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Just Institutions or just Institutions? Research on Groundwater Justice in the European Union

REVIEW ARTICLE

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ABSTRACT

This qualitative systematic literature review examines discussions on groundwater justice in the European Union (EU) by analyzing 51 peer-reviewed academic articles that address groundwater governance and justice-related issues. The review identifies a limited number of studies that explicitly focus on groundwater justice, with most research emphasizing the local and regional institutional setup for groundwater distribution, particularly in agricultural contexts in Spain and France. Key themes in the literature include the role of institutions in regulating groundwater distribution, decision-making processes, and the recognition of different forms of knowledge. The literature also examines groundwater markets, often in relation to their potential to exacerbate inequalities, and explores the historical development of groundwater rights regimes, highlighting their continued influence on governance and water rights regimes. Additionally, studies discuss how infrastructure investments can further amplify inequalities, particularly as groundwater levels decline.

The limited explicit focus on groundwater justice in the EU may be linked to disciplinary traditions in commons scholarship and environmental justice research that tend to focus on institutions and high-profile cases of injustices, respectively. This paper highlights how grounded justice perspectives from EJ and Water justice literature based on capabilities and power can analyze more subtle cases of injustice. The review suggests that integrating uncertainty as an analytical category might be fruitful for groundwater justice research since uncertainties regarding groundwater materiality and modelling ultimately influence institutions mediating groundwater access and decision-making processes. Future research could therefore explore the relationship between uncertainty and justice, specifically how uncertainties shape groundwater rights distributions and decision-making processes.

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1 GROUNDWATER COMMONS AND JUSTICE IN THE EU

The question of how groundwater can be shared among different users and how institutions can be designed to manage groundwater sustainably has been central to commons scholarship since the beginning of the discipline (Ostrom, 1990). Since the early 2000s, there has been a growing discussion, inspired by critical institutionalism, on the importance of incorporating justice as an analytical category for examining institutional processes (Whaley 2018; Cleaver and de Koning 2015; Sinner et al. 2022; Cleaver 2002; Whaley 2022). Similarly, several reviews around water governance in recent years have called for a more active engagement of the field with issues of justice, equity, and power (Özerol et al., 2018; Whaley, 2022), and the governance of water is increasingly understood as an issue of justice (Boelens et al., 2018). Scholarship has highlighted that the distribution of groundwater, the decision-making processes and which knowledges are recognized in these decision-making processes are relevant to groundwater justice (Neal et al., 2016).

In the European Union (EU), groundwater supplies around 65% of drinking water and 25% of irrigated agriculture (European Environment Agency, 2023). As in many other regions of the world, groundwater is overexploited in parts of the EU, particularly in the south-west, affecting farmers' livelihoods and, in some cases, threatening the availability of drinking water (Calatrava et al., 2022; European Environment Agency, 2023). Climate change is predicted to lead to increased droughts across Europe (Grillakis, 2019), which is likely to increase the amount of irrigation required for agriculture (Riediger et al., 2014), further exacerbating groundwater degradation. These dynamics raise critical questions about which actors are able to secure access to groundwater, at whose expense, and how this is regulated through institutions, especially in times of scarcity. Given that groundwater supplies a substantial proportion of drinking water throughout the European Union, how it is governed is important for the region's drinking water supply. The issue seems particularly relevant as these already regionally serious problems around droughts are expected to intensify in the future and also in the non-Mediterranean parts of the EU (Grillakis, 2019).

The European Union (EU) presents a unique case for investigating environmental justice (EJ), particularly in groundwater governance, due to its shared institutional framework and the requirement to implement key directives such as the Water Framework Directive (WFD) or the Groundwater Directive (GD). The WFD, in particular, is positioned by the EU as a participatory directive (Pellegrini, Bortolini, and Defrancesco 2019; Jager et al. 2016). This raises the question of whether and how the literature evaluates the influence of these directives on justice.

Much of the existing Environmental Justice (EJ) literature on groundwater seems to have focused on contexts outside the EU, particularly in the North American context (Bae et al., 2023; Mascarenhas, 2007) and in different countries of the Global South (Cuadrado-Quesada & Joy, 2021; Faroque & South, 2022). These studies frequently centre on justice concerns related to Indigenous rights (Tari et al., 2024), which has received little attention in EU contexts (Grote, 2006). However, rather than indicating the absence of justice concerns within EU groundwater governance, this lack of scholarly engagement highlights a critical gap: justice-related issues may be present but remain underexplored. Given the institutional specificity of the EU and the increasing pressures of groundwater scarcity, there is a need to examine how justice is conceptualized (or overlooked) in the academic discourse on groundwater governance in this context. This paper aims to analyze and synthesize justice-related discussions within the academic literature on groundwater governance in the EU. Using a qualitative systematic literature review, it identifies, evaluates, and reflects on how justice-related issues are addressed (Gopalakrishnan & Ganeshkumar, 2013).

Accordingly, this article addresses the following research questions:

- *What key justice-related issues are identified in the academic literature on groundwater governance in the European Union?*
- *How is justice conceptualized around these issues?*

By reflecting on the results through perspectives from water justice, EJ, and political ecology, this paper further seeks to deepen the understanding of groundwater justice in the EU context. It applies an EJ framework that considers distributive, procedural, and recognitional justice (Schlosberg, 2004) and intergenerational justice (Frow, 2023). The paper first provides an overview of how these EJ dimensions relate to groundwater, followed by a description of the methods. The results are then presented based on the main themes of justice identified in the literature. Finally, the discussion reflects on these findings and showcases potential ways to better understand groundwater justice in the EU context.

2 THEORETICAL FRAMEWORK

Groundwater Justice, as well as Water Justice research, shows that the challenges surrounding the sharing and governance of groundwater can be understood through a justice lens (Boelens et al., 2018; Cuadrado-Quesada & Joy,

2021; Neal et al., 2014, 2016; Zwarteveen & Boelens, 2014). In this regard, water control issues are seen as political (Boelens, Vos, and Perreault 2018) and the distribution of water is *"always contested"* (Zwarteveen and Boelens 2014, 143). This contestation is particularly evident in groundwater allocation decisions, where minority and local groups and the environment often emerge as the *"losers"* (Neal et al., 2016, p. 253). Minorities and local groups are also frequently unable to influence decision-making processes that directly impact them, leading to outcomes from which they continue to suffer (King & Murphy, 2020).

Understanding groundwater justice and water justice as thematic branches of the broader environmental justice (EJ) literature, this review applies an EJ-based theoretical framework, adapted using insights from groundwater and water justice scholarship.

The framework builds on the widely used EJ dimensions—distributional, procedural, and recognitional justice—developed by Young (1990); Fraser (1997; 2005) and Schlosberg (2004). These dimensions are recognized as key in the conceptual literature on water and groundwater justice (Boelens et al., 2018; Neal et al., 2016) and have been empirically applied across various case studies (Mascarenhas, 2007; McLean, 2007; Mehta et al., 2014; Middleton et al., 2015).

