

Editorial

# First Issue of Water Scarcity and Drought

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Received: 29 August 2024; Accepted: 2 September 2024; Published: 6 September 2024

Water is a critical resource for socio-economic development, playing an essential role in agriculture, industry, energy generation, daily human activities, and maintaining healthy environments. It supports the production of food, energy, and raw materials, driving economic growth and ensuring livelihoods. In agriculture, water is necessary for irrigation, which boosts crop yields and food security. Industrial processes rely on water for manufacturing, cooling, and cleaning, contributing to economic output and job creation. Additionally, access to clean water is fundamental for public health and hygiene, reducing the incidence of water-related diseases. The availability of water also supports human well-being, education, cultural practices, and recreational activities, enhancing social cohesion and quality of life.

However, water scarcity for both human and environmental uses is common and the occurrence of water deficits has profound implications for social, economic, and environmental stability. Water scarcity can lead to reduced agricultural productivity, threatening food security and increasing poverty, especially in rural areas of developing countries highly dependent on subsistence farming. Industrial operations may face disruptions due to insufficient water supply, affecting economic performance and employment. On a societal level, water scarcity can exacerbate social and economic inequalities, as marginalised communities often have less access to reliable water sources. Environmentally, water shortages stress ecosystems, threatening biodiversity and impairing the health of aquatic habitats. This can lead to the degradation of natural resources and ecosystem services, further exacerbating the challenges faced by human populations. Understanding the causes and impacts of these water scarcity conditions is essential, as they stem from various mechanisms and drivers that need differentiation (Table 1). Water scarcity can be temporary or permanent, influenced by natural climate conditions and anthropogenic interventions, such as overuse, political and economic decisions about water allocation and land use changes.

Drought is a relevant concept to characterise the periods when water availability falls below long-term average conditions. Droughts can occur in any climate, affecting both dry and humid regions. Historical records document severe droughts over centuries [1,2], with proxy records extending even further back [3,4], indicating that droughts are a global phenomenon. Human activities can exacerbate drought characteristics through



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greenhouse gas emissions [5] and poor water management or land use practices [6]. Water shortages due to human system failures are particularly severe during droughts, as they compound the natural low water availability in water sources. Droughts are complex, with indeterminate start and end points, varying spatial extent, and intensity [7,8]. The mechanisms driving droughts are multifaceted [9], and the phenomenon's multidimensional and interlinked nature—encompassing meteorological, agricultural, hydrological, ecological, and socioeconomic droughts—complicates assessment, adaptation, and mitigation efforts.

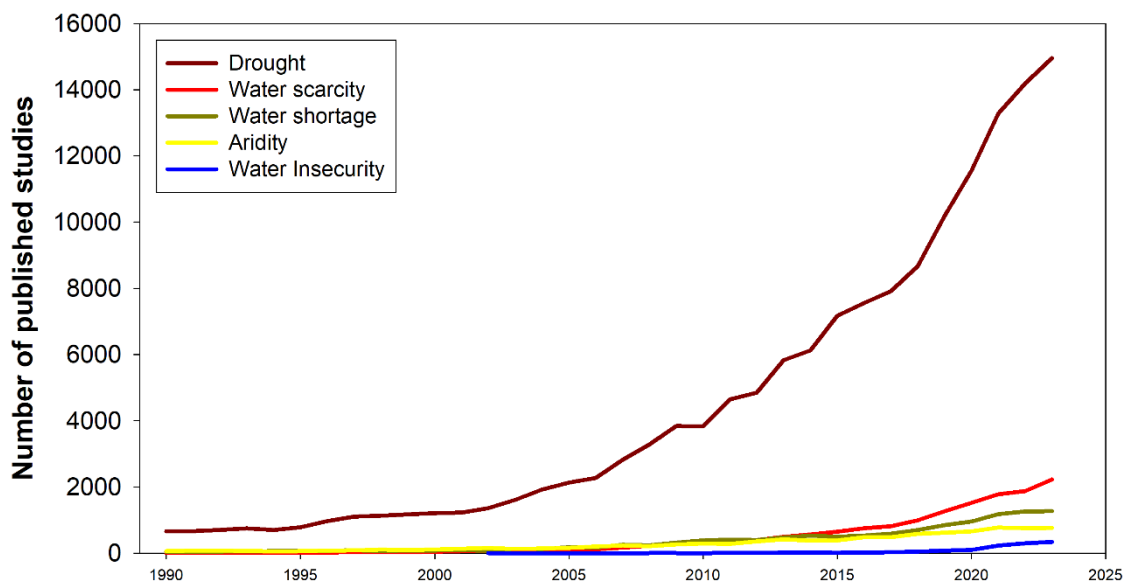
Permanent water scarcity occurs in areas with low precipitation and high atmospheric evaporative demand, such as deserts. These conditions result from atmospheric circulation and land influences that tend to create prevalent high-pressure anomalies and atmospheric stability. Aridity, the state of a long-term climatic feature characterised by low available water in a region, shapes ecosystems [10], water availability [11], and the way of life for human communities in arid regions. Unlike the natural character of aridity, permanent water scarcity can also arise from human overuse of water resources, such as increased irrigation [12] or industrial and urban water demands, which may cause water insecurity [13] if the water demand exceeds water supply in the long-term.

