or eliminate barriers to international trade, allowing goods and services to move more freely across borders. Key components of trade liberalization include the reduction or removal of tariffs, import quotas, and various forms of protectionism. The primary goal is to create an open, competitive international marketplace where countries can trade based on their comparative advantages, thereby promoting economic growth and efficiency (<https://www.oxjournal.org/trade-liberalization-policies-by-supranational-organizations/>) .

#### **2-1 Historical context of trade liberalization:**

The concept of trade liberalization has evolved significantly since World War II. The establishment of the General Agreement on Tariffs and Trade (GATT) in 1947 marked an important moment in the history of global trade. This agreement aimed to ensure that international trade flows as smoothly and predictably as possible. In 1995, the World Trade Organization was established, succeeding GATT and expanding to include new areas such as property and services. The WTO continues to play a crucial role in promoting trade and liberalization through its various agreements and mechanisms.

The Post-World War II period also saw the rise of trade agreements and economic blocs, such as the European Union (EU) and the North American Free Trade Agreement (NAFTA), which aimed to further promote trade liberalization among member countries. Developing countries, particularly in Asia and Latin America, adopted export-oriented growth strategies, integrating more deeply into the global economy. This shift was driven by the acknowledgment that participating in global trade could increase economic growth and development. (Global Trade Liberalization and the Developing Countries — an IMF Issues Brief, 2024)

#### **2-2 Role of supranational organizations in promoting trade liberalization:**

Supranational organizations such as the International Monetary Fund (IMF), World Trade Organization (WTO), and the World Bank have played a pivotal role in promoting trade liberalization globally. These organizations provided frameworks for international trade and cooperation and established rules to facilitate freer trade.

- **International Monetary Fund (IMF):** The IMF supports trade liberalization by providing financial assistance and policy advice to countries facing economic crises such as developing countries. Through Structural Adjustment Programs (SAPs) which will be explained later in the paper, the IMF often requires countries to implement trade liberalization measures, such as reducing tariffs and opening up markets to foreign competition.

– **World Trade Organization (WTO):** The WTO is responsible for overseeing international trade rules. It facilitates negotiations to reduce trade barriers and resolve trade disputes among member countries. The WTO's agreements, such as the General Agreement on Trade in Services (GATS) and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), aim to create a more open and predictable trading environment. **World Bank:** The World Bank promotes trade liberalization as part of its broader mission to reduce poverty and support developing countries and economies. It provides financial and technical assistance to developing countries to help them implement trade reforms and improve their trade infrastructure. The World Bank's Trade Facilitation Support Program (TFSP) is an example of its efforts to enhance trade efficiency and reduce trade costs for developing countries. TFSP's will be explained in depth later in the paper.

### **Third: The Relationship Between Trade and Sustainable Development:**

interest in the interrelationship between international trade, environmental protection, and sustainable development grew markedly during the 1990s. Although proposals were advanced during the Uruguay Round negotiations to integrate environmental considerations more explicitly into the multilateral trading system, these proposals failed to secure sufficient support among the contracting parties. In response, the Marrakesh Ministerial Decision of April 1994 established the Committee on Trade and Environment (CTE) within the World Trade Organization. The Committee was mandated to examine the linkages between trade and environmental policies with a view to promoting sustainable development while safeguarding the integrity of the open, non-discriminatory trading system.

#### **3-1 The nature of the interrelationship between trade and the environment:**

The relationship between trade and the environment stems from the fact that trade, as a process of exchanging goods and services among individuals, regions, and States, is intrinsically linked to production. Production, in turn, both depends on natural resources and affects the environment. While this interrelationship is complex and multifaceted, it does not necessarily imply that trade liberalization is, in itself, the primary driver of environmental degradation. Trade liberalization can promote economic growth and facilitate the diffusion of advanced technologies, some of which may intensify environmental pressures. However, this constitutes only one dimension of a broader and more nuanced relationship between trade and environmental protection (Asia., 2003,p2).