Most importantly, the dimensions are interrelated (see Figure 1); therefore, to analyze distributional processes, it is important to analyze how actors can influence these processes and to look at who can influence them on which claims. Exclusion from decision-making processes often leads to disparities in water access and allocation (Boelens et al., 2018). These decision-making structures are shaped by economic power dynamics, cultural norms, and dominant knowledge systems that determine which perspectives are legitimized and prioritized (ibid). In addition, for analyzing groundwater governance through a justice lens, an intergenerational aspect seems to be important (Gleeson et al., 2012), as the physical depletion of aquifers directly affects groundwater availability for future generations. Frow (2023, 25) understands intergenerational justice as *"the actions taken by one generation to transfer a world in an enhanced state to those who come after"*. The idea of transferring the world in an improved state is not limited to the material world (e. g., the aquifer level) itself. Applied to the case of groundwater justice in this paper, it also means the institutions in place for the distribution of groundwater and the knowledges and groups that can influence this distribution (Neal et al., 2016). The lens of groundwater justice is understood through these three interrelated dimensions of the EJ framework against the backdrop of intergenerational justice, which evaluates the institutional setup of groundwater distribution as well as the quantitative state of the aquifer. Thus, the institutional setup for groundwater distribution is understood as a justice issue because it influences who has access to and control over groundwater, whose knowledge and claims are recognized in decision-making, and the long-term sustainability of the aquifer.

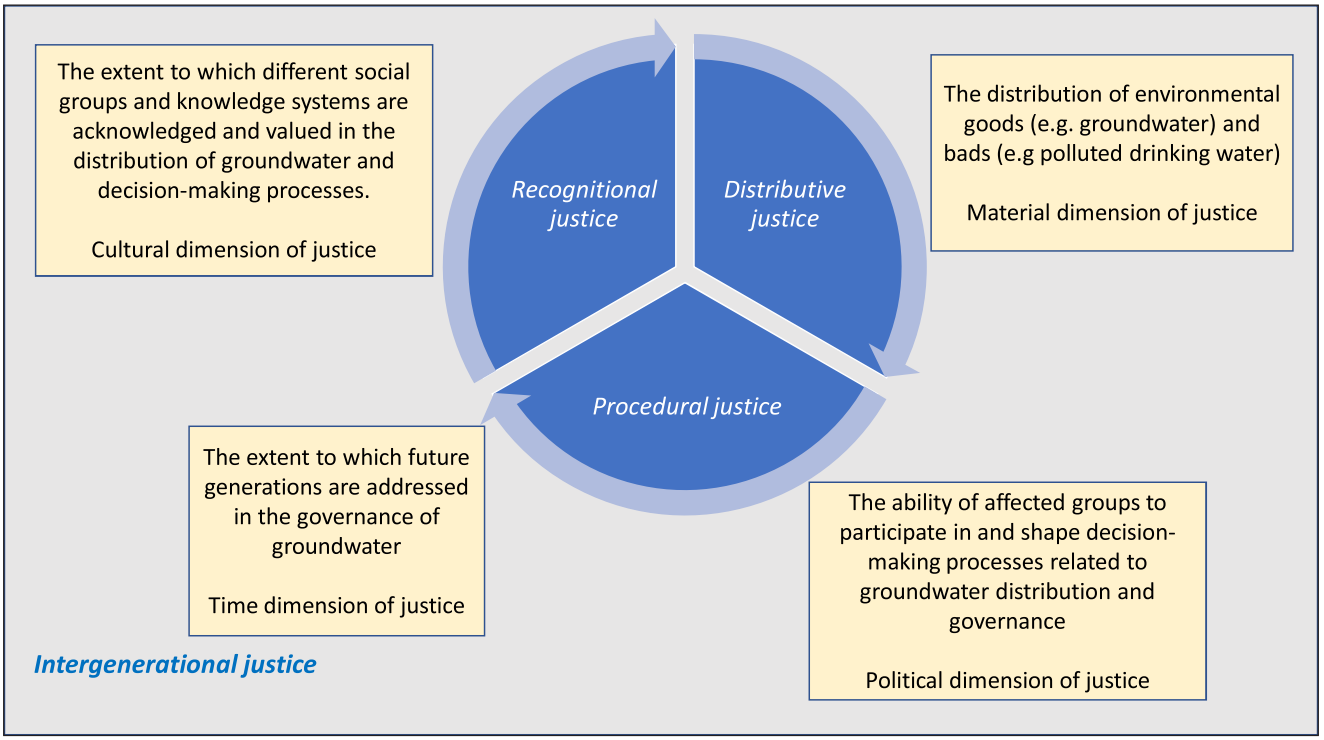

Figure 1 Conceptual model of groundwater justice. Source: Own work based on Schlosberg (2004), Boelens, Vos, and Perreault (2018), Frow (2023) and Zwarteveen and Boelens (2014).

3 METHODS

Qualitative systematic literature reviews follow a strict and replicable process to collect articles while qualitatively presenting the results and discussions (Snyder, 2019). This paper adapted the PRISMA framework for structuring the process of including papers in the literature review. As a result, the paper will highlight the identification (3.1) and screening of records (3.2) as well as the data analysis (3.3).

3.1 IDENTIFICATION OF RECORDS

The first step in a (qualitative) systematic literature review involves identifying potentially relevant literature. This review used the Web of Science database. Table 1 provides an overview of the search string combinations and their reasoning.

After the original search for "Justice", the number of potentially interesting articles was considered too low for a systematic review. Therefore, additional searches for "governance" and "institutions" were conducted to capture all EU-related papers that might discuss justice, to make the review as comprehensive as possible. The 'All' field was selected to ensure comprehensive coverage of the review and to avoid the possibility of missing any potentially relevant articles. This field offers a significantly broader search scope, with the capacity to capture articles in which the search terms are discussed but not emphasized in the title, abstract, or keywords. The cutoff date for the search was 08 April 2024. "Drinking Water" is a prominent utilization of groundwater, as evidenced by the fact that 65% of drinking water in the EU originates from groundwater (European Environment Agency, 2023). This figure contrasts the 35% share observed in the United States (Degnan et al., 2021), underscoring the close connection between groundwater and drinking water in the EU context. Consequently, "Drinking Water" has been incorporated into the search string.

3.2 SCREENING OF RECORDS

The next step in a systematic literature review is to exclude papers irrelevant to the research questions. Figure 2 gives an overview of this research selection process in the standardized PRISMA 2020 flow diagram template for systematic reviews.

After screening abstracts and excluding papers that do not focus on the EU, groundwater, or drinking water and did not include any discussions on governance, 401 papers were selected for full-text scanning to assess their relevance to discussions on justice. These full-text scans were done through MAXQDAs function "Keyword-in-context" (including 15 words before the term was mentioned and 15 words after) through the search of justice-related terms (see Figure 2) and an evaluation of whether these terms were actually used in a context of justice.[1] If they were seen as related to justice, e.g. if a hit mentioned that an "equitable distribution of groundwater" was important to groundwater governance, the whole paper was included in the systematic review. The overall goal here was to include papers discussing justice, not to define justice. The whole inclusion process was done by one person, following the strict criteria highlighted. After the full-text scans, 51 papers were included in the qualitative review. At some point in the paper, they all discuss justice or related terms, are focused on groundwater or drinking water, and are relevant to the EU.

