1 Introduction

References to the threat of an impending global water crisis have proliferated in the recent decades, suggesting devastating developments looming in the near future (e.g., Biswas & Tortajada, 2019; Dellapenna et al., 2013; Jury & Vaux, 2005, 2007; Moe & Rheingans, 2006). The concept of the 'global water crisis' has become increasingly present within academic literature since the early 1960s, with the number of documents published per year growing steadily, particularly since the turn of the twenty-first century (Biswas & Tortajada, 2023). Despite these trends, defining the nature of this global water crisis remains a challenge, as a plethora of water problems have fallen under the umbrella of this term (Srinivasan et al., 2012). Simplistically defined as a set of pressures to the global water reserves, the global water crisis encompasses an array of issues. This global waterscape is hard to navigate, as water problems are characterized by interconnectivity and reciprocity. The innate complexities of water as a resource, society's relationship to it, and its centrality for all ecosystems emphasize the wicked nature of contemporary water issues (Brennan et al., 2021; Cooley et al., 2013; Jury & Vaux, 2007; Li, Endter-Wada, & Li, 2015; Rangecroft et al., 2021; Woodhouse & Muller, 2017).

The global water crisis has been more recently redefined as a crisis of governance (Biswas & Tortajada, 2023; Cooley et al., 2013). According to this perspective, the mainstream water governance practices are ill-equipped to effectively cope with the swelling pressures imposed on water resources (Dellapenna et al., 2013). In this view, despite numerous efforts over the last decades, water challenges remain unresolved due to insufficient action and the debilitating effect of problem complexity on policy delivery (Cooley et al., 2013; Dellapenna et al., 2013; Grigg, 2021; Kirschke et al., 2017). The need for innovative and more robust governance practices has been stipulated within the water governance literature over the years (e.g., Baird et al., 2015; Cooley et al., 2013; Dellapenna et al., 2013; Jury & Vaux, 2007). Global water governance needs to take a leap to adopt practices better suited for the current challenges, as the growing pressures on water resources have been heightening at an alarming speed, particularly in recent years, with research showing that the world is off-track for meeting the Sustainable Development Goals for water by 2030, following in the steps of the unmet targets of the Millennium Development Goals (MDGs) set at the turn of the century (Hove et al., 2019; Koehler, 2023; Vörösmarty et al., 2010).

In the words of Jury and Vaux (2007), "the problems are daunting, but we are not without the means to address them" (p. 69). Nonetheless, despite the existence of an abundance of scientific information relevant in the face of

current water crisis, the data are not being applied (Graffy, 2006; Grigg, 2021; Jury & Vaux, 2005; Pahl-Wostl, 2017). The key limitation is the lack of a general consensus or any form of an overview of what actually constitutes the 'global water crisis,' neither from an academic nor a practitioner point of view. This diversity in perceptions displays that one's definition of water (and thus water problems) is highly contextual and dynamic, reflecting the multiplicity of water's material and elusive forms (Macura-Nnamdi & Sikora, 2023). Linton (2010) suggests a relational perception of water, arguing that it is the "various things and circumstances that . . . make water what it is" (p. 30). At the same time, there appears to be an absence of synthesis among global assessments on urgent water challenges, reflected in the continuous (re-)formulation of "challenges that are all variations and specifications of a limited set of problems" (van der Zaag, Gupta, & Darvis, 2009, p. 905). Exhaustive overviews of human–water problems discussed in academic literature have received little attention. There are a few exceptions, such as the research conducted by Srinivasan et al. (2012) on syndromes of coupled human–water issues, the study by Vörösmarty et al. (2010) on threats to river systems globally, publication on water governance paradigms by Bilalova, Newig, & Villamayor-Tomas (2025), and papers on global water grabbing (e.g., Dell'Angelo, Rulli, & D'Odorico, 2018; Franco, Mehta, & Veldwisch, 2013; Rulli, Saviori, & D'Odorico, 2013) and on the global virtual water trade (e.g., D'Odorico et al., 2019; D'Odorico, Dell'Angelo, & Rulli, 2019; Hoekstra & Chapagain, 2011). However, to the knowledge of the authors, there is no comprehensive study that synthesizes the abundance of literature on human–water problems globally.

Moreover, ambiguity in the way water discourses are applied by different actors brings political and power implications (Fallon, Lankford, & Weston, 2021). A leading example is the introduction of the interchangeably used notions of 'global water commons' and water as a 'global common good,' repeatedly adopted in the documents leading up to the United Nations (UN) 2023 Water Conference and during the event itself. An undoubtedly historic event, the Conference took place nearly 50 years after its predecessor – the 1977 UN Water Conference in Mar del Plata – the first ever water conference at a global scale (Quentin Grafton et al., 2023). Despite an inclusion of a variety of voices, it was arguably the highly visible involvement of corporate actors that was particularly noted (Mehta & Nicol, 2023; Sojamo & Rudebeck, 2024). In his analysis of the 2023 Conference, Vinciguerra (2024) demonstrates that despite the reliance on common vocabulary, the used concepts carry divergent meanings (and intentions) depending on the actor. In particular, Vinciguerra emphasizes two subgroups based on their understanding of

a 'common good' – one relying on neoliberal economic theory of the commons and the other in favor of wider public involvement.

