

# Adapting to Climate Change for Achieving Sustainable Development in Algeria: Strategies and Challenges

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**Abstract.** Achieving sustainable development while addressing the impacts of climate change represents one of the most pressing challenges facing countries worldwide. These challenges are closely linked to the availability of adequate financing, institutional and human capacities, as well as a robust legislative and regulatory framework, alongside raising awareness of the dimensions of sustainable development. In its pursuit of the Sustainable Development Goals, Algeria has developed several strategies aimed at adapting to climate change. However, the country continues to face numerous obstacles that may undermine its ability to effectively confront the adverse effects of climate change. This situation necessitates the search for practical and effective solutions to equip Algeria with the necessary tools and measures. Such solutions could be achieved through the conclusion of global agreements that serve as roadmaps to strengthen national capacities in addressing climate change impacts, or at the very least, to support the country's adaptation efforts in the coming years.

## 1. INTRODUCTION

Climate change is widely regarded as one of the most critical global issues of our time, owing to its profound risks and far-reaching consequences in both the short and long term. It poses serious threats to human security and fundamental rights, particularly the right to life, the right to health, and the right to a healthy environment.

In response, Algeria — like most countries around the world — has sought to implement a range of measures and mechanisms designed to mitigate the risks arising from climate change and to enhance its adaptive capacity to both current and future climatic shifts.

Against this backdrop, the central research question of this paper is: *What strategies has Algeria adopted to adapt to climate change in pursuit of sustainable development?*

### 1.1. The Concept of Climate Change and Mechanisms of Adaptation

This section begins by examining the concept of climate change through its definition and the identification of its underlying causes. It then explores the mechanisms of adaptation to these changes. The axis is divided into two main subsections as follows:

#### 1.1.1. The Concept of Climate Change

##### 1.1.1.1. Definition of Climate Change

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as: “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.”<sup>1</sup>

Thus, climate change refers to long-term shifts in weather patterns that result in rising temperatures in the atmosphere, oceans, and land. These shifts disrupt the balance of ecological systems that sustain life and biodiversity, adversely affect human health, and trigger various extreme weather events such as hurricanes, floods, and droughts. Moreover, climate change contributes to sea-level rise due to the warming of oceans and the melting of ice sheets.<sup>2</sup>

<sup>1</sup> United Nations Framework Convention on Climate Change, “What Is the United Nations Framework Convention on Climate Change?,” UNFCCC, accessed April 10, 2025, <https://unfccc.int/process-and-meetings/what-is-the-united-nations-framework-convention-on-climate-change>.

<sup>2</sup> Hala Abu Ali, “Climate Change and Sustainable Development,” *Egyptian Journal of Development and Planning*, no. 7, 111.

### 1.1.1.2. Causes of Climate Change

Multiple factors have contributed to the emergence and intensification of climate change and what is known as global warming. These causes can be broadly categorized into natural and anthropogenic (human-induced) factors, which are briefly outlined below:<sup>3</sup>

**a) Natural Causes** Climate change and global temperature rise can be attributed to natural factors, most notably solar winds, ocean salinity, and periodic climate oscillations.

- **Solar winds:** Some scientists maintain a strong link between solar activity and rising Earth temperatures. Solar winds shield the planet from cosmic rays, which are responsible for cloud formation and atmospheric cooling. Consequently, an increase in solar winds reduces cloud cover, leading to higher global temperatures, while a decrease has the opposite effect.
- **Climate oscillations and ocean salinity:** Other researchers associate climate change with periodic climatic oscillations that alter the salinity and density of ocean waters, particularly in polar regions.

**b) Anthropogenic Causes** Human-induced causes can be summarized as follows:<sup>4</sup>

- **Energy production** The generation of electricity and heat through the burning of fossil fuels accounts for a substantial share of global greenhouse gas emissions. Most electricity worldwide is still produced by burning coal, oil, or gas, releasing large quantities of carbon dioxide and nitrous oxide — potent greenhouse gases that trap heat in the Earth's atmosphere. Globally, only slightly more than a quarter of electricity comes from low-emission sources such as wind, solar, and other renewables.
- **Manufacturing of goods** Industrial processes and manufacturing generate significant emissions, primarily from burning fossil fuels to produce energy for manufacturing cement, iron, steel, electronics, plastics, textiles, and other products. Mining and other industrial activities also release greenhouse gases, as does the construction sector. Many manufacturing machines rely on coal, oil, or gas, and certain materials like plastics are derived directly from fossil fuel feedstocks. The manufacturing sector remains one of the largest contributors to global greenhouse gas emissions.
- **Deforestation** Clearing forests for agriculture, livestock grazing, or other purposes releases stored carbon into the atmosphere. Approximately 12 million hectares of forest are destroyed each year. Since forests act as major carbon sinks, their destruction not only releases carbon but also diminishes nature's capacity to absorb atmospheric CO<sub>2</sub>. Together with agriculture and other land-use changes, deforestation accounts for nearly one-quarter of global greenhouse gas emissions.
- **Transportation** Most cars, trucks, ships, and aircraft run on fossil fuels, making the transport sector a major source of greenhouse gas emissions, particularly carbon dioxide. Road vehicles account for the largest share of petroleum-based fuel combustion in internal combustion engines. Emissions from shipping and aviation are also rising steadily. Transportation is responsible for approximately one-quarter of global energy-related CO<sub>2</sub> emissions, with projections indicating a significant increase in transport energy demand in the coming decades.
- **Food production** Food production contributes to emissions of carbon dioxide, methane, and other greenhouse gases through multiple pathways, including deforestation and land clearing for agriculture and grazing, enteric fermentation in cattle and sheep, the production and use of synthetic fertilizers and manure, and the use of fossil fuel-powered machinery and fishing vessels. Food processing and distribution further add to these emissions, making the food system a major driver of climate change.
- **Energy use in buildings** Globally, residential and commercial buildings consume more than half of all electricity. When reliant on coal, oil, and natural gas for heating and cooling, they emit substantial amounts of greenhouse gases. Rising demand for heating and cooling — driven by increased ownership of air-conditioning units — along with higher electricity use for lighting and appliances, has contributed to a marked increase in energy-related CO<sub>2</sub> emissions from the building sector in recent years.