SEARCH STRING (IN ALL FIELD IN WEB OF SCIENCE)	HITS	REASONING
("Groundwater" OR "Drinking Water") AND ("Justice") AND ("All EU countries")	110	To generally find all papers about justice on groundwater and drinking water in the EU. Drinking water was include because of its close relation to groundwater in the EU and its high relevance for environmental justice.
("Groundwater" OR "Drinking Water") AND ("Governance" OR "Institution*") AND ("All EU countries")	1487	To generally find all papers about the governance on groundwater and drinking water in the EU that potentially include discussions on justice to give the review the most comprehensive scope as possible.
("Groundwater" OR "Drinking Water") AND ("Governance" OR "Management") AND ("Institution*") AND ("All EU countries")	876	To include papers that write about management instead of governance as they are sometimes used interchangeably (Hasselman 2016). Institution was additionally added as solely searching for management alone without a further restriction yielded too many results (9.835 as of 23.04.2024).
Overall: Literature on groundwater, drinking water and justice + extra literature on governance, management and institutions	2473	As the initial research on justice itself yielded too little results search was expanded to include all potentially relevant justice discussions.

Table 1 Overview of search strings used and the reasoning behind each search.

("Austri*" OR "Belgi*" OR "Bulgari*" OR "Croati*" OR "Cypr*" OR "Czech*" OR "Denmark" OR "Estoni*" OR "Finn*" OR "Franc*" OR "German*" OR "Gree*" OR "Hungar*" OR "Irel*" OR "Ital*" OR "Latvi*" OR "Lithuani*" OR "Luxem*" OR "Malt*" OR "Netherland*" OR "Dutch*" OR "Poland" OR "Portug*" OR "Romani*" OR "Slovaki*" OR "Sloveni*" OR "Spain" OR "Spanish" OR "Swed*" OR "Europe" OR "EU" OR "European Union").

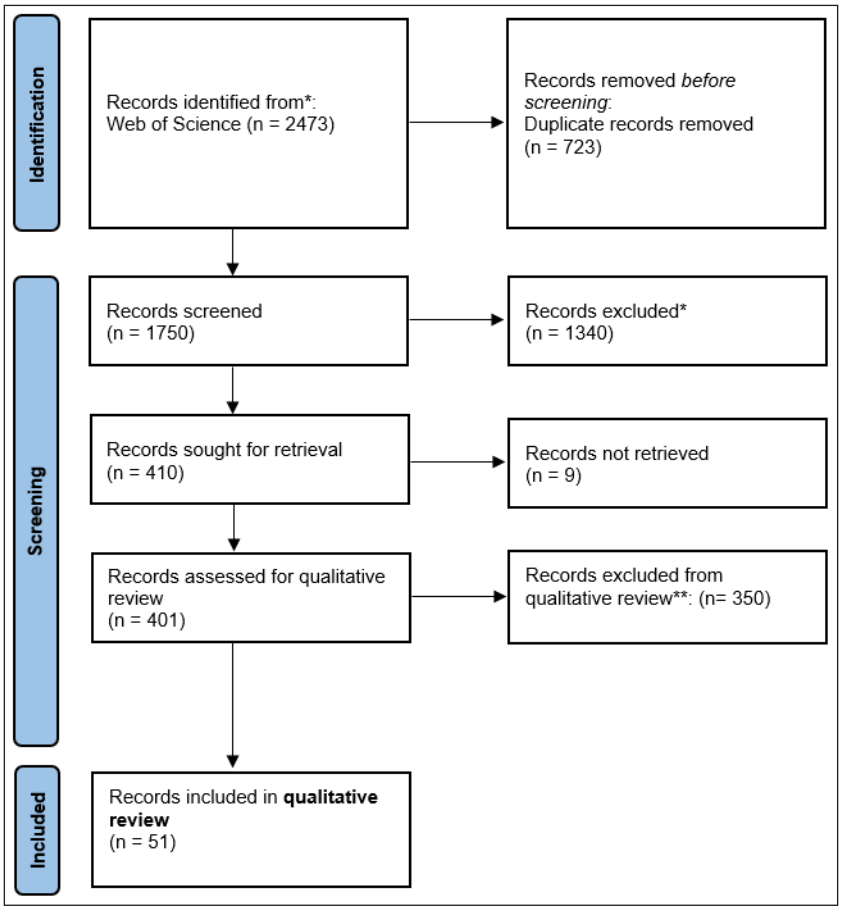

Figure 2 Description of sampling strategy including Identification of records through search terms, Screening of records, and Inclusion of studies for Qualitative review. Adapted from (Page et al., 2021).

*If the papers geographically did not include the EU or its member states, did not mention issues of governance/institutions, were not about groundwater or drinking water, were not in English and were not a scientific paper.

**If they had no mention of "Justice", "Equality", "Equity", "Fair", "Fairness", "Intersectional", "Race", "Class", "Gender", "Inclusion", "Exclusion", "Recognition", "Distribution", "Procedural" "right to water", "generation".

3.3 DATA ANALYSIS – CODING OF THE INCLUDED PAPERS

The data was analyzed using qualitative coding in MAXQDA, with a coding scheme initially derived from the theoretical framework, incorporating distributional, procedural, recognitional, and intergenerational justice aspects. However, qualitative coding benefits from openness to the data itself (Linneberg & Korsgaard, 2019). An inductive approach with open coding elements was applied to capture emerging themes beyond the theory-driven perspective (ibid.). As a result, the coding scheme was revised twice—after coding seven and twenty papers—adapting standard qualitative content analysis practices (Mayring, 2015). This process led to the identification of additional themes, such as market dynamics (see section 4.2.4) and access issues, later reframed as the "race to the bottom" (section 4.3).[2] Beyond coding, interpretation of the data (summarizing and interpreting the codes) plays a crucial role in uncovering patterns in the data. While coding facilitates pattern recognition, it does not determine it—interpretation of the data remains essential (Linneberg & Korsgaard, 2019). In this study, the interpretative phase revealed another significant topic: the historical dimension of water rights, which emerged as a key theme in the literature (see section 4.2.5). The coding was conducted by one researcher, who regularly discussed and received feedback on the process within the internal working group. A full overview of the final coding scheme, with definitions and examples for each code, can be found in the Appendix.

4 RESULTS

4.1 OVERVIEW

A brief overview of the overall body of research is provided before delving into the main justice-related themes discussed in the literature.

4.1.1 Justice focus

Out of the 51 papers analyzed, only six explicitly focus on justice, as evidenced by mentions of the term in the title, keywords, abstract, or introduction.[3] However, this does not imply that the other papers completely overlook justice-related topics. As indicated in the method section, all the papers at least touch on justice, often using related concepts like "fairness" or "equity" or briefly mentioning justice without making it their central focus. The literature analyzed, therefore, comes from various perspectives, mainly from collective action (Amblard & Mann, 2021; Lopez-Gunn, 2003; Rica et al., 2014) and institutional theory (Rouillard et al., 2021; Rouillard & Rinaudo, 2020), but also approaches such as IWRM (Jonch-Clausen & Fugl, 2001), critical institutionalism (Cleaver and Whaley 2018), or market-based approaches (Blanco & Gomez, 2014) with nearly all of these approaches being concerned with the ways institutions mediate the distribution of groundwater. However, research on groundwater in the EU specifically emphasizing justice remains limited.