In a similar vein, D'Odorico et al. (2024) critically reflect on this representation of water resources, raising concerns about the manipulation of this term to create the conceptual preconditions for privatization and commodification of water, and the leading role of the market as the best way to solve a potential 'Tragedy of the Commons.' This concern is also raised by Puy and Lankford (2024), who scrutinize the narratives used by the recently established Global Commission on the Economics of Water (GCEW) in reference to the ongoing water crisis. Convened by the government of the Netherlands and facilitated by the Organization for Economic Cooperation and Development (OECD), the Commission promises the development of "new thinking" (GCEW, 2023, para. 4) in the face of the ongoing standstill within the water policy and governance arena. Relying on a one-dimensional conceptualization, GCEW's understanding of the water crisis risks the return to panacean prescriptions and singular, paradigmatic thinking (Puy & Lankford, 2024). What is more, the line of thinking advocated for by the GCEW is unsurprisingly heavily reliant on market-based management of water resources, attaching monetary valuation and pricing prescriptions.

This review recognizes the need to go beyond a reductionist understanding of water problems, acknowledging the diverse ways water (and water challenges) are perceived. We believe that there is a clear need to identify and examine (human-)water problems in a broader and integrated manner. While partial, the linkages between diverse water problems are visible, with an ever-growing body of water governance literature describing the synergies and interdependence among water issues (see, e.g., Brennan et al., 2021; Jury & Vaux, 2007; Li, Endter-Wada, & Li, 2015; Woodhouse & Muller, 2017).

Water problems are wicked. They are complex, multi-dimensional, and unsolvable through the use of conventional, linear approaches (Lach, Rayner, & Ingram, 2005; Markowska et al., 2020; Rittel & Webber, 1973; Sanya, 2020). As wicked problems, they are difficult to define and "essentially unique" (Rittel & Weber, 1973, p. 164). Therefore, their solutions are hard to delineate and implement, as they carry both short- and long-term consequences (Grafton, 2017; Sanya, 2020). What is more, each wicked problem could be viewed as a symptom of another issue (Rittel & Weber, 1973). Thus, wickedness stems partially from the inherent interconnectedness of problems, something that evidently gets in the way of a simplistic taxonomic representation.

Nevertheless, in order to provide some analytical meaning to the ambiguous notion of 'global water crisis,' this research embarks upon an examination of academic literature and careful identification of emerging human–water

'problématiques' – meta-problems that go beyond the specific closed and clearly delineated definition of 'problems' and can be generalized as coherent areas of research and policy intervention even when happening on multiple spatial and governance scales.

Building on the concept of a 'problématique' introduced by Ozbekhan (1970) in the proposal for the Club of Rome, we define a problématique within the space of water challenges as a cluster of similar types of water problems; a broader, higher-level, recurring issue that manifests on multiple scales in various geographical settings, and persists in time. For the purpose of this Element, water challenges are understood as specifically human–water problems that represent a threat, an obstacle, a reason for concern or fear, and for which solutions are being searched or should be searched.

The focus on human–water problems stems from the fact that water challenges have both humans and nature at their heart, as shown by the interconnection between social and hydrological systems (Rangecroft et al., 2021). Furthermore, wicked problems are believed to always occur in a social context, with water problems more specifically often weaving "water and society together in a way that no single root cause of related complexity, uncertainty, or disagreement can be discerned" (Fallon, Lankford, & Weston, 2021, p. 36; Lach, Rayner, & Ingram, 2005).

Effective water governance practices require coordination between diverse actors, sectors, and scales, coupled with the agenda alignment (Cooley et al. 2013). Applying a synthesizing lens would allow for a clear delineation of the most pressing human–water challenges, helping set priorities for future-oriented water governance and effectively communicate the challenges of the ongoing water crisis with policymakers, practitioners, and the wider society. It is fundamental to be reflexive and critical about how water problems are identified, prioritized, and addressed, as these processes have political and decision-making implications. At the same time, unpacking the concept of the global water crisis can lead to more guided action, with a clearer focus and intention allowing for effective water governance practices.

This research engages with a synthesis of academic literature to produce a taxonomy of human–water problématiques and their components, and to develop a glossary for the global water crisis, contributing to the concretization of the question of *what we talk about when we talk about the global water crisis*. The Element examines: (1) what the most pressing contemporary human–water problématiques are according to the water governance scholarship; (2) how these problems are conceptualized by different scholars; (3) how the identification of human–water problématiques impacts the generation of

water governance paradigms, water governance patterns, and solutions; and (4) to what extent trends in prioritization of certain human–water problems over the years can be observed.

