

Water Stress, Integrated Water Governance and Socio-Economic Resilience: A PRISMA-Based Systematic Review

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Abstract

Water stress is increasingly recognized as a multidimensional sustainability challenge affecting water security, livelihoods, food systems, social vulnerability and territorial resilience. Previous reviews have generally examined water governance, integrated water resources management or resilience as separate research streams. This article addresses this fragmentation by systematically reviewing how recent literature links water stress, integrated water governance and socio-economic resilience within a single analytical framework. Its originality lies in conceptualizing water stress as a multidimensional pressure, integrating water governance as a mediating mechanism, and conceptualizing socio-economic resilience as a differentiated outcome across territories, sectors, and vulnerable groups.

In accordance with the PRISMA 2020 guidelines, this review examines peer-reviewed articles and reviews found in Scopus and Web of Science from January 1, 2020, to May 31, 2026. The approach utilized three main themes: water stress and scarcity; water governance and integrated water resources management (IWRM); and socio-economic resilience, vulnerability, and adaptive capacity. From an initial collection of 486 records, the final selection included 162 studies after eliminating duplicates, screening titles and abstracts, plus assessing eligibility. The analysis incorporates systematic screening, descriptive bibliographic reviews, keyword analysis, geographical mapping, and thematic interpretation. Results indicate a significant increase in publications in journals focused on water resources, sustainability, and environmental management post-2024. Scientific output reveals a regional imbalance largely centered in Asia, followed by Europe and the Americas. The review highlights five key thematic areas: factors driving water stress; governance frameworks and institutional responses; pathways to socio-economic vulnerability; strategies for resilience and adaptive capacity; and holistic approaches that integrate water stress governance with resilience efforts. Ultimately, these findings indicate that water stress is not merely a matter of physical shortages but also involves issues of governance and resilience influenced by factors such as institutional capabilities, policy coordination processes, stakeholder involvement prioritization, infrastructure readiness, social protection mechanisms, community knowledge harnessing, and adaptability skills.

Keywords: Water stress, Integrated water governance, Socio-economic resilience, Water scarcity, Climate change adaptation.

JEL Classification: Q25, Q56, Q54, Q58, O13

Paper type: Theoretical Research

1. Introduction

As drought events intensify and diversify, freshwater resources are under increasing pressure due to changes in climate patterns, accelerated population growth, shifts in agricultural production, urbanization, and the effects of economic change on the availability of freshwater services. Many water-scarce areas experience decreased access to water due to a combination of environmental issues and external factors such as poverty and unemployment. In addition to these socio-economic risk factors, areas experiencing severe water scarcity also receive inadequate investment in creating new sustainable water sources. Water security positively affects economic development, social peace, climate action, and sustainable development.

Recent global assessments also emphasize that water security is increasingly linked to prosperity, peace, social stability and sustainable development, confirming that water stress should be analyzed beyond physical scarcity alone (Programme 2024).

Water stress is increasing due to climate change through impacts on hydrological processes, greater incidences of droughts and floods, greater uncertainty in the long-term availability of water, and pressure on human and natural systems. The risk of future increases is likely to rise without effective adaptation measures, similar to those already implemented in much of the world (I.P.C.C. 2022). Therefore, we cannot understand water stress solely through hydrological indicators; we must also consider how institutions regulate access to water, manage competing uses, engage stakeholders in decision-making, and assist communities, regions, and sectors in adapting to changing conditions. Integrated Water Resources Governance (IWRG), particularly in developing countries, has emerged as an essential tool for managing water resources through integrated resource management, adaptive governance, stakeholder involvement, and multi-level coordination. However, most of the existing governance systems do not result in equitable socio-economic resilience because many affected regions continue to experience poverty, food insecurity, pressures for migration, loss of livelihoods, gender inequities, and unequal access to water services. While water scarcity, governance, and resilience appear as separate areas of scholarship, there is a gap in the literature on how governance mechanisms influence the nexus between water stress and socio-economic resilience, preventing a comprehensive understanding of their interaction.

The literature remains fragmented in at least four complementary ways. First, it is disciplinarily fragmented; hydrological and technical studies tend to look at the quantity of water and how severe droughts are or the provision of some type of infrastructure, while institutional and socio-economic studies would look at the quality of governance, vulnerability, livelihoods, equitable access to water, and the adaptive capacity of people or regions. Second, the literature is organized by study method: quantitative models, bibliometric maps, case studies on governance, and qualitative studies of resilience do not always connect with one another. Third, the literature is spatially fragmented; works associated with local, basin, national, and transboundary dimensions of water stress are usually analyzed independently, although many water-related vulnerabilities cross both administrative and ecological boundaries. Fourth, there is heterogeneity in the indicators of resilience; studies that focus on adaptive capacity and livelihood security generally have different indicators than studies that focus on institutional learning, infrastructure, food security, migration or social safety nets.

Existing reviews have offered valuable insights on a number of elements in the area of water management, including, but not limited to, Integrated Water Resources Management (IWRM), climate change adaptation, drought risk, hydrological scarcity, and socio-economic vulnerability/resilience. However, in these reviews, one of those elements most often serves as the dominant entry point for organizing and summarizing research to date (for example, governance performance, hydrological scarcity, adaptation strategies, or socio-economic vulnerability).

The contribution of the present article is therefore specific and cautious. Rather than claiming to replace previous reviews, it seeks to connect these research streams within a single PRISMA-based synthesis. Accordingly, this article examines how recent scientific literature conceptualizes the relationships between water stress, integrated water governance and socio-economic resilience, with particular attention to the role of governance mechanisms in shaping vulnerability, adaptation and resilience outcomes.

The overall aim of this study is to synthesize recent peer-reviewed evidence regarding water stress, governance, and resilience through a systematic review. The study's four secondary aims support the overall objective. The first aim is to document the recent scientific evolution of water stress, governance, and resilience. The second aim is to characterize the various journals, document types, citation patterns, keywords, and geographical locations that define the field. The third aim is to identify the themes that link the literature on water stress to governance and socio-economic resilience. The fourth aim is to examine the analytical pathways by which governance can help reduce, modulate or replicate vulnerability under water-stressed conditions.

Structurally, this article presents three contributions that align with its review findings. First, a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)-based empirical review of 162 studies from the Scopus and Web of Science databases provides an evidence-based synthesis. This provides readers with a transparent perspective on a rapidly expanding body of literature on water stress, governance, and resilience. Second, the results indicate that the field is structured not only by hydrological scarcity but also, increasingly, by the interaction among additional variables: water management, climate change, governance, vulnerability, and adaptive capacity. Third, an analytical framework is proposed that integrates an understanding of water stress as a multidimensional pressure; governance as a practice that mediates among water resource users; and socio-economic resilience as a variable outcome shaped by territorial, institutional, and social factors.

The remainder of the article is organized as follows. Section 2 develops the theoretical background by clarifying the links between water stress, integrated water governance and socio-economic resilience. Section 3 presents the PRISMA-based methodology, including the search strategy, eligibility criteria, data processing and synthesis strategy. Section 4 presents the descriptive, bibliographic, geographical and thematic results. Section 5 discusses the theoretical and policy implications of the findings, with attention to governance mechanisms, vulnerability and resilience. Section 6 concludes the article by summarizing the main contributions, limitations and future research directions.

2. Literature Review and Theoretical Background

This theoretical section advances the conceptual foundation required to interpret the systematic results. It first clarifies how water stress has been reframed as a socio-ecological and institutional problem, then discusses integrated water resources governance as a mediating mechanism and finally identifies the gap that justifies the present review.

2.1. Conceptual foundations of water stress, governance and socio-economic resilience

More recently, globally, there has been a fundamental shift from a narrowly interpreted, resource-based approach to understanding water stress through a broader socio-ecological and governance lens. Water stress is no longer solely defined as the result of insufficient water supply; rather, it is seen as the consequence of a variety of interrelated factors, such as demand, access/availability, allocation, infrastructure, institutional capacity, and social vulnerability (Katusiime et Schütt 2020; Ngene et al. 2021; Ofori, Cobbina, et Obiri 2021). The limited capacity of fragmented institutions to coordinate development efforts inhibits their ability to

manage competition and uncertainty and to ensure equitable access to water, thereby creating a critical state of water scarcity.

Water stress has many complementary viewpoints. Technical-hydrological studies typically look at water stress by measuring variables related to water availability, drought severity, supply-demand ratio, water quality, and infrastructure deficit. Governance-type studies examine policy coherence, governance development, regulatory frameworks, stakeholder engagement, and implementation capabilities. Socio-ecological and resilience-type studies examine how ecological pressures affect livelihoods, adaptive capacity, and social vulnerability. Lastly, critical gender governance studies argue that water stress can also be created or compounded by a number of factors, such as unequal power relations, the selection of allocation methods, institutional exclusion, and the uneven distribution of water resources. In this light, the tension among these multiple perspectives on water stress suggests that we would benefit from conducting a multidimensional review of the problem by considering each of the above perspectives together (Biswas 2008; Boelens, Perreault, et Vos 2018; Molle 2008). Critical water studies further show that scarcity is not only a physical condition but also a socially and politically produced category shaped by access, rights, allocation and power relations (Boelens et al. 2018; Mehta 2003).