4.1.2 Geographical Scale

Most literature does not address justice issues in-depth at the EU level. Instead, it concentrates on case studies from individual regions, particularly in Spain and France (20 papers include examples from Spain, 7 on France). Some EU-level discussions touch on the Water Framework Directive (WFD) and other legal frameworks in relation to groundwater governance. Still, they do not explicitly engage with justice as a central theme. Conti and Gupta (2014) highlight principles like 'equitable use' and 'polluter pays' within the Danube Convention, WFD, and Groundwater Directive, but without explicitly assessing their justice implications. Similarly, Carvalho et al. (2019) critique the WFD for lacking clear definitions of equity and fairness in the distribution of costs and benefits. Still, they do not systematically analyze its role in addressing groundwater justice. Rouillard et al. (2021) highlight how the WFD influences water rights regimes between France and Spain, yet their analysis does not explore whether or how it mediates injustices in this context. Other studies (Fritsch & Benson, 2020; Glavan et al., 2019; Grecksch, 2013) discuss governance aspects of the WFD, yet justice-related debates remain fragmented and largely implicit.

4.1.3 Thematic focus

Of the 51 reviewed papers, 29 focus exclusively on quantitative aspects of groundwater, while 11 examine only qualitative issues. Another 11 address both. Discussions on qualitative aspects are diverse but fragmented, with only a few studies directly linking groundwater pollution and drinking water quality to local-level social inequalities (Gorostiza & Saurí, 2019; Jeanjean et al., 2023). Meehan et al. (2020) challenge the notion of universal safe drinking water access in the Global North and the EU. Other papers explore varied topics such as citizen science in water quality monitoring (Brouwer et al., 2018), nitrate pollution in drinking water aquifers (Amblard & Mann, 2021), regulatory effects of drinking water directives on regional water supervision (March & Saurí, 2013), and eco-innovation strategies of water suppliers (Crisan et al., 2021). However, these studies rarely engage in detailed justice analyses, making them less central to this review.

Given the fragmented nature of the discussions around the qualitative dimension, this review focuses on the institutional setup for groundwater distribution, where the topics related to justice issues are more coherently addressed.

4.2 INSTITUTIONAL SETUP FOR GROUNDWATER DISTRIBUTION

Justice issues within the institutional setup for groundwater distribution are described from various perspectives, including the conceptualization of groundwater as a contested resource (distributive justice) (4.2.1), the decision-making power over groundwater distributions (procedural justice) (4.2.2) and the knowledges accepted in these processes (recognitional justice) (4.2.3). Additionally, the topics of markets (4.2.4) and history (4.2.5) emerged as key justice-related issues in the literature. They are presented separately, as they intersect with, but do not solely focus on, distribution, procedure, and recognition.

Outside of this literature that focuses primarily on institutions, some authors highlight potential relationships between sinking groundwater levels and rising injustice mediated through the possibility of investing in infrastructure highlighting it as an issue situated outside the institutional arena (4.3). Although intergenerational justice is not deeply examined in the analyzed body of literature, it is primarily framed in relation to aquifer sustainability and will be also briefly discussed in section 4.3.

4.2.1 Groundwater as contested resource – Distributive Justice

Many research papers describe groundwater as a contested resource, with a strong focus on competition among agricultural actors, although urban centers or industrial interests are also portrayed as competing for access (Livingston and Garrido 2004; Hellegers and Van Ierland 2003; Rouillard et al. 2021; Aguilera-Klink, Perez-Moriana, and Sanchez-Garcia 2001; Velez-Nicolas et al. 2020). Beyond the mere existence of competition, several authors highlight that groundwater governance can often result in an unequal distribution of costs and benefits, as users seek to secure their share, which can happen at the expense of others (e.g., Amblard & Mann, 2021; Hellegers & Van Ierland, 2003; Huntjens et al., 2012; Lopez-Gunn, 2012). However, by recognizing interdependence

in common-pool resource settings, users can initiate and develop *"norms of reciprocity that further enhance the process of cooperation"* (Chervier et al., 2022, p. 9). Accordingly, institutions regulating groundwater access can vary within countries, for example, in Spain (Lopez-Gunn, 2003), and even more so between countries in the EU. (Rouillard et al., 2021) highlight that Spain and France, for instance, have differing rights that regulate access.

Overall, only a few authors explicitly conceptualize this competition for groundwater and the varying institutions regulating access as matters of justice (e.g., F. Cleaver & Whaley, 2018; Herivaux et al., 2020; Hoogesteger & Wester, 2015; Rouillard et al., 2021), most tend to use other terms and concepts. These include unequal sharing and freeriding (Breeveld et al., 2013; Brugnach, 2017; Lopez-Gunn, 2003) or externalities (Livingston & Garrido, 2004). In conclusion, while groundwater is described as a contested resource with different institutional setups regulating access, the term "distributive justice" is rarely explicitly mentioned in the literature.

4.2.2 The decision-making power over groundwater distribution – Procedural Justice

Cleaver and Whaley (2018) describe a general trend in commons scholarship, shifting away from a focus on community-level governance of common-pool resources toward power-sharing arrangements between governments and communities. According to Rouillard and Rinaudo (2020), the power to distribute groundwater can be conceptualized along a continuum, ranging from completely state- to user-led regimes.

Overall, the literature is critical of state-led regimes, as efforts to regulate groundwater from a central authority have historically proven ineffective in regulating groundwater use ("as Hoogesteger and Wester 2015 argue"), leading to a system based on groundwater accumulation and expropriation. Building in part on their analysis of Spain, Hoogesteger and Wester (2015) show that groundwater is generally difficult to regulate from a central authority because it is an invisible resource, abstractors tend to be widely dispersed, and reducing extraction runs counter to states' incentives for constant economic growth. Moreover, state-led regimes are seen as running the risk of failing to recognize local groups' needs to include them in decision-making processes (Rouillard et al., 2021).

A call for participation is expressed throughout the selected articles (see, for example, Lopez-Gunn 2003; 2012). The literature consistently emphasizes the need to involve users in decision-making processes, sometimes stressing the importance of actively empowering them to influence outcomes (Molina-Gimenez, 2020) or often emphasizes the importance of making decision-making processes at least transparent (Amblard & Mann, 2021; D'Agostino et al., 2020; Grecksch, 2013; Huntjens et al., 2012; Rouillard & Rinaudo, 2020). Some authors link this need for participation to paying particular attention to vulnerable or marginalized groups, emphasizing that not all groups can typically participate in decision-making processes similarly (Brugnach, 2017; Huntjens et al., 2012).

However, (fully) user-based decision-making processes are seen as potentially too lenient in terms of regulation, which, as Rouillard et al. (2021) show, can potentially lead to declining groundwater levels and, thus, an increase in injustices (see section 4.3). In addition, Brugnach (2017) worries that without external, power-sensitive mediation, power imbalances between users could lead to an inequitable distribution of groundwater. Based on a case study in the Upper Guadiana Basin in Spain and the Puglia region in Italy, her analysis shows that many participation processes fail to address existing inequalities and power differentials between stakeholders. She, therefore, highlights the need to consider power imbalances in decision-making processes involving user input in order to incorporate and integrate mechanisms that empower marginalized actors, such as legal support, access to information, or capacity building (Brugnach 2017).