While the link between production and the environment is readily apparent in environmental degradation, resource depletion, and pollution—contributing to the emergence of the concept of sustainable development—the relationship between foreign trade and the environment is a relatively recent subject of inquiry. Research in this area has largely been undertaken by economic policy experts in industrialized countries, while receiving comparatively limited attention from economists in developing countries.

Policy initiatives and related agreements have largely originated in the Global North, with developing countries having had limited meaningful participation in their formulation. In essence, the relationship between trade and the environment is indirect: trade does not, in itself, directly generate pollution. Nevertheless, the continued expansion of foreign trade—and, consequently, global production—may come at the expense of the global environment. The expansion of world trade under the framework of the World Trade Organization (WTO) has therefore raised concerns that it may contribute to unsustainable patterns of production and consumption, thereby intensifying ecological pressures and pollution (Djalal, Abdel Fattah El-Mallah, 2000/2001,p1421).

Conversely, while the expansion of trade and production is associated with increased pollution and significant environmental risks, some observers argue that these adverse effects may be partially offset by rising global environmental awareness. Environmental advocates maintain that trade liberalisation can intensify pollution, undermine national sovereignty, and contribute to ecological disruption. From this perspective, the pursuit of economic growth and employment through trade frequently operates in tension with the requirements of stringent environmental protection.

Free trade proponents, on the other hand, express concern over the rise of 'green protectionism', whereby environmental standards and requirements are employed to restrict market access for foreign producers and thereby erode the gains from international trade. These concerns assume a distinctly political character when environmental objectives are invoked to legitimise underlying protectionist motives. Moreover, advocates of free trade caution that non-tariff measures—such as import bans or environmental levies—may be used to enforce compliance with multilateral environmental agreements or unilateral national regulations, practices that risk undermining the stability and predictability of the multilateral trading system (Safwat Abdel Salam, 1999, p12).

#### **Fourth: Evaluating the Contribution of Trade Liberalisation Policies to Sustainable Development in Algeria**

##### **4-1 Evolution of Foreign Trade Policies in Algeria:**

Foreign trade is one of the most essential pillars on which countries rely to achieve economic development. Since its independence, Algeria has worked to organize its foreign trade to achieve its developmental goals. Fluctuations in oil prices, economic instability, and successive state reforms have necessitated frequent updates to the laws regulating foreign trade. The development of Algerian foreign trade regulation has gone through four primary stages, each characterized by distinct policy instruments and objectives: (**Hassiba ALMI1, assessing the impact of alger's trade policies on foreign trade dynamics, 2025, pp 86-88**)

##### **– The Period of Foreign Trade Control (1963-1970) :**

Immediately after independence, Algeria continued to apply French legislation unless it contravened national sovereignty, as stipulated in Law No. 62-157 of 31 December 1962,

The existing authority limited itself to controlling foreign trade activity without imposing a monopoly. The quota system was applied under Order 63-188 of 16 May 1963, to limit imports, conserve hard currency, and protect nascent national products. The Central Bank was established by Law No. 62-144 of October 13, 1962, as an exchange control mechanism.

In 1963, the first customs tariff was established by Order No. 63-414 of 28 October, It set rates of 10% for processing goods and raw materials, 5% to 20% for 1963 semi-finished products, and 15% to 50% for finished products. The first tariff reform in 1968 imposed high rates on luxury goods, reaching 100% to 150%, while exempting raw materials and basic inputs.

##### **– The Period of State Monopolization (1970-1989):**

At the beginning of the 1970s, the state completely monopolized the foreign trade sector. Order 73-01 of February 20, 1973, confirmed this tendency. The monopoly aimed to protect the national product from foreign competition, develop the trade sector, and integrate trade flows into central planning. More than 80% of imports fell under the monopoly of public institutions. A new customs tariff adopted in 1973 introduced a general tariff for countries granting Algeria most-favored-nation (MFN) status and a special tariff for countries with mutual trade preferences.

The 1986 global oil crisis and the resulting budget deficit prompted Law 86-06 of

25 June 1986, which introduced a new customs tariff raising the maximum duty rate from 100 % to 120% and increasing the number of applied rates from 5 to 19. In 1988, further amendments raised customs duties on luxury goods as the collapse of oil prices led to the search for additional financing alternatives for the state treasury.