Table 1: Conceptual distinctions between key terms used in the review

Concept	Working definition in this review	Close concepts	Analytical distinction
Water stress	Pressure on water demand, availability, quality or access due to climatic, demographic, economic or institutional factors.	Water scarcity; drought; water insecurity	Broader than physical scarcity because it includes demand, access, governance and vulnerability dimensions.
Water scarcity	Insufficient water quantity in relation to demand.	Water stress; drought	More directly linked to quantitative shortage, while water stress also includes institutional and socio-economic pressures.
Water insecurity	Unreliable, unsafe, unaffordable or inequitable access to water for people, sectors or territories.	Water stress; vulnerability	Focuses on access, reliability, equity and human well-being rather than hydrological availability alone.
Integrated water governance	Coordination of actors, institutions, rules and policies across sectors and scales to manage water sustainably and equitably.	IWRM; water governance	Broader than technical management because it includes institutions, participation, allocation and power relations.
Adaptive governance	Flexible governance based on learning, experimentation, stakeholder participation and institutional adjustment under uncertainty.	IWRM; resilience governance	Emphasizes learning and adaptation more strongly than classical planning-based governance models.
Socio-economic resilience	Capacity of households, communities, sectors or territories to absorb, adapt to and transform under water-related shocks while reducing vulnerability.	Adaptive capacity; livelihood resilience	Focuses on social and economic outcomes rather than ecological recovery alone.
Water justice	Equitable distribution of water-related benefits, risks, responsibilities and decision-making power.	Equity; political ecology	Highlights power, rights, recognition and distributive conflicts often underemphasized in technical approaches.

Source: Authors' own synthesis based on the theoretical literature on water stress, IWRM, adaptive governance, resilience and water justice.

Researchers have established a link between water stress and livelihoods, migration, and women's socio-economic resilience. Hoffmann et al. (2022) and Irbi (2022) have indicated

that water-related pressures will constrain agricultural livelihood options, influence mobility decisions, and create differentiated vulnerabilities for women, especially those in fragile contexts or climates (Hoffmann et al. 2022; Irbik 2022). Additionally, these studies provide an economic/normative perspective on how economic incentives (Ross et al. 2024) and norms, values, etc., (Schulz et al. 2024) affect water-related decision-making. As such, the research shows that water stress is both a tangible condition of resource scarcity and a political condition that is experienced as such, governed by the same institutional, normative, and power relationships that govern all other human-created systems. Therefore, the current review will now examine how water-related pressures are managed and translated into socio-economic resilience through the governance theories that inform them.

The operational definition of socio-economic resilience for the purpose of this review is based on a community's, household's, sector's, and territory's ability to withstand water shocks by adapting their livelihood or resource use practices and to adapt their socio-economic and institutional structures to reduce vulnerability to water shocks, provide development potential, and provide an equitable share of the available water-related resources.

2.2. Theoretical approaches to integrated water resources governance

The concept of integrated water resources governance has evolved, as it is viewed as both an ecological resource, an economic input, a social good, a territorial asset, and a political object. The most recent literature continues to support the original IWRM framework, but has reframed it as a context-based, adaptive, institutional, and context-sensitive governance. Katusiime and Schütt (2020) have shown that IWRM's success depends on the policy context, the effective use of management tools and instruments, stakeholder participation, and local capacity. Ngene et al. (2021) reinforce this assertion, stating that in developing countries, IWRM's implementation is often limited by institutional weaknesses, governmental fragmentation, and limited financial resources. Thus, integrated governance can be viewed as an ongoing coordination of the various actors and sectors within a water basin, within the community of users, rather than the mere development of water policy or a set of legal instruments or plans.

Nagata et al. (2022) provide further insight into this issue, noting that for IWRM to be effective, it must be tied to the political, cultural, socio-economic, and hydrological characteristics of the area, and policies cannot be transferred from one area of the world to another without due regard to its unique context. As such, this distinction is significant in light of the different theoretical mechanisms of classical IWRM to adaptive governance (Nagata et al. 2022). Classical IWRM focuses on coordinating across sectors, users, and scales to ensure more coordinated management of water resources. Adaptive governance, on the other hand, focuses more on the ability to learn, adapt, manage uncertainty, experiment with institutions, and adjust regulatory systems as socio-hydrologic systems change, thereby providing integrated water governance as an integrated governance framework that combines the desire for coordinated management of IWRM with the flexibility, learning and participatory aspects of adaptive governance.

Various distinct mechanisms can identify how governance can operate as a mediator. Firstly, the allocation mechanism determines how water is allocated to different sectors of use, namely households, agriculture, industry, ecosystems, and urban use. The coordination mechanism concerns the governance institutions' ability to coordinate across sectors, administrative levels, and geographical areas when aligning policies. Governance institutions are subject to learning mechanisms, whereby systems are adjusted to respond to uncertainty based on mechanisms (e.g., learning through monitoring, providing feedback, experimenting, and changing through institutional adaptation) (Pahl-Wostl 2009). The extent to which governance systems integrate users of water, communities, and vulnerable populations into decision-making depends on the participation mechanism. Governance systems use redistribution mechanisms to correct for unequal exposure to water risks and unequal access to resources for adaptation through policy

corrections. Finally, infrastructure investment mechanisms refer to the extent to which territories have the physical infrastructure to treat, store, and reuse water. Given this set of governance mechanisms, governance can mediate the impact of similar levels of water stress, leading to different resilience outcomes depending on the quality, inclusivity, and adaptability of governance systems.

The theoretical basis of the nexus and territorial literature is further supported and developed by Irbik (2022), who demonstrated that separating water-related vulnerability from other factors (migration, gender) made it much harder for humanity to address these issues cohesively. Grison et al. (2023) provide evidence that when water scarcity is intertwined with urban expansion, insufficient infrastructure and resource access, poverty, and climate hazards, an integrated approach to water governance is essential for a successful resolution of these combined implications for social and environmental systems (Grison et al. 2023). Monteiro et al. (2024) further support this with their research about agricultural systems, and that user behavior related to water will be influenced by the environmental, socio-economic, political, technological, and psychological influences; hence, water use must also reflect governance with regard to risk perceptions, incentives, trust, and daily use (Monteiro, Bahta, et Jordaán 2024). The authors who discuss the challenges of governing transboundary aquifers in data-scarce areas (Anghileri et al. 2024) demonstrate a clear need for increased collaboration between scientists and policymakers, while Okello et al. (2024) and Sithole et al. (2025) show that successful patterns of governance include water infrastructure, nature-based methods of managing water, Indigenous knowledge systems, and digital and institutional supports (Okello et al. 2024; Sithole, Morepje, et Mokoena 2025). Collectively, the contributions of the authors in these references support the idea of creating adaptable, inclusive, and contextually informed water governance systems that use formal political institutions, incorporate public input and experiences, and acknowledge the current socio-economic conditions of populations living in proximity to water. However, as noted above, the research conducted by the authors remains divided between separate empirical and conceptual frameworks; thus, this section provides clarity on the integration and progression of this body of work.

2.3. Research gap and positioning of the study

Literature on integrated resilience continues to grow globally. Early studies demonstrated relationships among water stress, governance quality and development systems, food security, migration, gender, behavior, conflict, ecosystem-based adaptation, and macroeconomic vulnerability, and increasingly focused on integrating these areas into a unified model. By 2024 and 2025, the literature began to clearly articulate that integrative resilience must come from the articulation of local practices, formal institutions, technological processes, and an inclusive means of governing.

As literature has evolved, so has the analytical fragmentation within the field. Some studies have focused primarily on IWRM and governance performance, while others have addressed water stress via agriculture, food security, livelihoods, migration, or gender. Still another body of literature examines the behavioral, economic, conflict-related, or ecosystem-based aspects of scarcity. The various strands are complementary yet not commonly connected within a single systematic framework. Therefore, there is a significant gap in synthesizing research on the interrelations among findings on water stress, governance, and resilience.

This literature review serves to fill that gap. The literature conceptualizes water stress as a multidimensional socio-economic system pressure, IWRM as the mediating mechanism that either mitigates or reproduces socio-economic vulnerability, and socio-economic resilience as the product of adaptive, inclusive, and joint governance. Therefore, it represents a unique theoretical and methodological contribution to the field as it establishes a foundation for linking hydrological stress, governance mechanisms, and resilience outcomes through a systematic

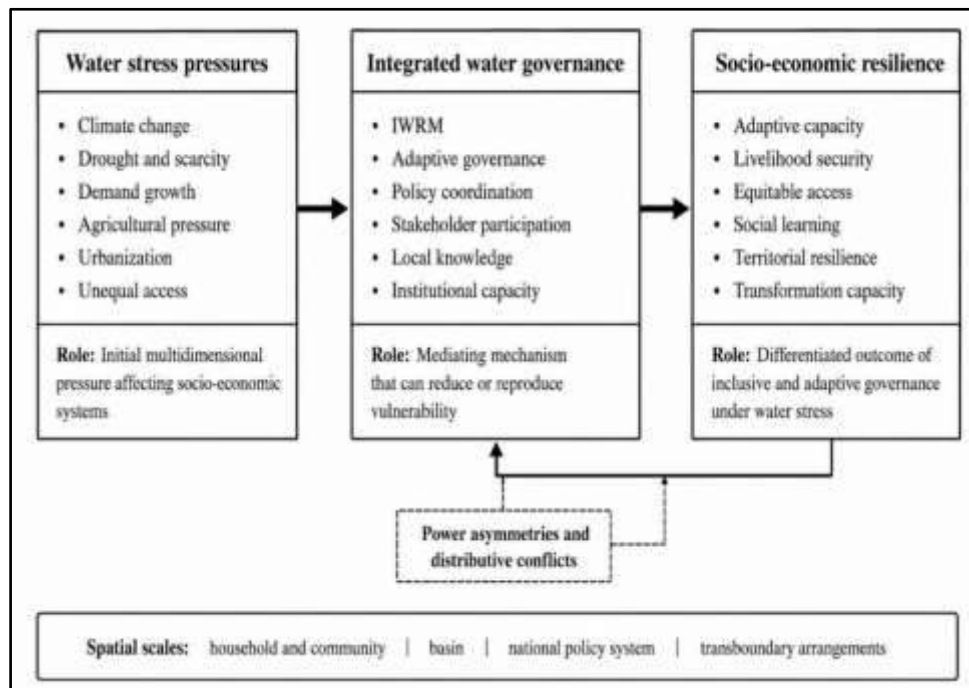
synthesis using the PRISMA methodology. Therefore, this literature review addresses the need for a systematic synthesis to clarify the pathways linking water stress to integrated governance and socio-economic resilience.