Therefore, water scarcity can result from diverse phenomena with different origins and implications, extending beyond physical and socioeconomic causes to encompass various social and policy impacts.

**Table 1.** Key concepts related to water scarcity.

	Natural	Human induced
Temporary	Drought	Water shortage
Permanent	Aridity	Water insecurity

The wide-ranging implications of water scarcity have led to a substantial and growing body of research in recent decades. In scientific literature databases like SCOPUS, the number of studies published since 1990 that include keywords such as “drought”, “water scarcity”, “water shortage”, “water insecurity” and “aridity” exceed 193,000. Most of these studies focus on drought, with a noticeable increase in publications over time (Figure 1). In 2023 alone, nearly 15,000 studies were published on drought, over 2,200 on water scarcity, more than 1,200 on water shortage, 761 on aridity and 343 on water insecurity.



**Figure 1.** Evolution of the number of studies related to water scarcity, drought, water scarcity, water shortage, water insecurity and aridity in the SCOPUS bibliographic database.

These studies encompass a diverse range of topics, leading to publications in journals from various fields of knowledge. The largest proportion are in agricultural and biological sciences (49.3%), environmental science (38.4%), earth and planetary sciences (19.5%), biochemistry and molecular biology (16.9%), social sciences (9.4%), and engineering (9.3%). Other disciplines, such as computer science, chemical engineering, and economics, have also published a substantial number of studies (>2,000) on this topic since 1990.

Journals with the highest number of studies related to water scarcity include specialised publications in agricultural and biological sciences, such as *Frontiers in Plant Sciences*, *Acta Horticulturae*, *Forest Ecology and Management*, and *Agronomy*, with 2,535, 1,465, 1,234, and 1,117 studies respectively. Journals focused on water resources, such as *Water* (2,097 studies), *Journal of Hydrology* (1,674 studies), and *Water Resources Research* (740 studies), also contribute significantly. Additionally, climate-related journals like *Theoretical and Applied Climatology* (745 studies), *Journal of Climate* (592 studies), and *Climatic Change* (564 studies) publish numerous articles on these topics. Social science journals, including *Water Policy* (262 studies) and *Land Use Policy* (122 studies), and multidisciplinary journals like *Science of the Total Environment* (2,262 studies), *Scientific Reports* (1,276 studies), and *Environmental Research Letters* (785 studies), have also made substantial contributions. High-impact journals such as *Proceedings of the National Academy of Science* (558 studies), *Nature* (408 studies), and *Science* (361 studies) also feature research on water scarcity.