##### **– Gradual Liberalization of Foreign Trade (1990-2006):**

Following the 1986 oil crisis and mounting foreign indebtedness, Algeria undertook reforms under international institutional pressure. The 1990 Supplementary Finance Law initiated partial liberalization

through its articles 40 and 41. The Monetary and Loan Law 10-90 of April 14, 1990, stipulated the free movement of capital to and from Algeria, opened the way for foreign investment under the 49/51 rule, and authorized the opening of foreign bank branches. Executive Decree 91-37 of 13 February 1991, abolished the state monopoly on foreign trade, allowing any natural or legal person to engage in import and export activities.

During the in-depth economic reforms of 1994-1998, supported by the IMF Structural Adjustment Program, more comprehensive liberalization occurred. The maximum customs duty was reduced from 60% in 1994 to 50% in 1996 and to 45% in 1997.

Quantitative restrictions were largely eliminated by mid-1995. The national currency was devalued by 22% in 1991, 50.6% in 1994, 36% in 1995, 15% in 1996, and 5.4% in 1997, moving the dinar from 23.3 per dollar in 1993 to 60 per dollar in 1998.

Order No. 01-02 of August 20, 2001, established a new customs tariff with a maximum rate of 30% for all final consumer products. By 2006, the average tariff had been reduced to approximately 12%, with a protectionist strategy maintained only for luxury product imports. The EU-Algeria Association Agreement, signed in 2002 and in force since 2005 further committed Algeria to a progressive dismantling of tariff barriers with the EU.

– Return to Managed Openness and Protectionism (2009-2025):

Fearing the steady growth of imports and its impact on foreign exchange reserves, Algeria adopted measures to control trade liberalization. The 2009 Supplementary Finance Law mandated the use of documentary letters of credit for imports and prohibited the importation of used machinery and equipment. Following the 2014 oil price collapse, policies shifted toward import substitution. Law No. 15-15 of July 15, 2015, provided for the application of quantitative or qualitative restrictions when importing or exporting products.

The 2018 Finance Law included several import and export measures. Algeria banned the import of 851 products in January 2018, as stipulated in Decree No. 18-02. This was amended in May 2018 to include 877 products. In 2019, Algeria announced a new import regime, cancelling the ban on more than 800 goods while imposing a temporary additional safeguard duty (DAPS) covering 1,095 tariff lines.[

Recent policies under President Tebboune (2021-2025) have sought a balance between attracting investment and maintaining import controls. The Investment Law of 2022 aimed to attract FDI and ease restrictions in non-strategic sectors. Algeria joined the African Continental Free Trade Area (AfCFTA) and pursued regional ties. The World Bank highlighted the Port Community System launched in 2021, the rise of accredited laboratories, and the tripling of non-hydrocarbon exports since 2017, which reached \$5.1 billion in 2023. At the same time, the EU launched arbitration proceedings in 2025 against Algeria, citing import licensing systems that effectively amount to an import ban, subsidies contingent on local inputs in the automobile sector, and a cap on foreign ownership for import companies.

#### **4-2 The Role of Trade Liberalization Policies in Achieving Economic Sustainability in Algeria:**

Economic sustainability will be assessed using a set of macroeconomic indicators that reflect the overall performance of the Algerian economy. This approach aims to identify and analyze the relationship between changes in key macroeconomic indicators and the volume and dynamics of international trade flows. By examining these indicators, it becomes possible to evaluate the extent to which trade liberalization policies contribute to strengthening economic performance and supporting sustainable, economic growth in Algeria.