The position from which this analysis is written also requires recognition of the limits and controversies associated with integrated water resources management. While IWRM has offered a very strong framework to assist in coordinating water policies among different sectors and at different scales, it has also been critiqued as being too normative and technocratic and as an approach that is difficult to implement in all settings where institutional fragmentation, limited financial capacity, and unequal power relations exist (Biswas 2008; Molle 2008).

In many Global South countries, formal integration does not lead to effective participation, equitable allocation or more resilient systems. Therefore, the present study lies at the intersection of several related fields. Political ecology highlights power relations, conflict, and inequitable access to water. Socio-hydrology highlights the co-evolution of human societies and water systems, and climate adaptation studies highlight uncertainty, vulnerability and capacity to adapt. Sustainability transition research supports the understanding of long-term changes in both institutions and technology. These different perspectives come together and provide a more complete theoretical basis for the review, preventing the consideration of IWRM as a purely technical or universally applicable solution (Boelens et al. 2018; Linton et Budds 2014).

More specifically, this review applies political ecology to examine the power dynamics and distributional conflicts associated with water systems; socio-hydrology correlates changes within a water system to social responses; climate adaptation research identifies how vulnerability and adaptive capacity are defined; and sustainability transition analyses allow for the discovery of the institutional and technological changes that occur over time. As such, it is clear that integrated water governance is not viewed only as a neutral technical solution but also as an ongoing contested and multi-scalar process through which water stress is transformed into either vulnerability or resilience.

Figure 1: Integrative conceptual model guiding the review



Source: Authors' own conceptual synthesis based on the theoretical literature reviewed.

The review is guided by an integrative model in which water stress operates as a multidimensional pressure, integrated water governance functions as a mediating mechanism, and socio-economic resilience represents the outcome of adaptive, inclusive and coordinated responses.

The model is an illustrative dynamic representation, rather than a linear model, that depicts the reciprocal relationships among water stress, governance, and socio-economic resilience. Water stress influences resilience outcomes through various governance mechanisms, and the effectiveness of these outcomes ultimately provides feedback to the institution by shaping the ability to learn, make investment decisions, develop social trust, and adjust adaptive strategies in the future. The interaction of these three concepts operates at various scales from the household to the basin, from the national to the transboundary, and from different contexts, where there are often unequal power relationships among users, sectors, and territories. Therefore, governance will determine how water risks are managed, who is included in the recognition of vulnerability, and how adaptive capacity is strengthened or constrained.

3. Research Methodology

3.1. Review design and PRISMA protocol

This research includes a systematic literature review. A systematic literature review design meets the need to establish the research question at the intersection of several distinct research streams: water scarcity/stress, Integrated Water Resource Governance (IWRM), and socio-economic resilience. It is unlikely that a narrative review alone will be adequate in capturing the full range of studies and research conducted in these three areas, whereas a bibliometric approach alone may not provide sufficient information on how the various environmental pressures, IWRM governance mechanisms and socio-economic resilience interact through the process of developing and implementing water resource governance.

The literature review followed the PRISMA 2020 guidelines, a framework for systematic reviews (Page, McKenzie, et Bossuyt 2021). The PRISMA framework documents the process through which studies were included in the review, including the process from identification of records in databases through to final inclusion in the review, with regard to retrieval of records, removal of duplicates, assessment of records for eligibility to be included, and retention of studies for further analysis.

This research uses a theoretical, integrative systematic review approach rather than a meta-analytic design to test a statistical hypothesis or estimate a single effect. Thus, the overarching goal of the study is to synthesize current multidisciplinary literature on the linkages among water stress, social vulnerability, governance mechanisms, and resilience. The authors will maintain the credibility of this study by using the PRISMA protocol (Donthu et al. 2021; Grant et Booth 2009) for the identification, screening, and selection of studies that were deemed relevant for inclusion in this review and will use bibliometric indicators to describe and interpret various aspects of this field of research. By utilizing mixed-evidence synthesis that incorporates how the various and newly formed bases of research conceptualize the relationship between water stress, governance, and resilience, while maintaining the contextual and theoretical details of earlier published literature, this type of synthesis is highly likely to be valid (Dixon-Woods et al. 2005).

3.2. Databases, search strategy and eligibility criteria

The databases Scopus and Web of Science have been chosen to provide high-quality, substantial amounts of peer-reviewed research covering broad environmental topics, including environmental studies, water resource management, governance, sustainability, and socio-economic studies. In this study, only articles published between January 2020 and 31 May 2026

will be reviewed, as 2026 publications are incomplete because searches were conducted before the end of 2026. The reason for this timeframe is that it is the most recent and covers the current debates and ways the IWRM concept is being reframed through issues of climate change, adaptive governance, vulnerability, water justice, and socio-economic resilience. As a result, the study does not reconstruct the history of IWRM but rather how the legacy of IWRM is being interpreted in modern, multidisciplinary research.

The search strategy was developed using three conceptual categories related to the main components of this systematic review: water stress, integrated water resource governance, and socio-economic resilience. The first search category encompasses all types of water-related pressures, including water stress, water scarcity, water insecurity, water shortage, and drought. The second category focuses on the governance aspects of water resources management; searches in this area included terms such as integrated water resource management (IWRM), water governance, adaptive water governance, and sustainable water management. The final category looks at socio-economic and resilience dimensions, including vulnerability, adaptive capacity, livelihood resilience, poverty, food security, migration, health, and inequality. The search categories were combined using the Boolean operator "AND" so as to retrieve a body of literature specifically addressing the intersection of all three categories, rather than literature that addressed any one of these categories independently.

The search was operationalized in two stages. In Scopus, the advanced search was applied to titles, abstracts and keywords using the following equation:

TITLE-ABS-KEY ((“water stress” OR “water scarcity” OR “water insecurity” OR “water shortage” OR drought) AND (“integrated water resources management” OR “IWRM” OR “water governance” OR “water resources governance” OR “integrated water governance” OR “adaptive water governance” OR “sustainable water management”) AND (“socio-economic resilience” OR “socioeconomic resilience” OR “socio-economic” OR socioeconomic OR “social resilience” OR “economic resilience” OR “community resilience” OR “livelihood resilience” OR “territorial resilience” OR “adaptive capacity” OR vulnerability)).

Only articles in the English language that related to Environmental Sciences, Social Sciences, Agricultural and Biological Sciences, Earth Sciences and Planetary Sciences, Economics, Econometrics and Finance, Business Management/Accounting, and Decision Sciences were included in the search. A total of 267 entries were returned with this search.

The second stage was conducted in Web of Science Core Collection using the same conceptual logic, while adapting the syntax to the database indexing system. The Topic field (TS), which covers titles, abstracts, author keywords and Keywords Plus, was used as follows:

TS = ((“water stress” OR “water scarcity” OR “water insecurity” OR “water shortage” OR drought) AND (“integrated water resources management” OR “IWRM” OR “water governance” OR “water resources governance” OR “integrated water governance” OR “adaptive water governance” OR “sustainable water management”) AND (“socio-economic resilience” OR “socioeconomic resilience” OR “socio-economic” OR socioeconomic OR “social resilience” OR “economic resilience” OR “community resilience” OR “livelihood resilience” OR “territorial resilience” OR “adaptive capacity” OR vulnerability)).

The method used to search for articles in the Scopus and Web of Science Core Collection databases is outlined below. Search terms for both databases were specific to original and review-type articles in English, published between 1 January 2020 and 31 May 2026, identified in two separate searches for each database. From the search under the Web of Science, some specific disciplines were used to limit the number and types of records retrieved; those disciplines included Environmental Sciences, Water Resources, Environmental Studies, and Green Sustainable Science Technology; multi-discipline areas including Agriculture Multidiscipline, Agricultural Economics Policy, Development Studies, and Economics,

Management, Public Administration, Sociology, etc.; all of which produced a combined total of 219 records. From the Scopus database, 267 records were obtained (a combined total of 486 records), providing the first set of data prior to duplicate removal. After duplicates were identified and removed, screening and eligibility were conducted in accordance with the PRISMA 2020 Guidelines. All retained records were compiled into one database for analysis; search procedures are outlined in Table 2. This retains the ability to ensure transparency, traceability, and repeatability across both databases.

