



REFRAMING WATER SECURITY UNDER CLIMATE CHANGE: A POLITICAL–INSTITUTIONAL FRAMEWORK FOR ADAPTIVE GOVERNANCE

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Abstract:

The accelerating impacts of climate change have fundamentally reshaped the concept of water security, moving it beyond concerns of physical water scarcity and technical resource management toward a broader political and institutional challenge. This article aims to reframe water security through a political and institutional perspective by examining the evolution of the concept within security studies, tracing its transition from national security to human and environmental security, and analysing how climate change has politicized water governance while increasing the strategic importance of public institutions and governance systems. The study adopts a conceptual and analytical approach based on a critical review of contemporary literature in political science, security studies, environmental governance, and climate policy. It argues that climate change does not directly generate political crises; rather, it functions as a multiplier of institutional vulnerabilities by interacting with weaknesses in governance systems. Consequently, long-term water security depends less on the physical availability of freshwater than on governance quality, institutional capacity, adaptive governance, and multilevel coordination. Building on this argument, the article proposes an integrated political–institutional framework that conceptualizes water security as the outcome of interactions among environmental sustainability, institutional capacity, governance quality, societal resilience, and multilevel cooperation. The proposed framework provides a more comprehensive analytical foundation for understanding water security under climate change and offers valuable insights for future research and public policy aimed at strengthening resilience, sustainability, and effective governance.

Keywords: Water Security; Climate Change; Adaptive Governance; Institutional Capacity; Environmental Governance; Environmental Security; Water Governance; Institutional Resilience.

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Introduction :

Water security has become one of the defining governance challenges of the twenty-first century. While concerns over freshwater availability have long occupied a central place in environmental policy, the accelerating impacts of climate change have fundamentally transformed both the nature of water-related risks and the approaches required to address them. Increasing temperatures, prolonged droughts, changing precipitation patterns, glacier retreat, groundwater depletion, and the growing frequency of extreme hydrological events have exposed the limitations of conventional water management models that were primarily designed under assumptions of climatic stability. Consequently, ensuring water security has evolved from a predominantly technical objective into a multidimensional political and institutional challenge.

Recent debates in political science and environmental governance increasingly recognize that water insecurity cannot be explained solely by physical water scarcity. Countries experiencing comparable climatic conditions often display markedly different levels of resilience because institutional quality, governance effectiveness, public policy, and state capacity significantly influence their ability to manage environmental uncertainty. Climate change therefore acts less as an isolated environmental threat than as a catalyst that amplifies existing governance weaknesses and institutional vulnerabilities.

Against this background, this article seeks to reframe water security through a political and institutional perspective. Rather than approaching water security primarily as a hydrological or engineering issue, it argues that contemporary water security is fundamentally shaped by governance systems, institutional resilience, adaptive policymaking, and multilevel political cooperation. This perspective reflects the growing convergence between political science, environmental governance, security studies, and climate policy.

The central research problem addressed in this article is formulated as follows:

How has climate change transformed the concept of water security from a resource management issue into a political and institutional governance challenge?

To answer this question, the article addresses the following sub-questions:



- How has the concept of water security evolved within contemporary security studies?
- In what ways has climate change contributed to the politicization of water governance?
- What role do state capacity and governance quality play in strengthening water security under conditions of climatic uncertainty?
- How can adaptive governance contribute to building resilient and sustainable water security systems?

The article advances the following hypotheses:

- Climate change has fundamentally transformed water security into a multidimensional political and institutional issue rather than a purely hydrological concern.
- Institutional capacity and governance quality exert greater influence on long-term water security than physical water availability alone.
- Adaptive governance represents the most effective institutional approach for strengthening resilience under conditions of climatic uncertainty.

Methodologically, the study adopts a conceptual and analytical approach based on a critical review of the contemporary literature in political science, security studies, environmental governance, and climate policy. By synthesizing theoretical contributions from these disciplines, the article develops an integrated political–institutional framework for analysing water security under climate change.

THE FIRST TOPIC: The Evolution of Water Security under Climate Change

The accelerating impacts of climate change have profoundly transformed the conceptual foundations of water security. Once regarded primarily as a technical issue associated with water supply, infrastructure, and resource management, water security has evolved into a multidimensional concept situated at the intersection of environmental governance, political institutions, and sustainable development.