– Gross Domestic Product (GDP) Growth:

**Table 01:** Evolution of Algeria's Gross Domestic Product (GDP), 2018–2025

Unit: USD million

| Year | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|------|------|------|------|------|------|------|------|------|
|------|------|------|------|------|------|------|------|------|

|     |         |         |         |         |         |         |         |         |
|-----|---------|---------|---------|---------|---------|---------|---------|---------|
| GDP | 194,507 | 193,361 | 164,774 | 185,850 | 225,709 | 248,087 | 269,140 | 285,724 |
|-----|---------|---------|---------|---------|---------|---------|---------|---------|

**SOURCE :** -<https://www.worldometers.info/gdp/algeria-gdp->

Table (01) presents the evolution of Algeria's Gross Domestic Product (GDP) between 2018 and 2025, measured in current US dollars and expressed in millions. Overall, the data indicate a clear upward trend in Algeria's GDP over the period under consideration, although this development was characterized by a notable contraction in 2020 followed by a sustained recovery in subsequent years.

Taken as a whole, the period from 2018 to 2025 reflects a net increase of approximately 46.9% in Algeria's GDP, from USD 194.507 billion to USD 285.724 billion. The most pronounced annual increase occurred between 2021 and 2022, when GDP expanded by approximately 21.4%. Although the pace of growth moderated thereafter, GDP continued to increase, suggesting a relatively persistent expansion during the 2022–2025 period.

#### – Inflation Dynamics in Algeria:

**Table (02): Inflation of Algeria (annual %) Period 2018-2025**

| Year | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|------|------|------|------|------|------|------|------|------|
| GDP  | 4.27 | 1,95 | 2,41 | 7,22 | 9,26 | 9,32 | 4,04 | 1,41 |

**SOURCE :** - <https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?locations=DZ->

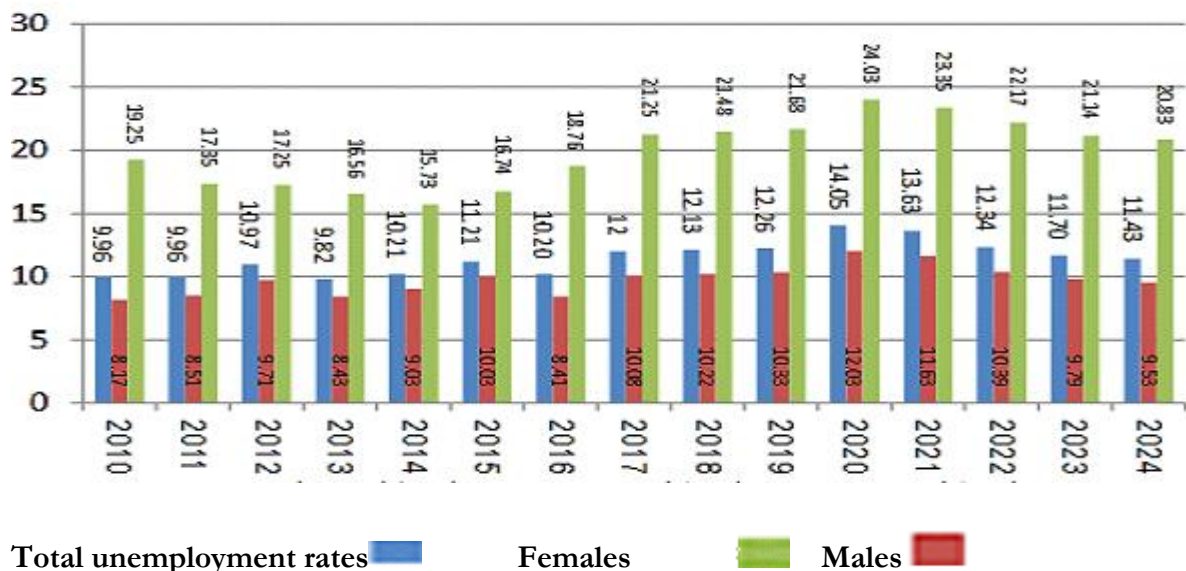
Figure (01) illustrates the evolution of unemployment rates in Algeria over the period 2010–2024, disaggregated by gender alongside the national total rate. The data reveal a persistent and substantial gender gap in the Algerian labour market, as well as a clear responsiveness to macroeconomic shocks.

