



Climate Change and Water Conflicts: Their Implications for Water Security in Algeria

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Abstract ;	Article info
<p>Climate change has immediate and direct impacts on water resources, including floods, droughts, and social conflicts over water and food access. This critical paper focuses on the interlink between climate change, water availability, and social conflicts in Algeria. The Algerian government faces challenges in addressing these issues comprehensively due to implications for socioeconomic development and national stability.</p> <p>The essay utilizes an interdisciplinary approach to analyze tensions and conflicts induced by droughts and water scarcity. The war in Syria serves as an example of the cumulative impacts of drought on the economy, agriculture, and food security. The paper presents the current situation regarding drought, climate change, water, and food security in Algeria, along with an analytical framework and recommendations for further research.</p>	<p>Received novembre 09.2024</p> <p>Accepted May 21.2025</p> <p>Keyword:</p> <ul style="list-style-type: none">✓ Climate change,✓ Water Conflicts,✓ Water Security

1. Introduction

This study explores the relationship between climate change and the water security of the Algerian people, for whom water is a matter of life and death. Today, the Algerian population is more exposed to heavy rains and their consequences, such as floods and droughts, which lead to a collapse of the most important socio-economic sectors, such as agriculture and energy. Regular interruptions of electricity and drinking water supply are becoming urgent issues for the Algerian people, who are already grappling with high unemployment rates and a shortage of cash due to the lack of foreign exchange earnings as a result of lower oil and gas prices. In the Algerian Sahara, nonrenewable fossil aquifers are, along with hydropower, the basis of human development.

However, available groundwater resources have fallen considerably over the past three decades due to the depletion of aquifers. The environmental costs are enormous and combine with the socio-economic costs for the future of the local population. In addition, the resource in question plays an important role as a bulwark against social tensions and a source of inspiration for terrorism in marginal Sahara sectors. The estimates of withdrawals for drinking water,

irrigation, and livestock are considered today to be risky because they could create serious problems for the security and integrity of the resource in several sites. This is why we will examine two expressions of the impact of climate change on water security in Algeria in the next two subsections, and the indicators of the existence of armed conflicts fueled by the water issue in the last two sections.

Research problem :

How does climate change exacerbate water security challenges in Algeria, and what socio-political factors contribute to the emergence and escalation of water-related conflicts?

Climate Change Impacts on Water Resources in Algeria :

The impacts of climate change on water resources in Algeria have greatly increased the vulnerability of the country, particularly in terms of water management. The occurrence of climatic phenomena, both high and low-frequency, has resulted in a heightened number of climatic hazards, loss of habitats, and a decline in agricultural and fisheries productivity. Unavailability and difficulty in accessing these vital resources are primarily indicated by two factors: precipitation anomalies, commonly known as droughts, and rising temperatures that trigger increased

evapotranspiration, consequently reducing water resources.

In Africa, climate-related impacts on water availability vary based on regional and spatial factors. The eastern part of the continent experiences higher water stress compared to the western region. Projections indicate that the Sahara, where around 1,000 dams have been constructed to harness wadis originating in the Atlas Mountains, is expected to face extreme water scarcity by 2025. Algeria, situated in the North Africa region as one of the Maghreban countries, possesses a semi-arid to arid climate, resulting in varied water resource availability depending on the specific region and season. The study reveals that the impact of climate change in the North African region is also influenced by geographical factors such as topography and the presence of relief, including mountains and depressions along the Atlas chain. These geographic features divide the region into distinct geographical and climatic entities, promoting the diversification of climates and juxtaposition of potential water resources.

Consequently, the effects of climate change also impact the socio-economic vulnerability of different regions, leading to a decrease in

economic performance, particularly affecting the agricultural sector. Notably, agriculture represents a significant portion of the workforce, accounting for approximately 12.1% of the active population in 2017. Considering the pivotal role of water resources in the socio-economic development of Algeria, particularly in the agricultural sector, this expansion aims to delve into the characteristics of water resources and the distribution of rainfall across the Algerian territory¹.

Water Conflicts in Algeria: Causes and Consequences

Underlying causes of water conflicts in the country The competition for limited water resources is the primary cause of conflict in Algeria. This struggle has progressively intensified due to an unprecedented impact of climate change and significant population growth. The rural exodus that has been recorded in certain regions, including the Tellian country and throughout the arid zone on the southern slopes of the mountains, has also contributed substantially to this phenomenon. Additionally, the desertification of certain areas has further aggravated the scarcity of water resources, leading to heightened tensions².

Socio-political context of water-related conflicts in Algeria The socio-

political context of Algeria is also promoting the emergence of various water disputes and their intensification on a diverse scale. Five main socio-political arguments express this assertion:

- (1) Disproportionate demographic growth
- (2) Governance of water conflict
- (3) Historical mismanagement of water
- (4) Concern of populations about the future
- (5) Sustained decivilizing trend of society and spurious management of its resources.