4.2.3 Knowledges – Recognitional Justice

Related to the debate about whether the distribution of groundwater (rights) should be based on a state-led or user-led regime is the question of which knowledges are recognized in decision-making processes. Brugnach (2017) emphasizes the need to incorporate diverse forms of knowledge and perspectives beyond just scientific expertise and technical knowledge. She suggests that effective water management requires flexible, collaborative networks that include local actors, citizens, and marginalized groups, rather than being dominated by professional engineering approaches. Similarly, she highlights the potential for self-regulation and voluntary agreements among water users, which can leverage their specialized, place-based knowledges. This, however, requires an institutional culture that is open to harnessing local creativity and expertise rather than overriding it. Chervier, Amblard, and Depres (2022) argue that scientific knowledge can help build consensus, while local knowledge can help better understand local resource dynamics. Similarly, Lopez-Gunn and Cortina (2006, 363) note that water user associations in different regions in Spain *"can command a great degree of expertise and/or knowledge, because even if their knowledge is not technical, rather it is indigenous, contextual knowledge, it is nevertheless extremely valuable."* However, despite this emphasis on diverse knowledges, the analyzed literature does not further describe indigenous perspectives on groundwater in the European Union.

While overall, there is a call for including users in decision-making processes and incorporating their diverse knowledges, also more critical authors, such as Hoogesteger and Wester (2015) and Brugnach (2017), highlight that some sort of regulation of groundwater depletion is necessary. In their understanding, this requires a shift from viewing regulation as the sole approach and an active inclusion of justice and local knowledges in groundwater governance.

4.2.4 Markets

Another dimension in the institutional setup for groundwater distribution is the tradability of groundwater through markets. It is seen as a different mode of groundwater distribution that does not necessarily fit on the continuum between state-led and user-led distribution processes (Rouillard et al., 2021).

In some cases, markets are seen as a mechanism to achieve equitable distribution, particularly in approaches like Integrated Water Resource Management (IWRM), where water can be treated as an economic good to be reallocated to higher-value uses (Batchelor, 1999; Jonch-Clausen & Fugl, 2001).[4]

Groundwater markets typically operate on cap and trade policies, setting an aggregate cap on water abstraction and allowing rights to be traded (Herivaux, Rinaudo, and Montginoul 2020). Rouillard et al. (2021) highlight that market outcomes are usually seen as justified when they are maximizing economic efficiency, with justice not being an active perspective in market-based allocation regimes. The underlying reasoning is that markets reach an 'optimal' groundwater allocation more efficiently than command – and control policies (Herivaux, Rinaudo, and Montginoul 2020).

Overall, the literature criticizes groundwater markets for favouring the interests of a few at the expense of others (Bouarfa & Kuper, 2012; Hoogesteger & Wester, 2015). Critics argue that these markets often exacerbate inequalities, particularly by excluding certain groups, and that market-based allocations overall are neither just or efficient (Aguilera-Klink et al., 2000; Hoogesteger & Wester, 2015). Historical examples, such as in The Canaries, show that markets can be manipulated to create artificial scarcities, e.g., by pouring water into the sea in winter to raise prices, which increases inequalities. This also proves to be a very inefficient way to govern groundwater (Aguilera-Klink et al., 2000). Furthermore, Herivaux, Rinaudo, and Montginoul (2020) highlight that farmers in France have ethical concerns that marketization undermines community solidarity by intensifying competition.

More fundamentally, the tendency for market mechanisms to prioritize economic efficiency over equitable access is seen as a fundamental flaw, particularly in contexts where water scarcity is already exacerbating social tensions (Hoogesteger & Wester, 2015). Hoogesteger and Wester 2015, (142) additionally express their criticisms towards privatized libertarian governance regimes that see a "*free exercise of [...] rights*" as inherently fair, even when they result in significant inequalities in groundwater access. Similarly, Walsh (2022) criticizes current governance regimes that employ a laissez-faire rule protecting individuals' rights to extract groundwater, rooted in historical dispossession and enclosure processes. Similarly, by reducing water to a commodity, markets cannot incorporate the social and ecological value of water or local knowledges.

Overall, while institutional setups for groundwater distribution, particularly the tradability of groundwater rights, dominate discussions in the literature, broader criticisms highlight the negative justice impacts of privatization and marketization within the capitalist political economy.

4.2.5 Historical dimension

The historical dimension of groundwater distribution, particularly through the establishment of groundwater rights, is highlighted by several authors as a significant factor influencing current distribution practices and raising questions of justice (Aguilera-Klink et al., 2000; Bouarfa & Kuper, 2012; Livingston & Garrido, 2004; Mechlem, 2016; Obani & Gupta, 2014; Rouillard et al., 2021). Essentially, when discussing the current way to structure the institutional setup for groundwater, the literature highlights the importance of the historical dimension – specifically, who has historically been able to access, withdraw, and manage groundwater.

In their analysis of legal frameworks for groundwater governance, Mechlem (2016) shows that groundwater – in opposition to surface water – generally was treated as a private good which, according to the law, belonged to land owners. Going into an analysis of France and Spain, Rouillard et al. (2021) highlight how differently groundwater rights regimes have been set up in the past, even between two neighboring EU countries. While France and Spain both base their systems on landowners as central right-holders, the rules governing access, withdrawal, management, exclusion, and alienation of groundwater rights are highly complex and vary significantly between the two countries. For example, considering withdrawal rights, Spain differentiates between those granted before or after the 1985 Water Law (Rouillard et al., 2021). Landowners with private historical water rights, granted before the 1985 Water Law, had no restrictions on how much water they could pump, except for guidelines regarding the distance between wells. Concessions granted after the 1985 Water Act specify a maximum annual and monthly volume that can be extracted. These concessions are valid

for 50 years and are non-revocable, although they can be reduced in overexploited aquifers (Rouillard et al., 2021). In France, there is a difference between restricted basins and unrestricted basins. In non-restricted basins, the requested volume is granted by the state agency after verifying that there is no impact on third parties or the environment, typically through an environmental impact assessment. In restricted basins, farmers apply annually to the local water user association, which manages the individual requests by the farmers and potentially adjusts the limits (Rouillard et al. 2021). This highlights that throughout the EU (even between two states), there are different ways of withdrawing groundwater that affect justice. Rouillard et al. (2021, 14) interpret the stronger control of users in France as an "*emphasis on social justice than efficiency*" being put in place by France in groundwater governance compared to Spain, which has a stronger state-led regime. In their study on the adaptation of groundwater markets in France, Herivaux, Rinaudo, and Montginoul (2020), however, report that workshop participants argued that allocations of groundwater rights based on previous usage (based on landownership) perpetuate an unfair system, as water-saving efforts are not rewarded.