Table 2: Search strategy and database configuration

Element	Scopus	Web of Science
Database	Scopus	Web of Science Core Collection
Search field	Title, Abstract and Keywords (TITLE-ABS-KEY)	Topic (TS), covering title, abstract, author keywords and Keywords Plus
Publication period	January 2020-31 May 2026	January 2020-31 May 2026
Document types	Article and Review	Article and Review Article
Language	English	English
Subject areas / categories	Environmental Science; Social Sciences; Agricultural and Biological Sciences; Earth and Planetary Sciences; Economics; Business; Decision Sciences	Environmental Sciences; Water Resources; Environmental Studies; Green & Sustainable Science & Technology; Agriculture Multidisciplinary; Agricultural Economics & Policy; Development Studies; Economics; Management; Public Administration; Sociology
Records retrieved	267 records	219 records

Source: Authors' own elaboration based on the search strategy applied in Scopus and Web of Science Core Collection.

The second part of the methodology was to frame the approach for ranking and documenting the collected data. The outlined inclusion/exclusion criteria in Table 3 encourage an intersectional conceptualization of these studies, rather than treating a study from one area (e.g., water stress, governance, or resilience) as a stand-alone document in the search results.

Table 3: Inclusion and exclusion criteria

Selection aspect	Inclusion criteria	Exclusion criteria
Publication period	Studies published between January 2020 and 31 May 2026	Studies published before January 2020 or indexed after 31 May 2026
Document type	Peer-reviewed journal articles and review papers	Conference papers, book chapters, editorials, notes, reports and non-peer-reviewed documents
Language	English-language publications	Non-English publications
Water-related focus	Studies addressing water stress, water scarcity, water insecurity, water shortage, drought or water-resource pressures	Studies without a clear water stress or water scarcity focus
Governance dimension	Studies including water governance, IWRM, policy, institutions, regulation, stakeholder participation, allocation or adaptive governance	Studies without a governance, policy or institutional dimension
Socio-economic/resilience dimension	Studies addressing socio-economic resilience, vulnerability, adaptive capacity, livelihoods, poverty, food security, migration, health, inequality or sustainable development	Studies without socio-economic, resilience or vulnerability relevance
Technical scope	Technical analysis linked to governance or socio-economic implications	Purely hydrological, chemical, engineering or modeling studies without governance or socio-economic interpretation

Source: Authors' own elaboration based on the predefined eligibility criteria of the systematic review.

Restricting the review to peer-reviewed English-language literature increased coherence and traceability; however, it could also exclude potentially relevant studies published in non-English languages, as well as grey literature, institutional reports, and basin-level documents. This limitation creates challenges in interpreting the review findings due to the territorial and political nature of water governance. These limitations have been recognized in interpreting the results. The exported database was cleaned, harmonized, deduplicated, and screened to produce a valid database that underpins both the bibliometrics and the thematic analysis that follow.

3.3. Data processing, screening and synthesis strategy

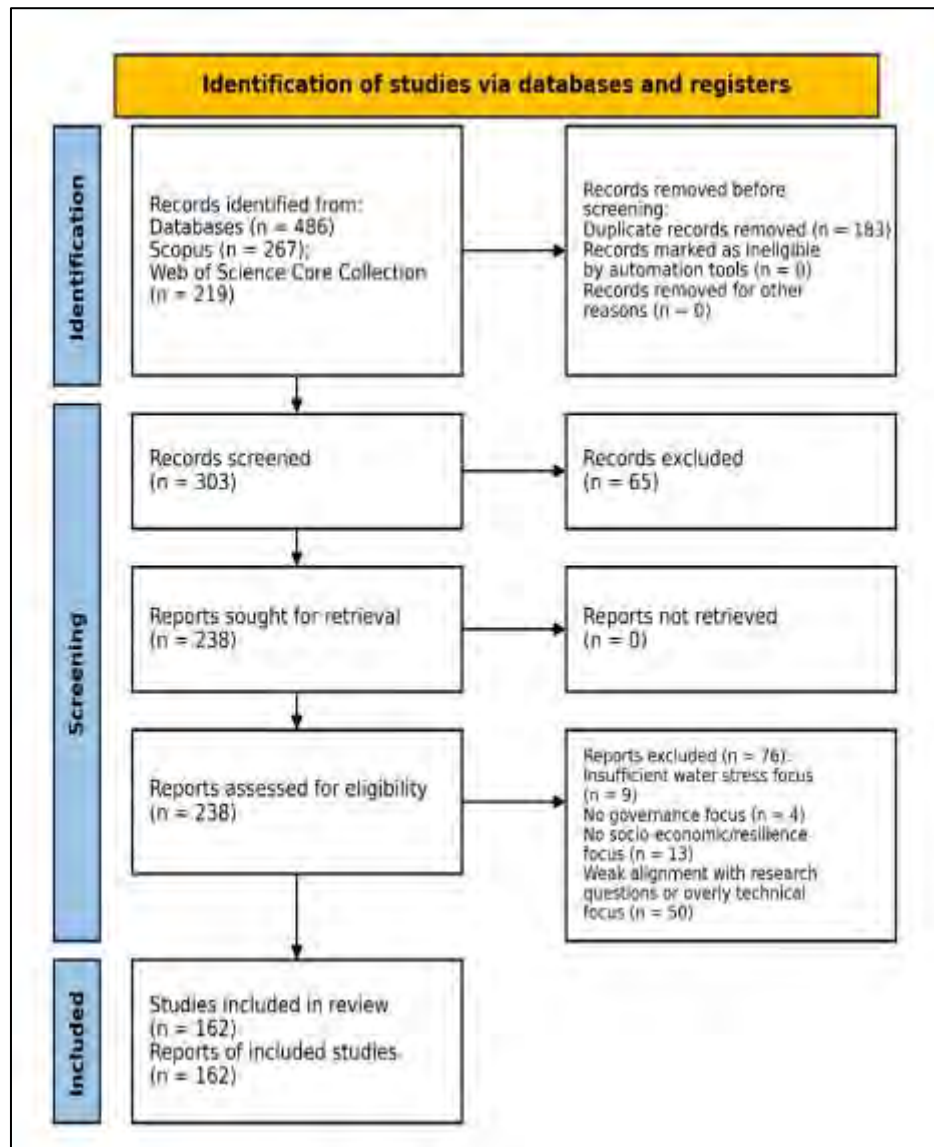
The Scopus and Web of Science Core Collection databases were downloaded and processed using R software. In order to create a harmonized dataset, Scopus and Web of Science Core Collection records were combined and standardized for several bibliographic fields, including but not limited to: Title, Author, Year of Publication, Title of Journal/Publisher, DOI, Abstracts, Author Keywords, Affiliations of Authors, Number of Times Cited, Number of References and Total Number of Distinct Records. To avoid ambiguity, the 486 records correspond to the initial raw corpus retrieved from both databases before duplicate removal, namely 267 records from Scopus and 219 records from Web of Science. After harmonization and duplicate detection, 183 duplicate records were removed, leaving 303 records for title and abstract screening. Before screening, duplicate detection was performed using the DOI number as the primary criterion for matching and a normalized title as a secondary criterion for matching records without DOIs or missing/inconsistent DOIs. As a result of this process, 183 duplicates were removed, and 303 records remained for title and abstract screening. The title and abstract screening process occurred in two phases. In Phase 1, records were screened based on title, abstract, and keywords, resulting in the exclusion of 65 records. In Phase 2, 238 records were evaluated against predefined eligibility criteria. At this point, 76 records were excluded for not placing sufficient emphasis on water stress; not covering governance, socio-economics, or resilience; not being sufficiently aligned with the research questions; or being overly technical. The final corpus contained 162 studies. The data cleaning, duplicate removal, bibliographic standardizing, and descriptive analysis were conducted using R (Team 2025). The classification of countries of authors' affiliations by continent for geographical analysis was performed using the country code package; see the documentation in Arel-Bundock et al. (2018). The entire selection process is illustrated in Figure 2, providing a clear audit trail from the initial identification of records through to the inclusion of studies (Arel-Bundock, Enevoldsen, et Yetman 2018).

To minimize selection bias, the review process was repeated after the initial assessment to confirm decisions on screening and eligibility, and exclusion reasons were documented systematically. No formal inter-rater reliability coefficient was obtained; nevertheless, all review processes were made auditable through defined criteria, documented categories for excluded records, and iterative consistency checks across the entire corpus.

To increase the reliability of the review, verification (or validation) of the process used to screen studies involved two steps. The first step was to determine whether the combination of the study's title, abstract, and keywords met the eligibility criteria. The second step was a re-evaluation of all studies that were not excluded to determine whether there was sufficient logical consistency among the water-related stressor, governance/institutional context, and socio-economic vulnerability/resilience of the study for the authors to reach agreement on the study's inclusion or exclusion from the review. Even though there was no formal calculation of inter-rater reliability, this verification process limited or eliminated selection bias, improved the consistency of decisions about including or excluding studies, and increased the transparency and auditability of this review. To facilitate future replication of this study, final search equations, search and screening criteria, a thematic coding matrix, and R codes created during

the cleaning, descriptive analysis, and visual representation of results stages of this review are available upon reasonable request or will be provided as supportive information if required for inclusion in the journal.