To address these questions, this Element relies on a two-step methodology, consisting of a systematic literature review (SLR) and a constant comparative method (CCM). This review is organized in the following manner: Section 2 discusses the applied methods. Section 3 presents the main results of this Element; first, in the form of a taxonomy, and second, as an in-depth water governance glossary, where each cluster represents a human–water problématique and its components. Section 4 discusses the linkages between distinct problématiques, reflects on potential solutions mentioned in the analyzed body of literature, and traces the evolution of the term 'problem' in the water governance scholarship. Lastly, the Conclusion completes the Element with some final remarks and thoughts about the way forward.

2 Methodology

The methodology applied in this research was twofold. The first phase applied an SLR as a means of collecting and reviewing existing scientific data on human–water problems worldwide to arrive at an overview of problématiques. The database created through this process served as the foundation for the second stage of the methodological approach – a constant comparative analysis centered around the objective of creating a water governance glossary. The following sections dive into the specific steps of the two stages.

From a theoretical stance, the point of departure for this research is the underlying recognition of water problems as wicked. Standing in opposition to tame problems, wicked issues cannot be tackled through 'normal science.' Therefore, this research is rooted in the 'post-normal science' (PNS) approach. This is applicable in cases where "facts are uncertain, values in dispute, stakes high, and decision urgent" (Funtowicz & Ravetz, 1994, p. 1882). Considering the wickedness of water problems, a conventional understanding of those as issues in need of clear, definitive solutions does not seem to be accurate (Fallon, Lankford, & Weston, 2021; Funtowicz & Ravetz, 1994). Moreover, the relevance of PNS in this context is further strengthened by its applicability in face the of epistemological uncertainty, a concept particularly relevant for this research (Funtowicz & Ravetz, 1993).

Considering the large scope of this research, an engagement with divergent theoretical approaches, paradigms, and epistemological diversity was expected. At the same time, a visibilization of the existent plurality of

worldviews and knowledges was one of the ambitions of this work. Therefore, this Element simultaneously draws on social constructivism, which recognizes the crucial influence of the wider context on one's perception (and construction) of reality (Amineh & Asl, 2015; Fallon, Lankford, & Weston, 2021). As shown by this research, the numerous understandings of reality translate into the many definitions of water and, by extension, water problems (Macura-Nnamdi & Sikora, 2023).

As argued by the PNS approach, a dialogue involving all voices is needed to reach effective solutions (Funtowicz & Ravetz, 1993). This research makes a step toward this goal by engaging with a pluriverse of perspectives within the water governance scholarship, veering away from reductionist approaches and the idea of one, universal way of understanding the global water crisis.

2.1 Systematic Literature Review

This research applies an SLR approach to: (1) perform a coherent search strategy with the objective of identifying all relevant publications within the water governance scholarship; and to (2) facilitate a synthesis of the findings (Moher et al., 2015). The conducted literature review is molded according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) protocol.

2.1.1 Data Sources

To narrow down the number of potential publications and to ensure a high quality and relevance of included sources, SCOPUS was used as the sole database. Although problématiques refer to higher-level issues that manifest on multiple scales and in various geographical settings, for operational reasons, the review was restricted to English-language publications. Nonetheless, the authors recognize the value of expanding the data sources to different languages, as reliance on exclusively English-language literature could lead to a Western bias and a neglect of alternative perspectives, including those originating from the Global South. Thus, the literature sources are treated with consideration for this aspect.

2.1.2 Search Strings

For the purpose of this Element, a single search string including an exhaustive number of related search terms was preferred over the use of several search strings in parallel. This choice was selected based on the

expected increased efficiency. In the trial phase, a search string consisting of terms "water," "governance," and "problem*," followed by synonyms to each component was applied. However, this process offered 47,753 sources, which were then narrowed down through different search iterations. Ultimately, a search string consisting of a list of terms synonymous with "water," followed by "governance" AND "problem*" was selected.

With the aim of identifying all the human–water problems discussed in the academic literature, this research is of an explorative nature. Thus, to remain unbiased when conducting the database search, search terms that might suggest a specific water-related problem and nudge the process onto a specific trajectory were omitted. Therefore, the authors refrained from including terms such as "pollution" or "water conflict*" in order not to manipulate what kind of articles the search would yield. The final search string consisted of a list of purely water/hydrologic terms synonymous to "water" based on the expertise of the interdisciplinary group of academics working on this research. After several iterations and interdisciplinary discussions, the authors arrived at the following search string:

> water* OR freshwater* OR groundwater* OR river* OR basin* OR watershed* OR catchment* OR irrigation* OR wastewater* OR wetland* OR lake* OR hydro* OR glacier* OR sociohydro* OR aquatic* OR "urban water" OR desalinat* OR ecohydro* OR reservoir* OR dam* OR hydropower OR rain* OR precipitation OR runoff OR "overland flow" OR "transboundary" AND governance AND problem*

2.1.3 Eligibility Criteria

To narrow down and increase the robustness of the potential literature, specific eligibility criteria were applied when searching the selected database. These are listed in Table 1.

Table 1 An overview of eligibility criteria applied in the conducted SLR.

	Eligibility criteria
Focus of the publication	freshwater governance problems
Date of publication	between 2004 and 2022
Language	English
Document type	peer-reviewed scientific articles from indexed journals
Geographic location	global