This evolution reflects broader changes in security studies, where environmental pressures are increasingly understood as strategic challenges that influence state capacity, public policy, and societal resilience¹. Accordingly, this topic examines the evolution of water security within contemporary security studies and analyses how climate change has contributed to the politicization of water governance.

FIRST REQUIREMENT: The Evolution of Water Security in Security Studies

The concept of water security has evolved in parallel with the broader transformation of security studies over the past several decades. During the Cold War, dominant realist approaches defined security primarily in military terms, emphasizing territorial integrity, national sovereignty, and the protection of state interests. Within this framework, water was viewed mainly as a strategic economic resource supporting agricultural production, industrial development, and national infrastructure. Consequently, water management remained largely confined to technical disciplines such as hydrology, engineering, and public administration, while its political significance received comparatively limited scholarly attention².

The end of the Cold War marked a turning point in security thinking. The emergence of new transnational threats—including environmental degradation, climate change, food insecurity, pandemics, and resource scarcity—challenged traditional state-centred conceptions of security. Scholars increasingly argued that long-term security could no longer be explained solely through military capabilities but also depended upon economic stability, environmental sustainability, institutional effectiveness, and human well-being. Within this broader analytical framework, water gradually emerged as a strategic component of contemporary security debates³.

Climate change has significantly accelerated this conceptual transformation. Scientific evidence demonstrates that changing precipitation patterns, prolonged droughts, glacier retreat, groundwater depletion, and extreme weather events are disrupting freshwater systems across the globe. These developments have exposed the limitations of conventional water management approaches that were designed under relatively stable climatic conditions. Governments are now required to govern increasingly uncertain socio-ecological systems, making institutional adaptability and governance quality essential determinants of water security⁴.

As a result, contemporary definitions of water security extend far beyond ensuring adequate quantities of freshwater. They incorporate equitable access to



water, ecosystem protection, disaster risk reduction, institutional resilience, and adaptive governance⁵. Water security has therefore become a multidimensional concept linking environmental sustainability with political stability, economic development, and institutional performance. This evolution reflects a broader recognition that effective governance, rather than physical water availability alone, increasingly determines the resilience of societies facing climate-related water challenges.

SECOND REQUIREMENT: The Politicization of Water under Climate Change

Climate change has transformed water from a technical resource management issue into a strategic political concern. As freshwater becomes increasingly scarce and hydrological uncertainty intensifies, decisions regarding water allocation, infrastructure development, ecosystem protection, and climate adaptation inevitably involve competing political interests. Water governance has consequently become an arena where questions of power, legitimacy, public policy, and institutional coordination play a central role⁶.

The politicization of water is evident at both domestic and international levels. Within states, governments must balance the competing demands of agriculture, urban development, energy production, environmental conservation, and public consumption while ensuring fairness, transparency, and long-term sustainability⁷. Such decisions are no longer guided solely by technical expertise but also by political priorities, institutional capacities, and societal expectations.

At the international level, climate change has increased the strategic importance of transboundary water governance. Shared river basins such as the Nile, the Euphrates–Tigris, and the Indus illustrate how water governance intersects with diplomacy, regional cooperation, and national security⁸. Contemporary research demonstrates that while water scarcity rarely leads directly to armed conflict, it substantially increases the importance of effective institutions capable of facilitating negotiation, information sharing, and cooperative governance among riparian states⁹.

Furthermore, the concept of hydro-hegemony highlights that power asymmetries significantly influence the governance of shared water resources. States possessing greater political, economic, or strategic influence often shape institutional arrangements governing transboundary waters. Consequently, water governance cannot be understood exclusively through hydrological conditions; it



must also be analysed in relation to political authority, institutional bargaining, and governance capacity¹⁰.

Ultimately, the politicization of water reflects a fundamental transformation in contemporary environmental governance. Climate change has demonstrated that water security depends not only on the sustainable management of freshwater resources but also on the effectiveness of political institutions in reconciling competing interests, maintaining public legitimacy, and fostering cooperation across sectors and borders¹¹. Water has therefore become a strategic governance issue whose successful management increasingly determines environmental sustainability, socio-economic resilience, and political stability.