Figure 2: PRISMA 2020 flow diagram of the study selection process



Source: Authors' own elaboration based on the PRISMA 2020 framework and database search results from Scopus and Web of Science Core Collection; the review covers studies published between January 2020 and 31 May 2026, with 2026 limited to records indexed up to 31 May 2026.

The final corpus produced through this process constitutes the empirical foundation of the article. The following section, therefore, moves from methodology to results by first characterizing the corpus's structure and then interpreting its thematic content.

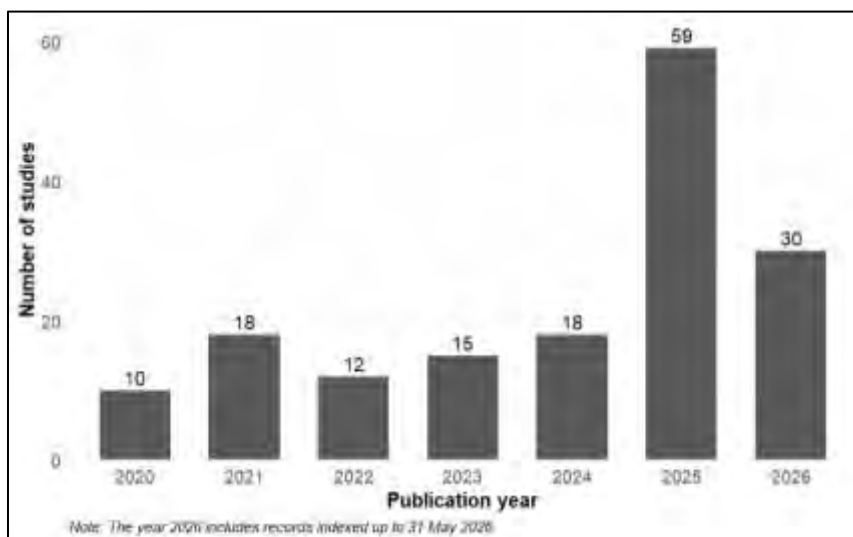
4. Results

The results of the systematic literature review conducted using the PRISMA 2020 protocol are presented in this section, along with a final corpus of 162 research articles. Analysis is divided into two phases: the first is a bibliographic and descriptive overview of the research articles analyzed, and the second is a thematic synthesis of substantive literature on the nexus between water stress, governance, and socio-economic resilience.

4.1. Descriptive and bibliographic profile of the selected studies

The temporal distribution of publications is the starting point of the descriptive analysis. The purpose of this first indicator is to ascertain whether a research area has consistently added publications over time (consistent growth) or has published more recently than in previous years (increased activity). In addition, it provides a basis for comparing journal, citation, keyword, and geographic patterns.

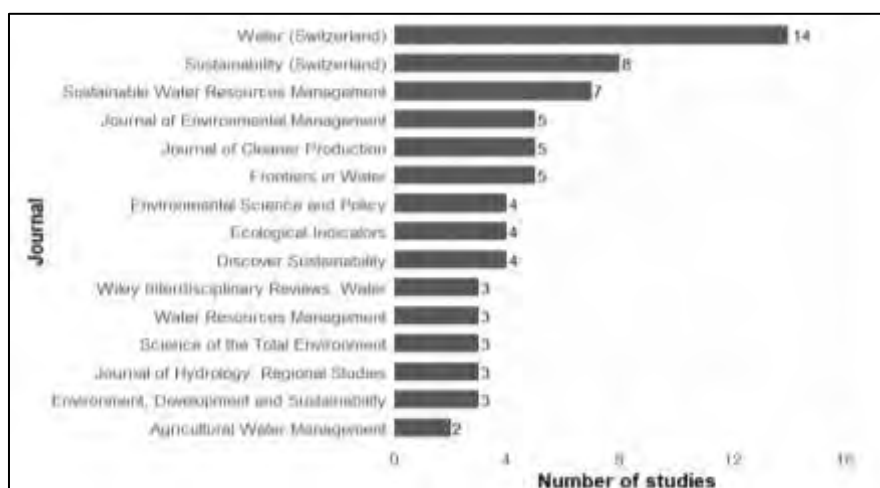
Figure 3: Annual distribution of included studies



Source: Authors' own elaboration based on the final corpus of 162 studies extracted from Scopus and Web of Science Core Collection; visualization generated using R.

Annual distribution of 162 studies included in the review (Figure 3). There has been a noticeable increase in scientific output throughout the period studied, especially after 2024. The year 2025 had the largest number of publications (59), followed by 30 studies as of 31 May 2026. The trend indicates that the interrelated nature of water stress and the integrated governance of water resources in relation to socio-economic resilience has become a growing focus in scientific discussions. After demonstrating the area's temporal growth, we will continue to determine where the majority of this research is published. Understanding the distribution of journals is important because it shows us the different disciplines and editorial outlets through which the topic has been discussed.

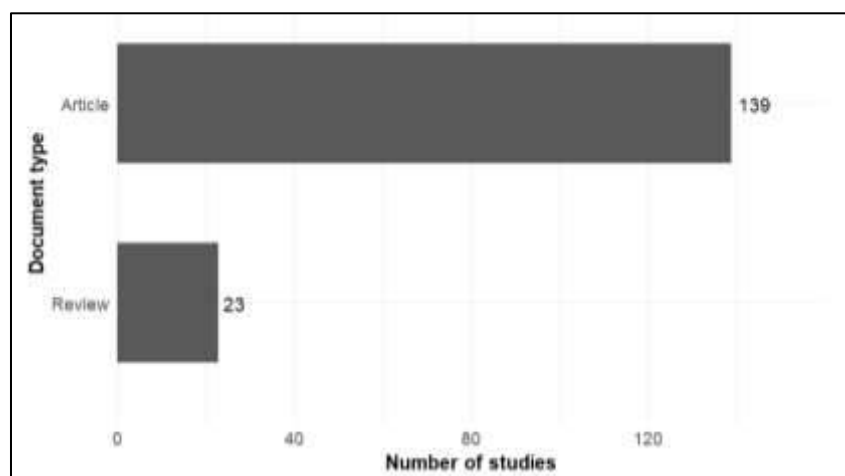
Figure 4: Top journals in the final corpus



Source: Authors' own elaboration based on the final corpus of 162 studies; visualization generated using R.

According to Figure 4, Water (Switzerland) has published the largest contributions (14), making it the most productive journal in the corpus. Sustainability (Switzerland), with 8 contributions and Sustainable Water Resources Management, with 7, are ranked next. The journals that publish on water resources, sustainability, environmental management, and/or policy have been the predominant focus of publications found in the corpus, along with other journals that have been included in the different document types shown in Figure 5; together, these findings indicate that the corpus covers an interdisciplinary field of research. The findings on journal distribution also have epistemological importance; they indicate that most of the literature on water stress conceptualizes it as an applied governance and sustainability issue, not just an economic, legal, or social justice issue. The framing of this issue in this manner will not only encourage interdisciplinary conversations about water stress, climate change, and institutional responses but may also privilege managerial and policy-integration perspectives over more conflict-based approaches typical of political ecology and water justice research.

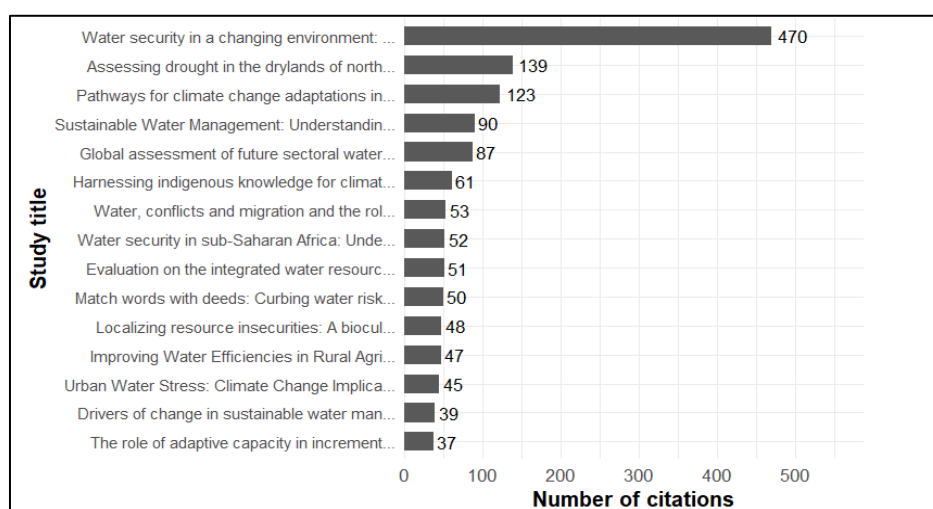
Figure 5: Distribution of document types



Source: Authors' own elaboration based on the final corpus of 162 studies; visualization generated using R.

The majority of the corpus consists of journal articles (139 studies), while review papers (23 studies) make up a small portion. Thus, we conclude that the primary basis for the systematic review is original peer-reviewed articles, with support from review articles, which are included as part of a larger conceptual and synthesis-type analysis of the empirical research.

Figure 6: Top cited studies in the final corpus



Source: Authors' own elaboration based on the final corpus of 162 studies; visualization generated using R.