These numbers exemplify the strong scientific interest in topics related to various aspects of water scarcity. However, this interest contrasts with the lack of a dedicated journal focusing on water scarcity and related topics like drought and water insecurity. Past initiatives, such as the University of Nebraska-Lincoln's Drought Network News (1994-2001) (<https://digitalcommons.unl.edu/droughtnetnews/>) and the French scientific journal *Sécheresse* (1990-2013) (<https://www.jle.com/fr/revues/sec/revue.phtml>), were short-lived. Consequently, specialists in these areas must publish their contributions in journals of specific fields, despite the inherently multidisciplinary nature of water scarcity issues, which involve climatic, hydrologic, plant, socioeconomic, policy, and adaptation aspects. Therefore, the development of a specialised journal dedicated to the multidisciplinary nature of drought and water scarcity is a priority for the scientific community, as well as for managers and policymakers dealing with drought mitigation and adaptation.

*Water Scarcity and Drought (WSD)* aims to be a comprehensive platform for cutting-edge research, insight, and solutions addressing water scarcity and drought at different scales, from global coverage to local applications. In an era marked by climate change and increasing pressure on water resources, the journal seeks to enhance our understanding of the complex interplays between physical and socioeconomic factors driving excessive water demand and the conditions leading to water scarcity across hydrological, agricultural, and ecological systems, considering the spatio-temporal dynamics of water availability and demand, the socioeconomic and environmental impacts, and sustainable water resources management. The establishment of this journal is critical especially considering the increasing severity of drought and aridity shifts due to climate change [5], as well as the projected intensification of these conditions in future climate projections [14], notably in countries of the global south with low adaptation capabilities. Furthermore, increasing water demands from a growing global population and intensified water usage by agricultural and industrial activities exacerbate water insecurity. Additionally, natural ecosystems face enhanced risks, such as increased plant mortality [15] and forest fire hazards [16] due to heightened water deficits.

The main objective of *WSD* is to serve as a forum for the publication of studies by the community working on these topics. Publishing original research, reviews, and case studies, *WSD* highlights innovative approaches to understanding, monitoring, predicting, mitigating, and adapting to water scarcity. The journal bridges the gap between theoretical research and practical applications, informing effective policy and management strategies. Emphasising the importance of scientific perspectives, it aims to facilitate the development of resilient water management strategies that withstand the challenges of climate variability and change, population growth, and increasing water demands. Ultimately, the journal aims to disseminate knowledge to help reduce the impacts of water insecurity for future generations amidst growing environmental challenges.

Topics include hydrology and water resources management, drought monitoring and prediction, mitigation and adaptation strategies, water conservation, sustainable agricultural practices, human ecology, socio-economic and policy dimensions, ecosystems, environmental impacts, technological innovations, case studies, and community engagement. Key areas also include physical mechanisms like atmospheric circulation, soil moisture dynamics, and hydrological processes. Research on past trends in drought frequency, duration, and severity, as well as future projections under different climate scenarios and socio-economic developments, is highly sought. The journal emphasises understanding drought propagation and its spatial-temporal dynamics across regions and ecosystems, highlighting impacts on the hydrological cycle, such as river flows, groundwater levels, soil moisture and water quality. Additionally, it explores socio-economic and environmental consequences, focusing on how water scarcity and drought affect forestry, agriculture, water resources, and human societies and well-being. Studies focusing on adaptation measures and innovative management strategies to mitigate adverse effects of water insecurity are particularly encouraged. By encompassing these interconnected topics across temporal and spatial scales, *WSD* aims to provide a holistic understanding of water scarcity and drought and support effective,

sustainable solutions, bridging the gap between scientific research and practical implementation for a sustainable water future.

WSD is published quarterly online by Scilight Press and invites contributions from diverse disciplines, including hydrology, climatology, environmental science, ecology, engineering, social sciences, and policy studies, to address the multidisciplinary aspects of water scarcity and drought. Covering a broad yet focused range of topics, it delves into the science and management of water scarcity and drought. The Journal publishes studies that advance both global and regional understanding, with a strong emphasis on scientific rigour and novelty. Contributions must offer transferable results or insights that extend beyond the specific region under study—this is especially crucial for case studies, which should present localised findings that also provide broader lessons or methodologies relevant to the international scientific community and demonstrate significant global or regional implications. We expect that the establishment of this journal will meet the notable expectations of the scientific community working on this topic and quickly become a leading scientific forum, advancing understanding of drought and water scarcity from multiple perspectives, and fostering real progress towards adaptation and mitigation.

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