These factors intertwine, creating a complex web of issues that exacerbate water conflicts across the country³.

Consequences of water conflict in Algeria Water disputes exacerbate the socio-economic distress of affected populations while undermining the productivity of the agricultural sector, their primary source of food. As water scarcity intensifies, farmers struggle to cultivate their lands, resulting in decreased crop yields and livelihood instability.

More seriously, these tensions promote the dismantling of the social fabric of local populations, as communities are divided over access to and control of water resources. The adversarial relationships that arise further challenge civil society and strain the capacity of Algerian public authorities to effectively manage and resolve these conflicts⁴.

Water conflict: case study The study of the different regions of Algeria shows us the importance of water in recent years in the civil unrest cases that have erupted. Among the various water disputes, three case studies allow us to highlight both the proximity of the

populations to the phenomena of water scarcity, their interactions, and the socio-economic concentrations that will be affected in the future, mainly in the conflicts arising from the water scarcity of the Medjerda dam. The vicinity of the Medjerda dam, the longest river in the North, is also the most important in an ecological, civilizational, and agricultural context. The first zones fall within the Said area with a Saharan vocation that borders the Medjerda and the Medjerda of Tablat, with an Algerian Tarabi region.

These areas not only face water scarcity but also struggle with the consequences of desertification, making the already limited water resources even more scarce. The provinces of Batna, Echalahda, and Magna are dependent on the water supply of the Medjerda in several sectors, especially agriculture and livestock. But these links concern both the western and eastern parts of the Medjerda, where the extent begins to spread towards the east of the Arab area, with cities like Aïn Beida and others, creating a ripple effect of water-related conflicts⁵.

The Intersection of Climate Change and Water Conflicts :

Climate change and conflicts have been identified as distinct security threats and are considered environmental risks that exacerbate one another. Environmental degradation, including water scarcity, leads to social and economic stress caused by limited access to resources and environmental pollution, while social stress leads to environmental degradation. Dissolving the boundary between climate change and conflicts and demonstrating how to build rational and coherent policy at the local and national levels highlighted the

usage of the concept of water conflicts in Algeria. This section comprises two case studies from Algeria, which evidence that climate change increased water stress by reducing water quality and quantity and subsequently created water conflict at the local government level. Beyond the scope of this discussion, water conflicts in Algeria also affect stability in the surrounding Maghreb and Al-Maghrib region.

The link between environmental violence and climate change has mainly been addressed in light of their feedback loops, in which conflicts contribute to environmental degradation. Conflict over resources is both a result and cause of environmental scarcity. This section also exhibits the feedback loop between climate variation and water conflicts. The findings and their implications suggest the need for a comprehensive approach to policy-making in which environmental and conflict resolution strategies are embedded within each other in order to achieve long-term success. The results illustrate the complexity of the drivers of water conflict. It was suggested that water scarcity and its impact on Algerian society should be taken into account due to their relation to other factors, such as conflict, and narrations of 'water wars' outside of broader state-making processes⁶.

it is crucial to recognize that climate change and conflicts not only pose distinct security threats but also have interconnected and mutually reinforcing impacts. The intricate relationship between these two phenomena underscores the urgency of addressing environmental risks as critical factors in conflict escalation and prevention.

With a focus on environmental degradation, especially concerning water scarcity, the consequences ripple through societies, causing social and economic stress due to restricted resource accessibility and the detrimental effects of environmental pollution. In turn, these social stressors further contribute to the degradation of the environment.

In understanding the intersectionality of climate change and conflicts, it becomes evident that the conventional boundaries that separate them must be dismantled. This realization calls for the development of rational and coherent policies at both the local and national levels. By examining the concept of water conflicts in Algeria, we shed light on how climate change acts as a catalyst, intensifying water stress by diminishing both its quality and quantity. The repercussions manifest in the form of water conflicts, permeating the structures of local government. However, the implications extend far beyond Algeria's borders, impacting the stability of the Maghreb and Al-Maghrib regions⁷.

Exploring the link between environmental violence and climate change underscores the presence of feedback loops that perpetually exacerbate each other. Conflicts contribute to the environmental degradation that climate change exacerbates, while environmental scarcity serves as both a cause and a consequence of resource-related conflicts. Furthermore, this section elucidates the reciprocal relationship between climate variations and water conflicts, emphasizing the dynamic nature of their interaction.