Figure 6 presents the studies that received the most citations across all included articles. The citation profiles show that many articles have lower levels of scholarly impact than a small group of highly cited articles. The most cited article focuses on water security in the context of climate change. It is one of the articles demonstrating the importance of water security in the discussion. Multiple other pieces also showed high levels of citation from a range of drought-related issues, including climate change adaptation, sustainable water resource management, sector-specific water scarcity, reliance on Indigenous knowledge systems and migration movements, all related to how they will assist in achieving the SDG 6 goals overall as well as building overall adaptive capacity. Because the visual information in the article titles has been shortened, Table 4 shows the full citation information for the 15 articles with the most citations shown in Figure 6. Thus, the citation and visual will provide you with the overall citation information for all articles referenced in the visual presentation.

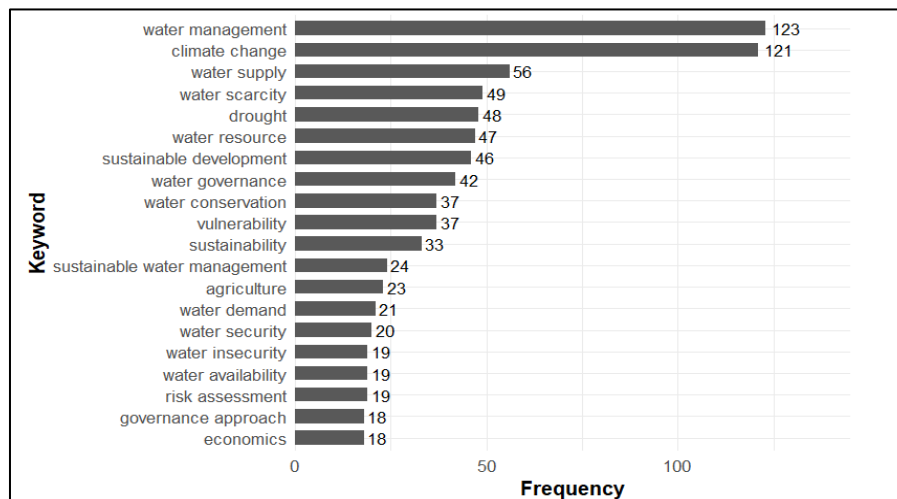
Table 4: Top 15 most cited studies in the final corpus

Rank	Study	Journal	Citations	DOI
1	Mishra et al. (2021), Water security in a changing environment	Water (Switzerland)	470	10.3390/w13040490
2	Marengo et al. (2020), Assessing drought in the drylands of northeast Brazil	Natural Hazards	139	10.1007/s11069-020-04097-3
3	Singh and Chudasama (2021), Pathways for climate change adaptations	Journal of Cleaner Production	123	10.1016/j.jclepro.2020.124744
4	Santos et al. (2023), Sustainable water management and socioeconomic dimensions	Sustainability	90	10.3390/su151713074
5	Huang et al. (2021), Future sectoral water scarcity	Science of the Total Environment	87	10.1016/j.scitotenv.2021.146973
6	Ghorbani et al. (2021), Indigenous knowledge and resilient water management	Climate and Development	61	10.1080/17565529.2020.1841601
7	Nagabhatla et al. (2021), Water, conflicts, migration and regional diplomacy	Environmental Science & Policy	53	10.1016/j.envsci.2021.03.019
8	Nkiaka et al. (2021), Water security in Sub-Saharan Africa and SDG 6	WIREs Water	52	10.1002/wat2.1552
9	Chang et al. (2020), IWRM in China's major cities	Journal of Cleaner Production	51	10.1016/j.jclepro.2020.121410
10	Cai et al. (2021), Water risk and the SDG 6 index	Journal of Cleaner Production	50	10.1016/j.jclepro.2021.128509
11	Brewis et al. (2020), Water and wellbeing	WIREs Water	48	10.1002/wat2.1440
12	Yadav et al. (2024), Water efficiencies in rural agriculture	Water Resources Management	47	10.1007/s11269-024-03836-6
13	Borah (2025), Urban water stress and climate change	Water Conservation Science and Engineering	45	10.1007/s41101-025-00344-5
14	Nyam et al. (2020), Sustainable water management and agriculture	Sustainable Water Resources Management	39	10.1007/s40899-020-00420-9
15	Dilling et al. (2023), Adaptive capacity in urban water systems	Global Environmental Change	37	10.1016/j.gloenvcha.2023.102649

Source: Authors' own elaboration based on the final corpus of 162 studies extracted from Scopus and Web of Science Core Collection; bibliometric table generated using R.

According to Table 4, the multidisciplinary aspects of water security (drought risk, adaptation, resource management, ecological knowledge, migration, and monitoring of the SDGs) are present throughout the corpus. Given this, citation counts should be interpreted with caution, as they primarily measure academic visibility and do not directly reflect theoretical or empirical relevance (Bornmann et Daniel 2008; Garfield 1979). Because of this issue of interpretation, the citation patterns presented in this work will indicate scholarly attention, along with an analysis of keyword frequencies, to provide insight into the overall concept of the corpus.

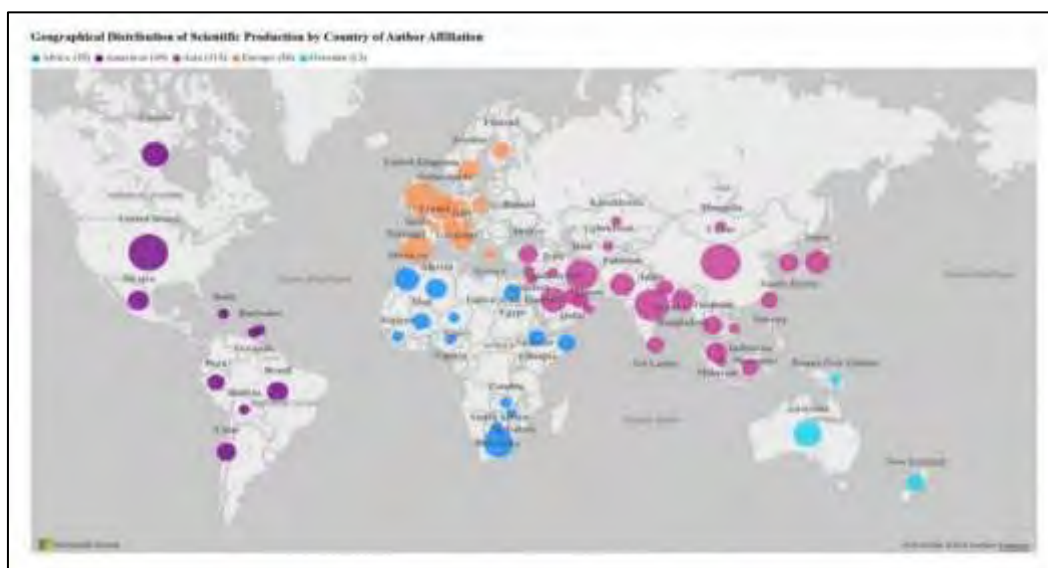
Figure 7: Most frequent keywords in the final corpus



Source: Authors' own elaboration based on the final corpus of 162 studies; visualization generated using R.

Figure 7 shows the most commonly used keywords in the final corpus. Water Management, Climate Change, Water Supply, Water Scarcity, and Drought were among the most often used keywords in this sample of literature. Use of terms such as "water governance," "vulnerability," "sustainable development," "water security/insecurity," and "economic context" also reflects that these studies do not consider water stress as a straightforward, physical/hydrological problem alone, but rather a complex, multidimensional issue that incorporates the following elements: institutional capacity, socio-economic exposure, and resilience-building processes.

Figure 8: Geographical distribution of scientific production by authors' affiliation countries



Source: Authors' own elaboration based on the final corpus of 162 studies extracted from Scopus and Web of Science Core Collection; map generated using Microsoft Power BI.

The geographic distribution of scientific production, by countries of author affiliation, is shown in Figure 8. The map shows geographically widespread but unequal distributions of research areas in water stress, integrated water resources governance, and socio-economic resilience around the world. It is meant to be a map of knowledge creation, not necessarily a direct map of the geographical locations where studies were undertaken.

Table 5: Geographical profile of scientific production by authors' affiliation countries

Indicator	Result	Analytical meaning
Country-affiliation occurrences	267	Total number of country-based affiliation occurrences identified in the final corpus.
Contributing countries	67	Scientific production is geographically dispersed across a broad range of national research systems.
Continents represented	5	The corpus includes contributions from Africa, the Americas, Asia, Europe and Oceania.
Leading continent	Asia - 115 records (43.1%)	Asia represents the largest share of affiliation-based scientific production.
Second leading continent	Europe - 56 records (21.0%)	Europe constitutes the second most represented regional contributor.
Third leading continent	Americas - 49 records (18.4%)	The Americas also contribute substantially to the reviewed literature.
Leading country	China - 25 records (9.4%)	China is the most represented country in terms of authors' institutional affiliations.
Second leading country	United States - 24 records (9.0%)	The United States is the second most represented country.
Top five countries	China, United States, India, Iran and United Kingdom - 93 records (34.8%)	Scientific production is partly concentrated in a limited group of leading countries.
Top ten countries	China, United States, India, Iran, United Kingdom, South Africa, Spain, Australia, Canada and Saudi Arabia - 139 records (52.1%)	More than half of all affiliation records are concentrated in the ten most represented countries.
Countries with a single record	25 countries	The corpus also includes dispersed contributions from countries with limited representation.