### 1.1.2. The Impact of Climate Change on Sustainable Development

Climate change constitutes one of the most significant threats facing humanity today. Unless the international community takes effective and decisive action, the planet risks a level of global warming that could trigger catastrophic events, potentially reversing decades of hard-won sustainable development gains.

Emissions from factories, waste, and the excessive consumption of natural resources are among the primary drivers exacerbating global warming. Consequently, the environment is no longer merely a means for achieving development but has become an end in itself. Countries worldwide are now striving to apply the concept of sustainable development by utilizing non-renewable natural resources only to the extent that meets current developmental objectives without compromising the ability of future generations to meet their own needs.<sup>5</sup>

Thus, achieving sustainable development while coping with the consequences of climate change remains one of the foremost challenges confronting nations globally. These challenges are intrinsically linked to securing adequate financing, building institutional and human capacities, establishing a comprehensive legislative and regulatory framework, and raising public awareness regarding the multifaceted dimensions of sustainable development.<sup>6</sup>

### 1.2. Mechanisms of Adaptation to Climate Change

Adaptation to climate change can also be defined as adjustments in policies and behaviors aimed at increasing resilience to the impacts of climate change that have already occurred or are anticipated in the future.

<sup>3</sup> See in detail: Nadia Litim, "Climate Changes: Causes, Future Implications, and Adaptation Mechanisms," *Journal of Legal Studies* 9, no. 1 (June 2022): 355 ff.

<sup>4</sup> United Nations, "Causes and Effects of Climate Change," <https://www.un.org/ar/climatechange/science/causes-effects-climate-change>.

<sup>5</sup> Shafiq Haddad and Nour Eddine Qalaqil, "The Impact of Climate Change on Sustainable Development: The Case of Algeria," *Industrial Economics Journal*, no. 15 (December 2018): 5.

<sup>6</sup> Abu Ali, "Climate Change and Sustainable Development," 115.

The core concept of adaptation rests on the capacity of a social or ecological system to absorb disturbances while maintaining its fundamental structure and functions, as well as preserving its self-organizing ability to cope with stress or change. Adaptation does not imply resistance to preserve a specific status quo in the face of climatic shifts; rather, it involves transforming societies and economies into more resilient systems capable of thriving under variable climatic conditions. Adaptation to climate change is built upon several key elements:<sup>7</sup>

- **Diversity:** The various components of diversity — whether in agriculture, industry, trade, or other sectors — serve as safeguards for communities, helping to mitigate fluctuations, enhance productivity, and ensure long-term sustainability.
- **Infrastructure:** This encompasses both the natural environment (such as vegetation cover and energy resources) and built infrastructure (such as roads, dams, and buildings). Appropriate utilization of infrastructure plays a vital role in reducing the adverse effects of climate change.
- **Self-organizing capacity:** This is achieved through fostering participatory approaches to build and strengthen capacities.
- **Learning capacity:** This involves the optimal use of information, technology, knowledge, and past experiences.

### 1.3. Algeria's Strategies for Adapting to Climate Change and the Challenges It Faces

This axis examines a range of strategies adopted by Algeria to address the risks arising from climate change, followed by an analysis of the key challenges the country encounters in this domain.

#### 1.3.1. Algeria's Strategies for Adapting to Climate Change

Within the framework of its national plan, which incorporates mechanisms for adapting to the effects of climate change, Algeria aims to confront major climate-related risks by relying on technical, legal, institutional, economic, and social dimensions of adaptation. These dimensions can be outlined as follows:<sup>8</sup>

- **Technical Dimension:** In this context, Algeria has identified key priorities to strengthen its technical capacities, including:
  - Enhancing institutional capacities in scientific research across fields related to climate change.
  - Developing technologies and exploiting renewable energy sources.
  - Establishing a comprehensive information system to provide essential data to all relevant bodies involved in developing adaptation technologies.
- **Legal and Institutional Dimension:** Following its accession to international and regional agreements, Algeria is working to strengthen both its legal and institutional frameworks to create a conducive environment for building resilience to climate change. Most laws related to climate change adaptation fall under environmental protection and sustainable development legislation, often taking the form of executive decrees or ministerial decisions. In addition to these decrees, various legal measures have been introduced targeting polluting industrial establishments to facilitate adaptation and minimize the damage caused by the phenomenon.