THE SECOND TOPIC: Political and Institutional Responses to Water Security under Climate Change

The conceptual evolution of water security demonstrates that climate change has fundamentally altered the conditions under which water resources are governed. As environmental uncertainty increases, traditional governance models based on centralized decision-making and reactive crisis management have become progressively less effective¹². Contemporary water security therefore depends largely on the capacity of political institutions to anticipate risks, coordinate public policies, integrate scientific knowledge, and adapt to continuously evolving environmental conditions. This topic examines the role of state capacity and governance quality in strengthening water security and analyses adaptive governance as the principal institutional response to climate-induced uncertainty.

FIRST REQUIREMENT: State Capacity and Climate-Induced Water Risks

The capacity of the state has become one of the principal determinants of water security in the era of climate change. While climatic conditions undoubtedly influence freshwater availability, they do not alone explain why countries exposed to similar environmental pressures experience different governance outcomes. Institutional effectiveness, administrative coordination, regulatory quality, and political leadership frequently determine whether climate-related water challenges evolve into manageable risks or severe political and socio-economic crises¹³.

State capacity encompasses the ability of public institutions to formulate coherent policies, implement regulations, mobilize financial and technical



resources, enforce legal frameworks, and coordinate multiple actors involved in water governance¹⁴. Under conditions of climatic uncertainty, these functions become increasingly important because governments are required to respond simultaneously to environmental variability, economic pressures, and growing societal expectations. Effective institutions therefore operate not only as service providers but also as mechanisms for reducing vulnerability and strengthening resilience¹⁵.

Climate change also functions as a political risk multiplier. Rather than directly causing instability, it intensifies existing institutional weaknesses, socio-economic inequalities, and governance deficiencies¹⁶. Prolonged droughts, floods, declining groundwater reserves, and changing precipitation patterns generate pressures on agriculture, food security, public health, and energy production. Where governance systems are resilient, these pressures can be managed through adaptive planning and coordinated public policies¹⁷. Conversely, weak institutions often amplify environmental stress, increasing the likelihood of social tensions, economic disruption, and declining public trust.

Another critical dimension concerns institutional legitimacy. Climate adaptation frequently requires politically sensitive decisions involving water allocation, infrastructure investments, pricing reforms, and restrictions on water consumption. Public acceptance of these measures depends upon transparent governance, accountability, and effective communication between public authorities and society. Institutional legitimacy therefore represents an essential component of long-term water security¹⁸.

Overall, contemporary water security reflects the quality of governance rather than hydrological conditions alone. Climate change has transformed institutional resilience into a strategic national asset, demonstrating that effective governance is indispensable for protecting both environmental sustainability and political stability.

SECOND REQUIREMENT: Adaptive Governance and an Integrated Political–Institutional Framework

The increasing complexity of climate-related water challenges has encouraged the emergence of adaptive governance as a new paradigm for managing socio-ecological systems. Unlike traditional governance models that rely upon fixed planning assumptions and centralized administrative control, adaptive governance emphasizes flexibility, institutional learning, collaboration, and continuous policy



adjustment. It recognizes that uncertainty cannot be eliminated but must instead be governed through resilient institutions capable of responding to changing environmental conditions¹⁹.

Adaptive governance places scientific knowledge at the centre of political decision-making. Advances in climate modelling, hydrological forecasting, remote sensing technologies, and environmental monitoring provide governments with unprecedented opportunities to anticipate future risks²⁰. However, scientific information contributes to water security only when institutions possess the capacity to incorporate evidence into legislation, strategic planning, budgeting, and operational management. Effective governance therefore depends upon strengthening the relationship between science, public administration, and political leadership²¹.

Equally important is the principle of multilevel governance. Climate-related water challenges frequently transcend administrative boundaries and involve actors operating at local, national, regional, and international levels²². Sustainable water governance consequently requires effective coordination among central governments, local authorities, river basin organizations, scientific institutions, civil society organizations, and the private sector. Such collaborative arrangements enhance institutional resilience by facilitating knowledge exchange, shared responsibility, and coordinated responses to environmental uncertainty²³.