Source: Authors' own elaboration based on the final corpus of 162 studies extracted from Scopus and Web of Science Core Collection; country and continent standardization supported by R and the countrycode package.

Table 5 shows that the final corpus generated 267 country-affiliation occurrences across 67 contributing countries and five continents. Asia appears as the leading contributor, followed by Europe and the Americas. At the country level, China and the United States are the two most represented countries. The top ten countries account for 52.1% of all affiliation records, indicating a moderate concentration, while the presence of 25 countries with only one record confirms the literature's geographical diversity.

This geography of scientific production also raises a knowledge-bias issue. The dominance of Asia, followed by Europe and the Americas, should not be confused with a direct geography of exposure to water stress, since the map is based on authors' affiliations rather than the location of empirical cases. The concentration of more than half of affiliation records in ten countries reflects differences in research capacity, indexing visibility, English-language publication, funding and access to international journals. It may also underrepresent territories where water stress is socially severe but where research infrastructures and publication channels are weaker. From a North-South perspective, this means that the most water-vulnerable regions do not always occupy a proportional place in knowledge production. This limitation strengthens the need to read geographical results as a map of scientific visibility rather than as a neutral map of water vulnerability.

4.2. Thematic synthesis of the selected studies

The systematic review analyzed the reviewed articles and established a coherent thematic structure for the field. Articles that were reviewed frame the topic of water stress as both a socio-ecological and a governance issue, influenced by climate change effects, the institutional arrangements in place, economic vulnerability, social inequities, and the ability to adapt to environmental conditions. There is currently a theme-based framework of five domains that has categorized the existing literature concerning these issues: drivers of water stress; Governance & Institutional Responses; Socio-Economic Vulnerability Pathways; Resilience and Adaptation Mechanisms; and Integrative Approaches Linking Water Stress to Governance & Socio-Economic Resilience.

Table 6 presents five distinct analytical domains through which to view this thematic framework. The purpose of the table is to demonstrate how each of the articles reviewed strengthens and enhances the overall understanding of the socio-ecological governance complexity associated with water stress.

Table 6: Thematic synthesis of the included studies

Thematic domain	Main focus	Synthesis of evidence	Analytical contribution
Water stress drivers and pressure systems	Climate change, drought, water demand, agricultural pressure, urbanization and water insecurity.	Water stress is produced by interacting climatic, demographic, agricultural and urban pressures rather than by a single environmental factor.	Identifies how climatic, demographic, agricultural and urban pressures become socio-economic risks when combined with unequal access, infrastructure deficits and institutional constraints.
Governance and institutional responses	IWRM, adaptive governance, policy coordination, regulation, stakeholder participation and institutional capacity.	Fragmented institutions, weak coordination and limited participation reduce the effectiveness of water management responses.	Shows that governance does not simply manage scarcity; it filters scarcity through allocation rules, coordination capacity, participation, accountability and implementation quality.
Socio-economic vulnerability and exposure	Livelihood insecurity, poverty, food security, migration, inequality, health risks and rural/urban vulnerability.	Water stress affects households, farmers, communities and territories unevenly depending on socio-economic position and adaptive resources.	Demonstrates that vulnerability is socially differentiated, because households, farmers, migrants and territories experience water stress according to their resources, rights and adaptive capacity.
Resilience and adaptive capacity	Community resilience, local adaptation, indigenous knowledge, coping mechanisms and transformative adaptation.	Local knowledge, social networks, institutional learning and adaptive capacity reduce the impacts of water stress.	Interprets resilience as a governance-dependent process shaped by local knowledge, learning, social networks, infrastructure and the ability to transform livelihoods under stress.
Integrated water stress-governance-resilience nexus	Interactions between water scarcity, governance mechanisms and socio-economic resilience outcomes.	Water stress cannot be addressed without linking hydrological conditions to governance systems and socio-economic capacities.	Uses the conceptual model to connect pressure, mediation and outcomes, while showing that feedback loops, power asymmetries and spatial scales condition the final resilience effect.

Source: Authors' own synthesis based on the thematic analysis of the final corpus of 162 studies.

The five thematic areas are intended to serve as analytical categories rather than descriptive terms, as they encompass the essential sub-dimensions that capture the interconnections among

water stress, governance, and socio-economic resilience. They consist of the following areas: formal governance, adaptive learning, water justice, infrastructure capacity, and vulnerability mechanisms that connect water scarcity with food security, poverty, health, and migration. To create these domains, a deductive-inductive process was used, based on the theoretical model and patterns observed across 162 selected studies, by examining bibliographic profiles and keywords and reviewing the abstracts and screened records of those studies. The synthesis of study findings indicates that multiple factors are putting pressure on water availability and on areas impacted by water stress, including climate change, droughts, population growth, urbanization, agricultural water demand, land-use change, and unequal access to infrastructure. These pressures have resulted in uneven impacts on different groups, including rural communities and smallholder farmers, food-insecure households, migrants, and resource-constrained communities. Therefore, resilience means more than just being able to withstand shocks; it also relates to the ability to reorganize governance systems, develop alternative livelihood strategies, and manage natural resources differently than in the past. The five thematic domains demonstrate how governance mechanisms can help to alleviate vulnerability by providing coordinated, equitable, and adaptive responses and/or reinforce the pressure of scarcity through fragmented and unequal responses, as demonstrated in Table 7.

Table 7: Thematic synthesis grounded in representative studies

Thematic domain	Representative studies	Evidence from the literature	Contribution to the review
Governance and IWRM	(Anghileri et al. 2024; Cai, Zhao, et Varis 2021; Chang et al. 2020; Dilling et al. 2023; Grison et al. 2023; Katusiime et Schütt 2020; Nagata et al. 2022; Ngene et al. 2021)	IWRM depends on policy environments, institutional capacity, stakeholder participation and contextual adaptation.	Shows that governance operates through coordination, allocation, accountability and contextual implementation, rather than through formal integration alone.
Food security and livelihoods	(Borah 2025; Hoffmann et al. 2022; Nyam et al. 2020; Ofori et al. 2021; Santos, Carvalho, et Martins 2023; Sithole et al. 2025; Yadav et al. 2024)	Water stress affects land-water-food systems, agricultural productivity and sustainable food production.	Links water stress to economic vulnerability by showing how agriculture, productivity, food security, rural livelihoods and infrastructure investment interact.
Migration, gender and differentiated vulnerability	(Borah 2025; Brewis et al. 2020; Hoffmann et al. 2022; Irbik 2022; Marengo et al. 2020; Nagabhatla et al. 2021; Santos et al. 2023)	Water-related pressures interact with mobility, gendered vulnerability and regional instability.	Demonstrates that exposure to water stress is unevenly distributed across gender, mobility status, poverty, territorial location and institutional recognition.
Adaptive capacity and socio-economic resilience	(Borah 2025; Cai et al. 2021; Dilling et al. 2023; Ghorbani et al. 2021; Okello et al. 2024; Ross et al. 2024; Schulz et al. 2024; Singh et Chudasama 2021)	Resilience depends on adaptive capacity, anticipatory behavior, investment foresight and value-based decisions.	Shows that resilience depends on adaptive capacity, economic behavior, learning, foresight, incentives and the capacity to reorganize practices over time.
Local knowledge and nature-based responses	(Anghileri et al. 2024; Dilling et al. 2023; Ghorbani et al. 2021; Grison et al. 2023; Nagabhatla et al. 2021; Okello et al. 2024; Sithole et al. 2025; Yadav et al. 2024)	Indigenous knowledge, nature-based solutions and local practices support adaptation in water-stressed contexts.	Expands governance beyond formal institutions by showing the role of local knowledge, nature-based responses, hybrid arrangements and place-based adaptation.

Source: Authors' own synthesis based on representative studies from the final corpus of 162 studies.

Table 7 presents five distinct analytical domains through which to view this thematic framework. The purpose of the table is to demonstrate how each of the articles reviewed

strengthens and enhances the overall understanding of the socio-ecological governance complexity associated with water stress.

4.3. Integrated interpretation of the results

In reviewing this literature, I have observed a significant shift from a restricted resource-scarcity framework to a broader governance/resiliency framework. In regard to this change, the interpretation of water stress is no longer strictly limited to available water supplies, drought severity or physical scarcity. Rather, water stress can be determined by institutional, economic, and social factors (e.g., those that influence the management and experience of water pressures). The recurrence of terms in the literature, such as water use, climate change, scarcity, drought, governance, etc., continues to reflect the research field's focus on environmental and hydrological issues. The analytical definition of the terminology becomes much more precise when those terms are aligned with institutions: infrastructure, policy coordination, economic vulnerability, social inequity, territorial exposure, and adaptive capacity. This suggests that the field has become more organized by the systematic processes through which water stress generates differentiated socio-economic results.

Thus, the synthesis lays the groundwork for the following discussion by indicating that the majority of this literature review's contribution goes beyond simple description. In addition to mapping publication trends, journals, keywords, and geographic distributions, the analyses indicate an epistemological shift in how water stress is conceptualized. Water stress has transitioned from being viewed as a hydrological shortfall to a distributional, coordinated, investment, equity and resiliency challenge. Therefore, the impacts of having a scarcity of water are not necessarily due solely to the total amount of water available, but rather depend on how institutions allocate the resource (water); how infrastructure provides for the adaptation of vulnerable groups; and how the governance system transforms environmental pressures into either socio-economic vulnerability or adaptive capacity.