Female unemployment (green bars) remained markedly higher than the other series throughout the period, ranging from approximately 15.7% in 2014 to a peak of 24.0% in 2020. Although a gradual decline occurred after 2020, the female rate stood at 20.8% in 2024. In contrast, male unemployment (red bars) exhibited lower levels and greater stability, fluctuating between 8.2% in 2010 and 12.0% in 2020, before declining to 9.5% in 2024. The total unemployment rate (blue bars) followed an intermediate path, ranging from 9.8% in 2013 to 14.1% in 2020, and reaching 11.4% in 2024.

Overall, the evidence points to a structural gender disparity, with female unemployment rates remaining substantially higher than those of males over the entire period. The simultaneous increase recorded in 2020 across all series reflects the severe impact of the COVID-19 pandemic. While the subsequent trajectory (2021–2024) indicates a partial recovery, the continued elevation of female unemployment above 20% suggests the persistence of institutional and structural barriers to **women's labour** market integration in Algeria.

#### – The Reality of Unemployment and Employment in Algeria :

**Figure (01): Evolution of Unemployment Rates in Algeria by Category (2010–2024) (%)**



**SOURCE :** Djamel meddat , grinat ismail, Development of unemployment in Algeria and government efforts to reduce it During the Period (2010-2024) ,journal maaref, vol20, N°2 ,alger ,2025 , p578.

Figure (01) illustrates the evolution of unemployment rates in Algeria over the period 2010–2024, disaggregated by gender alongside the national total rate. The empirical data highlight a profound and persistent structural gender gap in the Algerian labor market, alongside notable responsiveness to macroeconomic fluctuations and external shocks.

Female unemployment (green bars) remained substantially higher than all other cohorts throughout the 15-year period, ranging from a minimum of 15.73% in 2014 to a peak of 24.03% in 2020. Despite a gradual post-crisis reduction, female unemployment remained structurally elevated at 20.83% in 2024. In contrast, male unemployment (red bars) displayed significantly lower rates and greater stability, oscillating between 8.17% in 2010 and 12.03% in 2020, before settling at 9.53% in 2024. The total unemployment rate (blue bars) tracked the aggregate baseline, fluctuating between 9.82% (2013) and 14.05% (2020), and reaching 11.43% by 2024.

Overall, these findings demonstrate a persistent gender disparity in Algeria's labor market, with female unemployment rates consistently exceeding double those of males. The synchronized spike recorded across all series in 2020 reflects the severe disruption caused by the COVID-19 pandemic. Although the trajectory from 2021 to 2024 indicates cyclical recovery and gradual labor absorption, the persistent concentration of unemployment among females above the 20% threshold points to institutional and structural barriers hindering female labor force integration in Algeria.

#### – Human Development Index:

The developments in human development in Algeria over recent years can be analyzed based on the following table:

**Table (03):** Human Development Index 2019-2023

| year  | 2019  | 2020  | 2021  | 2022  | 2023  |
|-------|-------|-------|-------|-------|-------|
| Index | 0,753 | 0,742 | 0,755 | 0,761 | 0,763 |

**SOURCE:** <https://data.arabdevelopmentportal.org/ar/datacatalog/un-agencies/df1559b9-1c0f-8603-3dce-838b46733786#->

The data indicate a relatively stable level of human development throughout the study period, interrupted by a temporary decline in 2020, followed by a gradual recovery in subsequent years.

The HDI stood at 0.753 in 2019 before declining to 0.742 in 2020, representing a decrease of approximately 1.46% relative to the preceding year. This contraction reflects a temporary deterioration in the key

dimensions of human development. The decline should be interpreted within the broader socioeconomic context of the COVID-19 pandemic, which generated substantial disruptions to economic activity, employment, household incomes, education systems, and health services. Given the composite nature of the HDI, however, the observed decline cannot be attributed exclusively to a single factor without further empirical decomposition of its constituent components.