On the institutional level, Algeria has established several entities dedicated to environmental protection and sustainable development. These include relevant ministries and specialized bodies such as the National Observatory for the Environment and Sustainable Development, the National Center for Cleaner Production Technologies, the National Waste Agency, the National Institute for Environmental Training, the Coastal Planning Agency, and the National Agency for Climate Change (established in 2005 by Executive Decree No. 05/375). The latter aims to integrate climate change issues into all development plans and contribute to environmental protection.

- **Economic and Social Dimension:** In this regard, Algeria has developed a strategy to address the impacts of climate change on water resources, allocating more than 35 million USD in investments to the water sector.

The country also attaches great importance to the industrial sector by working to reduce greenhouse gas emissions through strengthened public-private partnerships, as well as local and international collaborations, to acquire cleaner production technologies.

In the transport sector, Algeria seeks to modernize its vehicle fleet to reduce air pollution and fuel consumption by encouraging the use of public transportation, promoting the purchase of new vehicles, establishing national technical inspection institutions for vehicles, and promoting the widespread use of less environmentally harmful fuels.

#### 1.3.2. Challenges of Adaptation to Climate Change

Countries face a variety of obstacles across political, economic, and security levels that may hinder their efforts to address the effects of climate change. In this context, the most prominent challenges affecting national capacities can be highlighted as follows:<sup>9</sup>

#### 1.3.3. Political Challenges: These include:

- The absence of effective governmental institutions capable of formulating comprehensive national strategies with specific actions and a holistic vision, which significantly undermines effective response. This is compounded by the fragility and weakness of qualifying infrastructure that would enable the state to enhance its resilience against climate change impacts and natural disasters, as witnessed in the devastating floods in Libya, Pakistan, and currently Somalia, the destructive earthquakes in Turkey, Syria, and subsequently Morocco, and forest fires in Algeria and South Korea.

Algeria faces a clear challenge in this area due to the lack of adequate training frameworks and specialized centers, resulting in a severe shortage of reliable climatic and environmental data.

- Divergent national visions regarding how to phase out climate-polluting sources, particularly emissions from all forms of fuel use. Disagreements persist over the future of fossil fuels (oil, natural gas, and coal). While some countries advocate

<sup>7</sup> Saida Kahal, "Climate Changes and Environmental Degradation: Toward Climate Governance for Adaptation and Mitigation Policies," *Legal and Political Research Journal* 8, no. 2 (June 2023): 505.

<sup>8</sup> Haddad and Qalaqil, "The Impact of Climate Change," 10 ff.

<sup>9</sup> "Item 8835," Future UAE, accessed September 12, 2025, <https://futureuae.com/ar-AE/Mainpage/Item/8835>.

for a gradual reduction leading eventually to their complete elimination, others call for a more immediate and total phase-out.

### 1.3.4. Economic Challenges: These include

- **Shortage of financial resources:** This represents a major obstacle that negatively affects countries' capacities and preparedness to confront climate change, especially as many nations have been grappling with intensified financial and economic crises over the past three years due to the COVID-19 pandemic and the subsequent Russian-Ukrainian war.
- **Depletion of natural resources:** The scarcity of natural resources, particularly water, constitutes one of the most pressing challenges. Many countries are experiencing increasing water poverty, which poses an existential threat to their populations.

## 2. CONCLUSION

In conclusion, this study affirms that, in its pursuit of the Sustainable Development Goals, Algeria has developed strategies that contribute to adaptation to climate change. Nevertheless, the diverse challenges facing nations — which significantly affect their ability to confront the impacts of climate change — necessitate the exploration of innovative and effective solutions. These solutions are essential to equip countries with the necessary tools and measures to address such impacts, whether through global agreements that serve as roadmaps to strengthen their capacities in mitigating climate change effects, or at minimum, to support their adaptation efforts in the coming years.

Based on the above, this paper puts forward the following recommendations:

- Adapting the legal and legislative framework to incentivize individuals and institutions to shift toward the use of clean energy.
- Providing adequate financial resources and suitable funding sources for climate change adaptation programs, while encouraging greater participation of the private sector in financing.
- Integrating climate action programs and plans into national sustainable development strategies and policies.
- Activating partnerships between universities and local and international research centers to acquire modern technologies, particularly in the field of renewable energy, which represents a fertile area deserving further development.
- Enhancing the role of civil society organizations in raising environmental awareness about the dangers of climate change, ensuring compliance with climate protection systems, and curbing environmental degradation.

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