Some other cases highlight how groundwater appropriation through rights-based regimes has helped only a few individuals in the past. Aguilera-Klink, Perez-Moriana, and Sanchez-Garcia (2000), illustrate how freshwater rights in the canaries de facto translated into groundwater rights. Initially, landowners began by abstracting water from surface sources, but they turned to groundwater when these surface waters ran dry. This shift not only affected groundwater levels but also limited the ability of others to access water. Bouarfa and Kuper (2012, 6) criticize the formalization of water rights generally, arguing that it has often "*cemented inequalities*" by allowing powerful rural actors to influence the distribution process in favor of already affluent groups. However, if existing groundwater rights were revoked, it would likely lead to affected users feeling unfairly treated, thereby complicating efforts to reform existing systems of groundwater abstractions (Livingston & Garrido, 2004).

Therefore, the history of groundwater rights, including the timespans and revocability associated with these rights, is a central theme in justice discussions surrounding the institutional setup for groundwater distribution in the EU.

4.3 THE RACE TO THE BOTTOM AND INTERGENERATIONAL JUSTICE

Outside of these institutional debates, some authors highlight an interlinkage between a material depletion of groundwater and an increase in injustices (Molle, Lopez-Gunn, and van Steenbergen 2018; Hoogesteger and Wester 2015; Walsh 2022). Hoogesteger and Wester (2015, 110) describe a "*race to the bottom*", where wealthier farmers outpump poorer ones as groundwater levels decline. As the costs of deepening wells increase, only more affluent farmers can afford to continue deepening their wells to access groundwater. Those unable to deepen their wells risk losing their livelihoods as more powerful actors deplete the resource and further lower groundwater levels (Hoogesteger & Wester, 2015).

Pumping groundwater demands a significant initial investment, particularly when deeper wells and advanced pumping technology are required. Moreover, these pumps increase the rate at which water is drawn towards them, intensifying the processes of groundwater depletion and dispossession (Walsh, 2022). Resource-poor farmers in different cases around Spain have been pushed out of the system as they have been outpumped (Aguilera-Klink et al., 2000, 2001; Bouarfa & Kuper, 2012). While only some of the authors go into this process of injustices and sinking groundwater levels, the literature highlights that several aquifers in Spain (Lopez-Gunn, 2003, 2012; Lopez-Gunn & Cortina, 2006; Molina-Gimenez, 2020; Molle et al., 2018), but also overall in the Mediterranean, are in overdraft (Blanco & Gomez, 2014). Overall, in this process, the greatest cost of aquifer exploitation, Walsh (2022) argues, is paid by poor people and the environment itself. He furthermore argues that through groundwater invisibility, depletions of groundwater are enabled. The before-mentioned justice issues around the institutional setup for groundwater distribution tend to intensify as groundwater levels sink. Due to this process, Hoogesteger and Wester (2015) call the focus on water rights misleading since they argue that the access to groundwater and processes of groundwater accumulation can be better analyzed through a structural and relational perspective.

While there is a discussion around intra-generational justice issues around sinking aquifer levels, only a few papers directly connect these issues with intergenerational injustices. Velez-Nicolas et al. (2020) address this connection in their analysis of sustainable groundwater management in the Benalup Aquifer in Southern Spain, stating that, in their view, the intergenerational aspect is inherent to the context of sustainability. Livingston and Garrido (2004) directly connect the issue of sustainability to justice as they highlight that intergenerational equity means that extraction paths of groundwater have to be sustainable for future generations. Overall, though, focusing on intergenerational justice seems to be quite rare.

5 DISCUSSION

This paper synthesizes the main justice-related issues in the academic literature on groundwater governance and

justice in the European Union and analyzes how justice is conceptualized. In this section, the results are reflected, examining the dominant focus on institutions in the literature (5.1) and the absence of a distinct groundwater justice scholarship (5.2). Together with reflecting on two approaches from EJ and water justice literature (5.3) as well as uncertainty in human-groundwater relationships (5.4), this section aims to deepen the understanding of groundwater justice, particularly in the EU context. Finally, some reflections on the limitations of this paper round of the discussion (5.5).

5.1 THE DOMINANT FOCUS ON INSTITUTIONS IN THE LITERATURE

The analyzed literature predominantly focuses on the institutional regulation of groundwater, particularly on the institutional setup for groundwater that regulates its distribution through institutions such as water rights and water user associations. This emphasis is unsurprising given the significant influence of Ostrom's work (1990) on understanding and governing common-pool resources like groundwater. Ostrom demonstrated that sustainable groundwater governance is possible through collective action and community-based institutions, preventing the so-called "tragedy of the commons." She also developed key design principles for "robust, self-organized governance institutions" (Ostrom, 2005, p. 1), which have been highly influential in groundwater governance research and, therefore are often referenced in the analyzed body of literature. While this institutional focus effectively highlights how collective action can contribute to the sustainable management of aquifers, it also means that spatial-relational perspectives receive less attention in this review. Only a few authors in the analyzed literature examine the direct link between groundwater depletion and the role of infrastructure in accelerating this process. However, those who do highlight how these developments often drive accumulation, dispossession, and increasing injustice (see Molle, Lopez-Gunn, and van Steenbergen 2018; Hoogesteger and Wester 2015; Walsh 2022, Section 4.3). As this decline is driven by the expansion of well and pump infrastructure largely situated outside the institutional arena, directly addressing the infrastructure used to access groundwater may be a promising approach from a justice perspective. This could help to highlight how infrastructure enables some actors to access groundwater at the expense of others, thereby translating power imbalances into a physical depletion of the aquifer and furthering inequalities. For instance, Birkinshaw (2022, 42) demonstrates how the materiality of wells and tubes shapes local power relations, leading to water grabs and heightened injustices. In Spain, De Stefano et al. (2015) highlight that 90% of wells may be illegal, operating outside collective action regimes, exacerbating inequitable groundwater access. Similarly, in Sainte-Soline, France, 2023 protests against "mega-reservoirs"—large basins filled with groundwater via pumps—illustrate how infrastructure can reinforce unequal access (Thompson, 2023). These cases underscore that groundwater infrastructure is not merely technical but a key mediator of power and inequality (McFarlane and Rutherford 2008). While inequalities should not be automatically equated with injustice (Walker, 2009b), the role of infrastructure in shaping groundwater access remains an underexplored yet important dimension of groundwater justice in the EU context.

5.2 THE LACK OF CLEAR GROUNDWATER JUSTICE LITERATURE IN THE EU

Only six of the 51 analyzed papers explicitly focus on (in-) justice, highlighting the absence of a distinct body of groundwater justice research in the EU (see section 4.1.1). In this section, three short potential explanations for this phenomenon are offered.

Disciplinary logics in groundwater governance literature

One reason for this gap may again be based on the disciplinary logic of groundwater governance literature – Ostrom's institutional approach does not explicitly center justice (Whaley, 2018). While there has been a shift in commons scholarship toward power-sharing arrangements between governments and communities (Cleaver and Whaley 2018, Section 4.2.2), justice considerations remain limited. This might explain why groundwater distribution is generally not understood as an issue of justice (see section 4.2.1).