From 2021 onwards, the index resumed an upward trajectory, rising from 0.755 in 2021 to 0.761 in 2022 and reaching 0.763 in 2023. This corresponds to a cumulative increase of approximately 2.83% between 2020 and 2023. The progressive improvement suggests a gradual recovery in human development outcomes following the setback recorded in 2020. Nevertheless, the pace of recovery remained relatively moderate, indicating that the rebound was incremental rather than rapid.

From a broader developmental perspective, the trajectory of the HDI points to a degree of resilience in human development outcomes. The post-2020 recovery is consistent with improvements in economic conditions, the restoration of productive activity, and the normalisation of access to education and health services. At the same time, the net increase from 0.753 in 2019 to 0.763 in 2023 represents a modest overall improvement of approximately 1.33% over the entire period. This finding suggests that structural constraints continue to limit the translation of economic progress into more substantial and sustained gains in human well-being.

The observed pattern can be characterised by three distinct phases: a relatively high HDI level in 2019, a temporary deterioration in 2020, and a subsequent gradual recovery between 2021 and 2023. The persistence of the upward trend after 2020 is particularly relevant from a development-policy standpoint, as it underscores that improvements in human development require not only short-term economic recovery but also sustained investments in education, healthcare, income-generating opportunities, and social protection systems.

#### - Carbon dioxide emission rate :

**Table (04): Energy consumption in Algeria in 2017.**

|                | ENERGY CONSUMPTION INDEX |                                   | TOTAL CAPACITY REACHES ONE MILLION TONS OF OIL PER YEAR. |
|----------------|--------------------------|-----------------------------------|----------------------------------------------------------|
|                | Gigawatt-equivalent/year | Tonnes of oil equivalent per year |                                                          |
| <b>Algeria</b> | 59423                    | 36.6                              | 17.39                                                    |

**SOURCE :** <http://data.as-rdp.org>.

Table (04) presents selected indicators of energy consumption and capacity for Algeria in 2017. The data provide a snapshot of the country's energy profile during that year, covering electricity consumption, primary energy use expressed in oil-equivalent terms, and an aggregate capacity measure.

Electricity consumption reached 59,423 gigawatt-hours (GWh) in 2017. This figure is consistent with official statistics reported by the Organization of Arab Petroleum Exporting Countries (OAPEC). The magnitude of electricity use underscores Algeria's heavy dependence on thermal power generation, predominantly natural gas, to satisfy residential, commercial, and industrial demand.

Primary energy consumption is reported at 36.6 million tonnes of oil equivalent (Mtoe). It should be noted that official Algerian energy balance data for the same year indicate a higher national energy consumption

of approximately 57–59.6 Mtoe, with final energy consumption around 44.6 Mtoe. The value of 36.6 Mtoe appearing in the table may therefore correspond to a specific category of consumption rather than the aggregate primary energy total. Clarification of the precise definition of this indicator is required for rigorous interpretation.

The total capacity figure of 17.39 million tonnes of oil per year is less clearly defined. Contemporary estimates of Algeria's refining capacity in 2017 ranged around 27 million tonnes per year (approximately 650–657 thousand barrels per day). The reported value of 17.39 may represent a partial capacity measure or a different operational indicator. In the absence of an explicit definition, caution is warranted when drawing comparisons between capacity and consumption metrics.

Taken together, the 2017 indicators portray Algeria as an energy-intensive economy reliant primarily on fossil fuels, particularly natural gas and petroleum products. The relationship between the reported capacity and consumption figures points to structural features of the national energy system that have implications for efficiency and resource management. These features highlight the relevance of policies directed at improving energy efficiency, expanding and modernising domestic refining infrastructure, and progressively diversifying the energy mix through the development of renewable sources, notably solar power. Such measures would contribute to the preservation of hydrocarbon resources for export while supporting longer-term energy security and sustainability objectives.