Building upon these considerations, this article proposes an integrated political–institutional framework for understanding contemporary water security. The framework argues that sustainable water security emerges through the interaction of five interdependent dimensions: environmental sustainability, institutional capacity, governance quality, societal resilience, and multilevel political cooperation. None of these dimensions operates independently. Instead, they reinforce one another, creating an integrated governance system capable of responding to climate-induced uncertainty while promoting long-term sustainability and political stability²⁴.

This framework also redefines the meaning of water security itself. Rather than viewing water security simply as the availability of sufficient freshwater resources, it conceptualizes it as the capacity of political and institutional systems to govern environmental uncertainty through adaptive, inclusive, and evidence-informed governance²⁵. Consequently, climate change should be understood not merely as an environmental challenge but as a continuous test of institutional performance, governance quality, and the resilience of political systems.



The adoption of this integrated perspective has important implications for both theory and practice. It encourages future research to strengthen the dialogue between political science, environmental governance, and climate studies, while providing policymakers with a comprehensive framework for designing institutions capable of enhancing resilience, sustainability, and effective governance under conditions of accelerating climate change.

Conclusion

This article has examined the transformation of water security under the accelerating impacts of climate change through a political and institutional perspective. The analysis has demonstrated that water security has evolved from a narrow concern with water availability and technical resource management into a multidimensional governance issue closely linked to institutional capacity, public policy, environmental sustainability, and political resilience. Climate change has fundamentally altered the conditions under which water resources are governed, requiring governments to move beyond conventional management approaches toward adaptive and integrated governance systems.

The study further argues that climate change should not be understood as an independent source of political instability. Instead, it operates as a multiplier of existing institutional vulnerabilities, exposing weaknesses in governance structures, administrative coordination, and public policy. Consequently, the quality of institutions has become a decisive factor in determining whether environmental pressures translate into resilience or crisis.

Another important finding concerns the central role of adaptive governance. The increasing uncertainty associated with climate change requires governance systems capable of continuous learning, institutional flexibility, scientific integration, and multilevel coordination. Water security therefore depends not only on the availability of freshwater resources but also on the capacity of political institutions to anticipate risks, formulate coherent policies, engage stakeholders, and maintain public legitimacy.

The integrated political–institutional framework proposed in this article contributes to the growing literature on environmental governance by positioning governance quality, institutional capacity, societal resilience, and political cooperation as mutually reinforcing pillars of sustainable water security. This perspective offers a broader analytical foundation for understanding the relationship between climate change, governance, and water security while



encouraging greater dialogue between political science, environmental studies, and public administration.

Main Findings

The study reaches the following conclusions:

1. Water security has become a multidimensional political and institutional issue rather than a purely technical or hydrological concern.
2. Climate change primarily amplifies existing governance weaknesses instead of directly causing political instability.
3. Institutional capacity and governance quality are fundamental determinants of long-term water security.
4. Adaptive governance provides the most appropriate institutional approach for managing climate-induced uncertainty.
5. Sustainable water security requires integrated cooperation among governmental institutions, scientific organizations, civil society, and international actors.

Recommendations

Based on these findings, the article proposes the following recommendations:

- Strengthen institutional capacity through comprehensive governance reforms that improve coordination, accountability, and administrative effectiveness.
- Integrate climate science and risk assessment into national water policies and long-term strategic planning.
- Promote adaptive governance by encouraging institutional learning, policy flexibility, and evidence-based decision-making.
- Enhance stakeholder participation to improve policy legitimacy and incorporate local knowledge into water governance.
- Expand regional and international cooperation for the management of transboundary water resources through information sharing, joint planning, and preventive water diplomacy.



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- Encourage interdisciplinary research that integrates political science, environmental governance, climate studies, and public administration to develop more comprehensive approaches to water security.

In conclusion, ensuring water security in the twenty-first century requires more than technological innovation or infrastructure development. It requires resilient political institutions capable of governing uncertainty, adapting to environmental change, and balancing sustainability with social equity and political stability. Reframing water security from a political and institutional perspective therefore provides a more comprehensive basis for both academic research and effective public policymaking in an era of accelerating climate change.

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