Similarly, other relevant approaches in the literature, such as Integrated Water Resources Management (IWRM) and market-based perspectives, o not inherently focus on justice but are frequently critiqued from justice accounts (see section 4.2.4). Political ecology scholars, for example, argue that IWRM's technocratic approach overlooks embedded power structures (Walter and Schmidt 2023). Boelens, Vos, and Perreault (2018) argue that while Mainstream water policies and discourses tend to emphasize "participation," "integration," and "recognition of local rights and cultures," they appeal to common-sense notions of justice and equality while depoliticizing water governance. This also raises the question of whether the frequent calls for "participation" (see section 4.2.2) in the literature can be understood primarily as an analysis or call for procedural justice. Wilson and Swyngedouw (2015) argue in this regard that participatory regimes are often depoliticized, preventing them from challenging the deeper systemic issues at the root of many injustices.

The disciplinary logic of the EJ and Water Justice literature

While groundwater governance literature oftentimes does not emphasize justice, EJ and water justice research have historically oftentimes focused on highly visible cases of environmental harm and resistance. EJ research originated in the United States as an activist movement highlighting stark racial and socioeconomic disparities in environmental exposure (Cutter, 1995). While EJ scholarship has since expanded globally (Walker, 2009a), Petrić (2019) argues that it only recently gained traction in EU research, potentially explaining a temporal lag in its application to groundwater.

Another factor might be the type of injustices studied in EJ and Water Justice literature. While EJ research has often focused 'clearer' cases on inequality or activist-led struggles (Walker 2014), the most commonly recognized cases of environmental injustice tend to involve the unequal distribution of environmental burdens, particularly those affecting marginalized communities (Schlosberg, 2004). This might have shaped the types of injustices studied, e.g. by focusing on more overt cases of injustice, such as colonial extractivism's impact on Indigenous communities (see e.g. Frost 2019). Similarly, water justice literature has emphasized resistance movements and struggles (Cleaver 2018), often overlooking less visible injustices in groundwater governance.

The relative invisibility of groundwater injustices in common-pool resource settings in the EU

In comparison to (anti-)colonial contexts—such as e.g. the Mapuche's struggle for water in Chile (Torres et al., 2022) or Indigenous water conflicts in Canada (Frost, 2019)—groundwater-related injustices in the institutional setup between agricultural actors might be perceived as a less pronounced case of injustice or resistance and struggle. These more subtle injustices tend to have been overlooked by water justice research (Cleaver 2018) and consequently may not have been studied under justice frameworks. While some very open cases of resistance, such as the Saint-Soline protests in France (Ndabezinhle, 2023) or Tesla's water use controversy in Germany (Deutschlandfunk, 2024), have emerged in the EU, these remain relatively recent developments. Similarly, while there are Indigenous struggles in the EU in the context of water – see, e.g. Samis's fight for recognition around the water crisis (Stockholm International Water Institute, 2019) overall, they are relatively less discussed in the EU. This might also explain why the discussions around recognitional justice (4.2.3) mostly center around the ways which knowledges are recognized in decision-making processes.

Additional factors may also contribute to the limited development of groundwater justice research in the EU. Linguistic diversity in academic publishing may limit international recognition of non-English research.

5.3 TWO OPTIONS FOR DEALING WITH SUBTLE ISSUES OF JUSTICE

Building on the gaps identified in the previous section, this section explores two potential ways in which EJ and water justice scholarship can contribute to developing a more nuanced groundwater justice research agenda in the EU by addressing the subtle mechanisms through which water injustices become normalized, accepted, and perpetuated (Cleaver 2018).

Capabilities approach

Walker (2009b) criticizes EJ scholarship, which too easily assumes injustices based on inequalities or employs EJ activism without reflecting on its normative stance. He follows Schlosbergs' (2007, 72) suggestions for justice scholarship, focusing on *"re-establishing the capabilities necessary for a healthy, functioning community."* Edwards, Reid, and Hunter (2016) argue that the capabilities approach in EJ has emerged as an outcome of a shift towards more pluralistic conceptualizations of justice. Rather than privileging one form, the capability approach originally developed by Amartya Sen (1974) and Martha Nussbaum (2003) can help to include a variety of necessary forms of justice (Walker, 2009b). Through at core asking which capabilities individuals (Sen 1980) or communities (Schlosberg 2007) have to have to be *"able to live lives that they consider to have value"* (Edwards et al., 2016, p. 3) it provides a normative basis for justice while still remaining open to what actually matters to local-level actors. Applied to a procedural justice issue, the key question becomes, "Do actors who want to participate in decision-making processes have the capabilities to do so?" If a farmer does not participate due to lack of access to information, institutional barriers, or exclusion by power dynamics, they lack the capability to engage—even if they want to.

The emphasis on "if they wanted to" is crucial because it focuses the analysis on how groundwater matters to local-level actors and whether it enables them to lead meaningful lives—whether that is food security, economic stability, self-determination, cultural or spiritual values, or health. This can then help guide groundwater analysis to examine how groundwater institutions, infrastructures, or power dynamics enable or impede their capabilities. The capabilities approach can, therefore, help to highlight especially the everyday ways in which water injustices become normalized, accepted, and perpetuated by those who experience them (see Cleaver 2018).

Embedment into power

Another way to approach these more subtle injustices is through insights from the water justice literature. Boelens, Vos, and Perreault (2018, 5) argue even more strongly that justice should be understood as relational, emphasizing the importance of asking *"how diverse people see and define justice within a specific context, history, and time."* Similarly, Zwarteveen and Boelens (2014, 147) assert that definitions and understandings of justice should not be based solely on abstract principles of *"what should be"* but must also be grounded in how injustices are actually experienced. Rinaudo, Moreau, and Garin (2016) highlight how local perceptions of what is seen as just are highly relevant for the acceptance of allocation rules. To embed these experiences and perception of (in)justices, Boelens, Vos, and Perreault (2018) propose that it is essential to recognize and analyze the power structures and politics of water governance. This is mirrored by Sultana (2018), who argues that water governance is at its core about power. By demonstrating how power and politics operate through underlying norms and rules that appear natural or technically neutral, Boelens, Vos, and Perreault (2018) argue that injustices are not only evident in overt conflicts but are also embedded in standard ways of knowing and governing and thus operate with more subtlety. Applying this power-sensitive lense on water justice, Swyngedouw and Boelens (2018, 129) showcase the hydraulic history of Spain in the 20th century and how the ways in which different alliances throughout this eventful period were able to reorder what is seen as just largely depended on the ways in which they were able to *"network, mobilize, and exercise power."* Thus, water justice can only be understood by examining how certain knowledges, practices and governance forms are legitimized while others are discredited (Swyngedouw & Boelens, 2018). Generally, the power-sensitive analysis can already be found in the analyzed literature as highlighted in sections 4.2.2–4.25, such as by Hoogesteger and Wester (2015) or Cleaver and Whaley (2018), showcasing its already existing application and usefulness for analyzing groundwater justice in an EU context.

Both approaches emphasize a relational and grounded understanding of justice, allowing experiences of injustice to be understood through a capability's perspective or in terms of power relations. These perspectives are relevant to understanding how infrastructures and institutions play a role in how injustices become normalized, accepted, and perpetuated by those who experience them (Cleaver 2018). They can also help to sharpen the focus on these injustices in processes of accumulation and dispossession associated with the race to the bottom, as described by Hoogesteger and Wester 2015 in section 4.3.