5. Discussion

The discussion interprets the systematic review findings by linking temporal trends, publication outlets, citation patterns, keywords, geographic distribution and thematic synthesis, showing that water stress has become a multidisciplinary issue at the intersection of environmental change, institutional capacity, resource allocation, socio-economic vulnerability and adaptive transformation. It also distinguishes empirical observations from policy implications: while the corpus shows a strong association between resilience, coordination, participation, infrastructure and adaptive learning, inclusive governance remains an analytical inference drawn from these patterns. Overall, the 162 studies confirm that governance matters, but also show that coordination alone is insufficient when allocation conflicts, infrastructure gaps, economic vulnerability, informal institutions and unequal decision-making power remain unresolved.

5.1. Consolidation of an interdisciplinary research agenda

Results indicate that the research agenda has coalesced into a single central point, previously dispersed across hydrology, sustainability studies, governance analysis, agricultural systems, socio-economic resilience, etc. The increase in publications, particularly from 2024 onwards, confirms a shift in focus towards the effects of climate change and its association with drought intensification, food insecurity, urbanization, and territorial vulnerability related to water scarcity. This demonstrates the theoretical shift identified in the literature review: water stress is seen increasingly as a socio-ecological condition shaped by both physical scarcity and institutional response capacity.

The structure of the publications and their citation profiles further provide evidence for this interpretation; journal publication structures and citation profiles indicate that there is no one disciplinary paradigm in water resources, sustainability, environmental management, and policy; rather, a hybrid intellectual space is emerging from the convergence of resource scarcity, governance, and development outcomes. The most frequently cited studies focus on multiple interrelated subject areas, including water security, drought risk, climate change adaptation, sustainable management, indigenous knowledge, migration, SDG monitoring, and adaptive capacity. It further demonstrates how the concept of water stress functions as a boundary concept across multiple research communities and substantiates the need for an integrated framework linking scarcity, governance, and resilience outcomes.

5.2. Governance as the central mediating mechanism

A second key finding is governance's role as a key mediator of water stress and socio-economic resilience. The majority of studies reviewed indicate that different socio-economic outcomes can result from the same hydrological pressures depending on the quality of governance, e.g., institutional quality, rules for allocation, level of stakeholder participation, execution of policies, ability to monitor, and the extent to which vulnerable populations were included. As a result, the role of governance should not be considered a separate variable added to a physical water issue but rather as the mechanism that changes scarcity into either vulnerability or adaptive capacity. The 162 studies reviewed, consistent with the integrative conceptual model presented in Figure 1, also support the idea that water stress is complex, that governance mediates water stress, and that resilience is a distinct outcome shaped by territorial, institutional, and social conditions. The system is not linear but dynamic; governance mediates water-related pressures by filtering, amplifying, and absorbing them to build resilience, supporting current and future investments, promoting social capital, adapting through institutions, and establishing future policy responses.

This view aligns with the governance literature previously discussed. Katusiime and Schütt (2020) and Ngene et al. (2021) illustrated that for IWRM to be successful, it needs to be based on a clearly defined institutional framework supported by coordination and implementation methods. Nagata et al. (2022), on the other hand, highlighted that IWRM requires further development in line with political, administrative, and socio-economic environments. In addition, the current review shows that governance's role in water management performance is not limited to improving performance. Governance determines who has access to water, who receives the greatest benefit from water allocation, how water-related conflicts will be resolved, and how opportunities for adaptation to change will be equitably distributed.

Thus, an analytical separation of adaptive governance from classical IWRM becomes essential. Classical IWRM provides a mechanism for coordinating water management across sectors and scales; however, when applied as a technocratic planning method, it alone is not sufficient. Adaptive governance emphasizes uncertainty, learning, flexibility, stakeholder involvement, experimentation, and adjustments based on local circumstances. The findings from this review confirm that the design of resilience-oriented water governance requires both the integrative capacity of the IWRM model and the learning-focused flexibility of the adaptive governance model. Therefore, a combined approach to governance is particularly important in the context of climate change, ongoing droughts, poorly developed institutions, and unequal access to infrastructure.

However, the convergence of the literature around integrated governance should not hide the existence of important contradictions. Several authors have warned that IWRM can become a normative and technocratic model when it is presented as a universal solution without sufficient attention to political context, institutional capacity and power asymmetries (Biswas, 2008; Molle, 2008). From a political ecology perspective, water scarcity is not only a hydrological

condition but also a socially and politically produced outcome shaped by allocation decisions, infrastructure priorities and unequal access to decision-making (Linton et Budds 2014; Swyngedouw 2009). Water justice scholars similarly argue that governance reforms may reproduce exclusion when participation is formal but not effective, or when vulnerable groups are consulted without having real influence over allocation and investment decisions (Boelens et al. 2018).

Integration does not necessarily produce resilience. In some contexts, formally integrated institutions may centralize authority without improving accountability. Stakeholder involvement can be more representative than accountable; thus, investing in infrastructure that protects agricultural or urban users may create risks for low-income groups due to shifts in risk. Climate-adaptive policies can widen inequities if they favour those with wealth to invest in economically strong sectors. The field surrounding integration and resilience is structured around an ongoing dispute between managerial models that emphasize coordination and efficiency and critical models that focus on power, conflict, rights, and distributive justice. Acknowledging these tensions helps improve the review, as it illustrates that governance is not solely a technical mediator of the relationship between water stresses and resilience; rather, governance is a political site where assertions about competing water uses and their inequitable capacities occur.

5.3. From vulnerability to socio-economic resilience

This thematic synthesis highlights that socio-economic resilience cannot be interpreted simply as a neutral or generic outcome. Instead, it represents how much a household, community, sector, or territory can absorb the impacts of a water-related shock, change their resource and livelihood practices through adaptation, and adapt to institutional arrangements (systems, processes, locations) in such a way that it reduces their vulnerability and increases or maintains their development potential. The ability to do so is unequal across space, with rural-based livelihoods (i.e., smallholder farmers, low-income families), migrants, and communities without a strong institutional base at greater risk of negative impacts from water stress due to their reliance on climate-dependent resources and their inability to adapt.

This view is supported by Hoffmann et al. (2022), who have linked the impacts of water-related stress to agricultural livelihoods, adaptation, and migration, and by Irbik (2022), who noted the gendered and mobility-related aspects of vulnerability. Additionally, Ofori et al. (2021) and Sithole et al. (2025) connected the effects of water scarcity on food security, sustainability of production systems, and adaptation in locales within Sub-Saharan Africa. This review adds a new component by combining these pieces into a larger governance-resilience discussion and showing that vulnerability is influenced by the existence of an institutional recognition of the scarcity and competition for water, and through the development and implementation of appropriate policy, the access to water infrastructure, the provision of social protections, the sharing of knowledge, and participation in decision-making processes.

This review goes beyond viewing water stress as a direct cause of socio-economic effects by demonstrating that its impacts are mediated through governance systems. Water governance serves as a mediator and filter through which similar hydrologic pressures can yield unequal outcomes, depending on how institutions manage allocation, participation, recognition, redistribution, infrastructure investment, and adaptive learning. Inclusive, coordinated, and adaptive governance can reduce vulnerability by protecting vulnerable groups, regulating competition among uses, integrating local knowledge, building community and organizational capacity, and creating opportunities for learning, livelihood diversification, and long-term resilience resulting from water stress. On the other hand, weak coordination, institutional capture, exclusion, and underinvestment can result in greater vulnerability, especially across lines of class, gender, geography, sectoral interests, and institutional voice. Therefore, the

review identifies, through analysis of the PRISMA corpus, governance as the principal economic and managerial mechanism through which water allocation, investment priorities, cost-benefit distributions, and institutional capacity determine whether water stress creates resilience or reinforces vulnerability.

6. Conclusion

This review confirms water stress as an environmental issue and also explores the socio-economic implications of water stress, arising from how governance systems distribute water, facilitate inter-organizational coordination, invest in infrastructure, target at-risk populations, and build adaptive capacity. The dataset of 162 studies revealed that the mediating role of institutions and the economy, rather than just the hydrological aspect, shapes vulnerability/resilience to scarcity; therefore, water stress can produce different degrees of socio-economic resilience outcomes depending on the governance system at work.

In terms of methodology, the article offers PRISMA screening as the basis for combining bibliographic description, keyword analysis, geographic mapping, and thematic synthesis. Theoretical contributions include the development of a pressure-mediation-outcome framework, where water stress represents the pressure, integrated water governance functions as the mediator, and socio-economic resilience is the outcome of the success of an integrated water system. In practical terms, findings demonstrate that the governance of a water system should be measured not solely through the means of coordination but also by how water is allocated among users, promoted as a learning community, redistributed to those in need, invested in infrastructure, and subjected to the relative power of users, maintaining accountability for decisions made in the governance of the water system.

Future research in this emerging area of scholarship should adopt more focused agendas. Identifying comparative analyses of governance failures, establishing operational metrics for socio-economic resilience, seeking social justice related to the distribution of water resources, assessing the impacts of informal and hybrid governance structures, and establishing a South-to-South lens on water governance would enhance the economic and managerial relevance of water governance research through linking institutional design, the investment decision-making process, allocation efficiencies, and the social equity of water use in a water-stressed environment.

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