To effectively address these challenges, it is imperative to adopt a comprehensive approach to policy-making. Such an approach necessitates integrating environmental and conflict resolution strategies, intertwining them to achieve long-term success. The complexity of water conflict drivers becomes palpable through the findings presented, warranting consideration of water scarcity and its societal impacts in Algeria. It is crucial to recognize their interconnectedness with other factors such as conflicts and narratives surrounding the notion of "water wars" outside the realm of broader state-making processes. Thus, an encompassing perspective that acknowledges the intricate web of interdependencies is essential. Only through this holistic approach can lasting solutions be attained⁸.

Strategies for Enhancing Water Security in Algeria :

While apparent conflict drivers like climate change and disputes must be addressed before they result in rampant violence, there are numerous strategies available to enhance water security and ensure a sustainable future. It is of utmost importance to improve water management practices by enhancing efficiency, productivity, and sustainability to meet the growing demand for water resources.

Reducing water losses during supply and increasing reuse must go hand in hand with the adoption of better and energy-efficient desalination technology, which has become a frequent and essential choice worldwide to enhance local water security and combat water scarcity⁹.

Currently, desalination by reverse osmosis technology accounts for a

significant contribution to water supply, especially in arid regions where traditional freshwater sources are limited. It serves as a vital global leader in efficiently desalinating seawater into drinking water, providing a reliable source of freshwater for countless communities. To ensure continued progress, the focus should remain on reducing capital expenditure through the utilization of more advanced desalination technology while guaranteeing high levels of security and operational efficiency¹⁰.

Simultaneously, developing a knowledge-based society is a prerequisite for transforming water use efficiency and resource management, effectively delaying the unavailability of water for essential agricultural activities. Strategic investments in physical infrastructure, particularly in regions at risk, play a crucial role in enhancing water security. Careful consideration must be given to designing these strategies with a long-term perspective, as overreliance on hyper-centralized systems can present challenges and potential vulnerabilities.

At the local level, community engagement and awareness initiatives significantly contribute to bridging the gap in knowledge and fostering a sense of responsibility among the population and stakeholders. Furthermore, the decentralization of water supply systems through the implementation of small-scale water desalination facilities powered by renewable energies presents an enticing solution. This approach efficiently provides potable water in remote and hyper-arid regions, ensuring sustainable access to a vital resource.

Additionally, at the strategic level, investment in increasing water storage

capacity and reducing water supply losses is imperative. By constructing reservoirs and adopting innovative technologies for water storage, we can effectively meet future demands while minimizing waste. Moreover, promoting the reuse of treated wastewater and the responsible exploitation of brackish aquifers proves to be a promising strategy. These physical infrastructure investments should be based on comprehensive risk and vulnerability assessments to maximize their efficacy and long-term sustainability¹¹.

In conclusion, addressing the challenges of water security requires multifaceted strategies that prioritize efficient water management, technical innovation, community empowerment, and strategic investments. By implementing these measures, we can ensure a sustainable and secure water future for generations to come.

Conclusion:

This chapter summarizes the main issues presented throughout the essay, providing an account of the escalating linkages between climate change, water conflicts, and water security in Algeria. It confers on the broader implications of the analysis and offers forward-looking policy recommendations designed to mitigate future risks.

It has been demonstrated that climate-induced water stresses are a cross-cutting issue for water users operating in many diverse sectors of Algeria. Recruiting an adaptive approach, based on forward thinking, can represent the best social, political,

and economic strategy. Stricter governance offers opportunities for more inclusive and innovative policy agendas and reduces the risks of water disputes. It has already been demonstrated that water management can be addressed in stages through collaborative management, capacity building, knowledge production, and the construction of many water institutions. There is no need to give up planning.

However, the sustainable histories of different modes of governance suggest that investment in state-led policy processes and the construction of water institutions is much more cost-effective and productive in terms of conflict resolution than more investment in new laws and regulations. An informed public opinion, based on research, is a driver of positive societal change. Similarly, the availability of reliable monitoring data is crucial for organizational learning.

Citizens have much to gain from water disputes being resolved and feel more secure from having a voice and equal access to water. In a country where such collective strategies are both possible and viable, appealing to the rhetoric of national identity and values of social justice can be effective. Economic and environmental water

institutions are also more likely to be viable than neighborhood models in the arid dryland peripheries of less elite urban zones, especially in areas crowded with vulnerable migrants.

Recommendations:

An early warning system is a suitable tool to prevent conflicts over water resources.

Comprehensive data on social, economic, and environmental aspects of water can be collected and analyzed to detect changes and influence management decisions.

Cooperation among the Arab and international community is crucial to clarify concepts, establish responsible arrangements, and encourage balanced resource use.

National institutions should also encourage cooperation with neighboring countries.

Regional agreements and dispute resolution mechanisms should be pursued to ensure sustainability and peace.

Failing cooperation may require costly measures like mediation or third-party adjudication.

Margins:

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