5.4 UNCERTAINTY AS INTEREST FOR GROUNDWATER JUSTICE RESEARCH

To further contribute to the understanding of groundwater justice research (in the EU), this section argues why integrating uncertainty as an analytical category might be fruitful for research around groundwater justice. Dewulf and Biesbroek (2018) propose a comprehensive framework for understanding uncertainty in complex environmental governance problems, distinguishing between different types and objects of uncertainty. Compared to surface water, substantive epistemic and ontological uncertainties might be especially relevant in groundwater governance due to groundwaters' invisibility (see also what Walsh 2022 argues in section 4.3) and the challenges of assessing its availability and dynamics through models.

Key aquifer characteristics—such as type, well depth, and flow dynamics—are often uncertain, complicating predictions of groundwater responses to environmental and human-induced changes. Furthermore, groundwater fluctuations depend on multiple factors beyond extraction, including precipitation patterns, land use, and surface water connectivity (Chávez García Silva et al., 2024). Additionally, groundwater reacts highly localized; even within Germany, groundwater's response to drought varies widely, from a few months in the highlands to several years in the lowlands (Hellwig & Stahl, 2018). While improved modelling can mitigate some of these uncertainties, groundwater's materiality—its entrenchment within rock and sediment, heterogeneity, and invisibility suggests a, to some degree, irreducible ontological uncertainty regarding the possibility of capturing it through numerical representations. Additionally, Beven and Alcock (2012) emphasize that hydrological models themselves contain many uncertainties, such as temporal variability in system characteristics and uncertainties in mathematical representations of processes.

Uncertainties regarding groundwater materiality, as well as the ways in which we can capture groundwater, ultimately influence institutions mediating groundwater access and decision-making processes. The way these uncertainties are handled and mediated, therefore, has direct implications for justice as they influence, e.g. the ways in which groundwater rights are distributed. For example, quantifying groundwater is often seen as a prerequisite for addressing distributional concerns in collective action theory, emphasizing the importance of delineating clear resource boundaries and aligning rules with local conditions (Amblard and Mann 2021). Similarly, market-based approaches build on quantifying groundwater levels as a foundational premise (Herivaux, Rinaudo, and Montginoul 2020). However, the numerical representation of groundwater is shaped by uncertainties

and is often simplified in ways that obscure complexities (Molle, Lankford, and Lave 2024). Highlighting the uncertainties can help understand the over-allocation of rights or failure to anticipate future shortages. On the other hand, assuming 'optimal' distributions neglects inter- and intragenerational justice concerns, as uncertainty shapes all decisions on groundwater. Yet, while hydrological literature explicitly acknowledges these uncertainties, they can turn invisible once translated into institutions. Recognizing and foregrounding these uncertainties in groundwater justice research can thus reveal how institutions either manage or obscure them, ultimately shaping groundwater distribution, decision-making, knowledge systems and long-term aquifer sustainability. This perspective could shed light on local-level injustices and how uncertainty is mediated in ways that influence justice.

5.5 LIMITATIONS

As highlighted in Section 3.1, this paper adopted a broad search for "justice-related terms" to enable a meaningful review of groundwater justice in the EU, given the limited studies on explicitly focused justice. This approach included all papers that mentioned justice-related terms, even if justice was not a central theme – some, in extreme cases, referenced terms such as "equitable distribution" only in one paragraph in the paper (which was the minimum for including them). As a result, not all analyzed papers are reflected in the results and discussion, as the focus was on those that substantively engaged with justice. This limitation particularly affected the coverage of groundwater's qualitative dimension, which also was thematically too diverse to coherently and meaningfully present justice conceptualizations. This literature review focuses exclusively on peer-reviewed academic papers. It does not include books or book sections in the results, which might also be relevant to the issue, such as the works from Rinaudo et al. (2020) or Rinaudo, Moreau, and Garin (2016).[5] However, they are taken up in the discussion with other relevant works—such as Swyngedouw and Boelens (2018)—to further explore issues around groundwater justice in the EU.

6 CONCLUSION

While there is a lack of a distinct justice literature on groundwater in the EU, the existing literature highlights the importance of institutions in mediating groundwater distributions, who decides over distributions and which knowledges are accepted in these processes. Additionally, it highlights how infrastructure investments enable groundwater access, lowering water tables and exacerbating inequalities, as not all actors have the same access to resources. Regionally, the literature focuses primarily on the Southwest of the EU and engages more coherently with justice discussions on groundwater's quantitative aspects than its qualitative role in drinking water. Intergenerational justice remains largely overlooked.

The dominance of institutional perspectives and the absence of a dedicated justice scholarship can be partially attributed to disciplinary traditions. Groundwater research has been shaped by Ostrom-inspired institutional approaches that do not center justice. At the same time, Environmental Justice (EJ) and Water Justice scholarship tend to focus on high-profile resistance, particularly in anti-colonial and Indigenous contexts, rather than the everyday injustices embedded in local groundwater-sharing regimes among agricultural actors.

To better understand groundwater justice in the EU, grounded and relational justice perspectives—particularly those emphasizing capabilities and power—offer valuable frameworks for analyzing these subtle injustices. Additionally, this paper argues that recognizing uncertainty adds analytical depth to justice research, as how uncertainties are managed or ignored shape groundwater distribution, decision-making processes, and the long-term sustainability of aquifers. Building on these discussions, future research on groundwater justice in the EU could:

- Examine the relationship between uncertainty and justice, particularly how uncertainties influence water rights distribution and decision-making processes.
- Highlight local-level understandings and experiences of groundwater (in)justice.
- Investigate how actors navigate uncertainties in groundwater governance and how these uncertainties shape their perceptions and experiences of (in)justice or the potential justice consequences.
- Study countries newly experiencing groundwater droughts, a trend expected to intensify.
- Address the qualitative aspects of groundwater, especially its role in drinking water and related injustices.

NOTES

1 E.g. "just" can also be used as an adverb, "class" can be used as a statistical category.

2 The distinction between case study-level and conceptual-level discussions became essential for clarifying how justice is addressed in the literature. This differentiation helped identify which studies provide concrete case examples of justice issues and which remain at a more abstract, theoretical level.

3 An overview of all the papers analysed, including whether they focus explicitly on justice, their scope and qualitative/quantitative perspective, can be found in the Appendix.

4 The IWRM Action Hub (2025) e.g. clearly states the potential for market-based instruments for solving water scarcity as well as pollution issues. Furthermore March and Saurí (2013: 2067) highlight that the Dublin Declaration offers an example of the *"dominance of economics in Water management"*. While it does not explicitly promote water markets they highlight that the Dublin Declaration can be seen as part of a discourse in the mid-1990s in which the best way to deal with water related scarcity issues is through recognizing its economic value and dealing with it as a marketable good (March & Saurí, 2013).

5 The chapter by Neal et al. (2016) in the book from Rinaudo, Moreau, and Garin (2016) however is included in the theoretical framework as well as Rinaudo, Moreau, and Garin 2016).

ADDITIONAL FILE

The additional file for this article can be found as follows:

- **Appendix.** Coding Scheme. DOI: https://doi.org/10.5334/ijc.1491.s1

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COMPETING INTERESTS

The author has no competing interests to declare.

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