#### – Primary Energy Supply in Algeria :

**Table 05: Share of Total Primary Energy Supply in Algeria, 2023**

|          | <b>Total<br/>Greenhouse<br/>Gas<br/>Emissions(all<br/>gases)</b> | <b>Renewables</b> | <b>Coal and<br/>coal<br/>products</b> | <b>Natural<br/>gaz</b> | <b>oil</b> | <b>Fossil CO<sub>2</sub><br/>EMISSIONS</b> |
|----------|------------------------------------------------------------------|-------------------|---------------------------------------|------------------------|------------|--------------------------------------------|
| <b>%</b> | 252.7                                                            | 0.1               | 0.3                                   | 64.9                   | 34.7       | 186.4                                      |

**Source:** <https://www.iea.org/> (2023 data)-.

Table (05) presents the structure of total primary energy supply (TPES) in Algeria for 2023, together with two emissions indicators. The data reveal an energy system characterised by an overwhelming reliance on fossil fuels.

#### **Structure of Primary Energy Supply**

Natural gas constituted the dominant share of total primary energy supply, accounting for 64.9%, followed by oil at 34.7%. Coal and coal products represented only 0.3%, while renewable energy sources contributed a marginal 0.1%. Consequently, fossil fuels collectively accounted for approximately 99.9% of Algeria's primary energy supply in 2023.

This highly concentrated structure is consistent with Algeria's substantial endowment of natural gas and oil resources and with the central role these fuels play in meeting domestic energy demand and supporting economic activity. At the same time, the negligible share of renewables points to a very low degree of energy diversification, despite the country's significant technical potential for solar energy deployment.

#### **Emissions Profile**

The table reports total greenhouse gas emissions (all gases) at 252.7 and fossil CO<sub>2</sub> emissions at 186.4. Although the units are not explicitly stated in the table, these figures are consistent with International Energy Agency (IEA) reporting conventions and are most plausibly expressed in million tonnes of CO<sub>2</sub> equivalent

(Mt CO<sub>2</sub>-eq). The elevated emissions levels underscore the environmental implications of a primary energy supply so heavily dependent on hydrocarbons.

### Economic and Policy Implications

The pronounced dependence on natural gas and oil exposes the economy to volatility in international energy prices and poses challenges for long-term energy sustainability. The data suggest that a strategic increase in the share of renewable energy, combined with improvements in energy efficiency, would constitute the principal pathways for reducing emissions, diversifying the energy mix, and strengthening the resilience of both the energy system and the broader economy over the medium to long term.

#### – Water Pollution:

**Table No. (06): Levels of Water Pollution Due to Organic Pollutants**

| Year 2000 | Organic water pollutant (BOD) emissions Kg per day per worker | Organic water pollutant emissions (BOD) measured in metric ton per day |
|-----------|---------------------------------------------------------------|------------------------------------------------------------------------|
| ALGERIA   | 0.25                                                          | 107                                                                    |

**Source:** United Nations Development Programme (UNDP), Regional Bureau for Arab States: Human Development Report 2011: Challenges to Human Security in the Arab Countries, Nairobi, Kenya, 2011, p. 45.

Table (06) reports two indicators of industrial organic water pollution in Algeria for the year 2000, measured by Biochemical Oxygen Demand (BOD) emissions. The indicators capture both the intensity of pollution relative to industrial labour and the aggregate daily load discharged into water bodies.

#### Emission Intensity per Worker

Organic water pollutant emissions averaged 0.25 kg of BOD per worker per day. This intensity indicator provides a partial measure of the pollution content of industrial production techniques prevailing at the time. It reflects the combined influence of process technologies, wastewater management practices, and the degree of environmental regulatory compliance within the manufacturing sector. In the absence of cross-country or intertemporal benchmarks within the table, the value should be interpreted cautiously as a descriptive baseline rather than as evidence of relatively high or low pollution intensity.

#### Aggregate Organic Pollution Load

Total organic water pollutant emissions reached 107 metric tons of BOD per day. This figure represents the cumulative daily volume of biodegradable organic matter released by industrial sources. Elevated BOD loads reduce dissolved oxygen concentrations in receiving waters, with potential adverse effects on aquatic ecosystems and downstream water uses. From an environmental-economics perspective, such emissions constitute negative externalities whose social costs are not fully internalised by polluting firms.

#### Interpretation and Limitations

The data pertain to a single benchmark year (2000) and therefore do not permit analysis of trends or formal testing of hypotheses such as the Environmental Kuznets Curve. They do, however, document that industrial activities—particularly in sectors characterised by high organic effluent generation—imposed a measurable pollution burden on Algeria's water resources at the turn of the century.

#### Policy Implications

Mitigation of these externalities requires a combination of regulatory and economic instruments. Relevant measures include the enforcement of effluent standards, application of the polluter-pays principle through appropriate charges or taxes, promotion of cleaner production technologies, and investment in industrial wastewater treatment infrastructure. Such interventions are necessary to reduce the environmental intensity of industrial growth and to support the sustainable management of water resources.

– **Vegetation Cover and Resource Depletion:**

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**Table (07):** Biodiversity and the Depletion of Natural Resources 2024

| COUNTRY | Forest Area (% of Total Area) | Tree Cover Loss from 2001 to 2025 | Species Threatened with Extinction |
|---------|-------------------------------|-----------------------------------|------------------------------------|
| ALGERIA | 0.08                          | 19                                | 14                                 |

**SOURCE:** Prepared by the researcher based on various sources (IUCN, BIODB)

Table (07) provides empirical indicators regarding biodiversity and natural-resource degradation in Algeria. The data reveal that forest areas constitute a very limited share, accounting for only 0.08% of the country's total land area, while tree cover loss accumulated to 19 [kha / thousand hectares] over the period 2001–2025. Concurrently, 14 species are officially classified as threatened with extinction, reflecting intensified ecological pressures on national ecosystems.

These figures indicate that Algeria faces acute environmental vulnerabilities linked to deforestation, land degradation, and habitat fragmentation. The extremely low baseline forest coverage, combined with ongoing tree-cover loss, exacerbates ecosystem fragility, diminishes national carbon-sequestration capacity, and accelerates soil erosion and water runoff. Furthermore, the number of endangered species serves as a clear bio-indicator of habitat destruction driven by anthropogenic activities and natural resource depletion.

From an environmental-economic standpoint, the continuous depletion of natural capital generates long-term economic costs by degrading essential ecosystem services, reducing agricultural land productivity, and limiting potential growth in nature-based tourism and green economic sectors. Consequently, implementing rigorous forest preservation protocols, enhancing biodiversity conservation, and promoting sustainable land-use management are essential for reinforcing long-term ecological sustainability and macroeconomic resilience in Algeria.

## **Conclusion**

Trade liberalisation policies in Algeria have produced mixed and asymmetric outcomes for sustainable development. On the economic front, they have been associated with significant nominal GDP expansion and partial recovery in human development indicators. Yet this progress remains fragile, heavily conditioned by hydrocarbon revenues, and insufficient to resolve structural labour-market imbalances or to generate robust, diversified growth.

On the environmental front, the evidence is more concerning. The near-total dependence on fossil fuels, combined with limited renewable-energy penetration, elevated emissions, residual industrial water pollution, and ongoing biodiversity loss, indicates that trade openness has not been accompanied by a decisive shift toward cleaner production patterns or effective internalisation of environmental externalities.

Overall, the Algerian experience illustrates that trade liberalisation alone is neither a sufficient nor an automatic driver of sustainable development. In a resource-dependent economy, openness tends to amplify existing comparative advantages in hydrocarbons while leaving environmental and social vulnerabilities

largely unaddressed. Sustainable development outcomes therefore require complementary domestic policies: accelerated economic diversification, strengthened environmental regulation, progressive energy transition, and targeted measures to reduce structural inequalities in the labour market. Without such integrated policy frameworks, further trade liberalisation risks reinforcing rather than mitigating the long-term sustainability challenges facing Algeria.

### Key Findings of the Study:

- Economic: Trade liberalization boosted GDP growth but failed to achieve structural diversification away from hydrocarbons
- Social: Human development indicators showed resilience, yet structural labor market disparities, particularly high female unemployment, persist
- Environmental: Industrial and trade expansion continues to exert heavy pressure on natural resources, characterized by high carbon dependence, severe forest depletion, and slow renewable energy integration.

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