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**ADVANCED REVIEW**

# Environmental justice and drinking water: A critical review of primary data studies

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**Abstract**

Though safe drinking water for all is a global public health goal, disparities in access persist worldwide. We present a critical review of primary-data based environmental justice (EJ) studies on drinking water. We examine their findings in relation to the broader EJ and drinking water literatures. Using pre-specified protocols to screen 2423 records, we identified 33 studies for inclusion. We organized our results using the following questions: (1) what sampling and data collection methods are used; (2) how is (un)just access to water defined and measured; (3) what forms of environmental injustice are discussed; (4) how are affected communities resisting or coping; and (5) what, if any, mechanisms of redress are advocated? We find that while many studies analyze the causes and persistence of environmental injustices, most primary-data studies on drinking water are cross-sectional in design. Many such studies are motivated by health impacts but few measure drinking water exposures or associated health outcomes. We find that, while distinct types of injustice exist, multiple types are either co-produced or exacerbate one another. Recognition of injustice is emerging as an undergirding injustice upon which others (distributional or procedural) can take hold. Tensions remain regarding the role of the state; redress for inequitable water access is often presumed to be the state's responsibility, but many EJ scholars argue that the state itself perpetuates inequitable conditions. The accountability for redress under different forms of water governance remains an important area for future research.

This article is categorized under:

Human Water > Methods

**KEYWORDS**

disproportionate impact, drinking water, environmental justice

## 1 | INTRODUCTION

Safe, affordable, and accessible drinking water is integral to health, dignity, and human rights. Globally, about 2 billion people lack access to safe and affordable drinking water (UNICEF & WHO, 2019). Recent media attention on lead

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contamination in Flint and wells running dry in California has elevated public awareness of drinking water injustices in the United States (Felton et al., 2021; Graham, 2016). Even today, at least ~500,000 US households struggle with incomplete plumbing, and over a thousand community water systems were recently out of compliance with the Safe Drinking Water Act (Mueller & Gasteyer, 2021). These violations are even more prevalent in rural, under-resourced areas (Patel et al., 2020). There is a substantial body of academic work using an environmental justice (EJ) frame to understand and evaluate disparities in drinking water access. Several review papers have synthesized theories and practices of EJ writ large (e.g., Agyeman et al., 2016; Mohai et al., 2009), but none, to our knowledge, focus specifically on drinking water. There are also many insightful reviews on various metrics and dimensions of drinking water access such as affordability (e.g., Goddard et al., 2022; Pierce et al., 2021), security (e.g., Hoekstra et al., 2018; Jepson et al., 2017; Octavianti & Staddon, 2021), rights (e.g., Sultana & Loftus, 2015), sustainability (e.g., Mehta & Movik, 2014), and environmental health (e.g., Rosinger & Young, 2020; Syafrudin et al., 2021; Ward et al., 2018), but not through a lens of environmental justice.

We evaluated studies of drinking water disparities that were explicitly framed in terms of “Environmental Justice,” a discipline that arose at the intersection of advocacy and academia to make visible unjust environmental risks where people “live, work, and play” (Alston, 1991). To understand how researchers captured drinking water challenges where people “live, work, and play,” we reviewed papers that were at least partly based on primary data collection.

To contextualize this review, we first briefly discuss the broader literature on environmental justice and on EJ and drinking water specifically (Section 2). We then explain our sample selection and methods using transparent inclusion and exclusion criteria (Section 3). We use the following questions to organize our findings (Section 4): (1) what sampling and data collection methods are used; (2) how is (un)just access to water defined and measured; (3) what forms of environmental injustice are discussed; (4) how are affected communities resisting or coping; and (5) what, if any, mechanisms of redress are advocated? In the final segment (Section 5) we contextualize our findings within the broader literature on EJ and drinking water: what scholars mean when they reference “drinking water justice,” what injustices look like, and who (if anyone) is to be held accountable. We pay specific attention to narratives on community resistance and coping in struggles to procure and maintain drinking water access, as well as to contemporary debates on the role of the state in alleviating water injustices. We show that the three main types of injustice discussed in the literature, that is, distributive, procedural, recognitional, do not exist in isolation but often produce or reinforce one another. Ultimately, this review aims to support researchers at the intersection of EJ and drinking water in understanding critical gaps and convergences in the literature, and to highlight the value of primary-data research.

## 2 | BACKGROUND

### 2.1 | Environmental justice

Environmental justice is grounded in the principle that all people deserve access to a healthy and safe environment, and to be protected equally by environmental and public health laws and regulations. From the 1980s on, building on the lessons and strategies of the Civil Rights movement, activists and scholars have used EJ as a framework to understand how environmental hazards are distributed (e.g., Bullard, 1990; McGurty, 2000; UCC Commission for Racial Justice, 1987; Wilson et al., 2010). EJ goals are now formally integrated into multiple levels of US government and policy (Bullard & Johnson, 2000). Definitions of EJ vary across agencies and authors (Holifield, 2001), but most interpretations converge on equal protection against the distribution of environmental harms, and equal access to participation in decision-making processes related to environmental hazards (Schlosberg, 2004).<sup>1</sup>

Environmental injustice occurs when a community is involuntarily subjected to disproportionate environmental burdens, excluded from decision-making processes, or prevented from seeking redress. Many earlier EJ studies investigated the first phenomenon, measuring patterns of environmental burdens along race and class lines (e.g., Bullard & Wright, 1993; Kuehn, 2000). Research on disparities across race and class have dominated the US literature, but EJ scholars and activists are also concerned with gender, ability, indigeneity, and other axes of difference (Pellow, 2017). Such selective allocation of environmental hazards (or benefits) is referred to as *distributive injustice*. The lack of opportunity for affected communities to participate in decision-making processes related to these hazards is referred to as *procedural injustice*. Examples of procedural injustices include exclusion from impact assessments of waste facility development in residential areas (Deacon & Baxter, 2013) or inadequate representation in the formulation of climate adaptation policy (Holland, 2017). A third variant of injustice, termed *recognitional*, is concerned less with the

distribution of goods and services and more with the humiliation or disrespect with which minoritized communities can be treated (Honneth, 2004). As we discuss below (Section 4.4), the different forms of injustice often co-occur, or one may lead to or exacerbate another.

Many EJ studies describe a collective victimization by a polluter, or a “bad actor” to be held accountable. The argument is that, given a clear connection between pollution and polluter, this actor (usually a corporation or the state) should compensate the affected communities and/or take corrective actions. Research has highlighted the health risks of living in proximity to known pollution sources (Brown, 1995; Bullard & Wright, 1993), as well as the importance of compensation from those responsible (Čapek, 1993). In this way, redress by polluters, or *corrective justice*, has also been central to study narratives.

Beyond documenting existing injustices, EJ research also points to the structural mechanisms underlying the existence and persistence of hazard distribution. Rather than proving “discriminatory intent” (Pulido, 1996), research on structural mechanisms study the “political economy of environmental discrimination” (e.g., segregation, suburbanization and white flight, historical patterns of development) (Morello-Frosch, 2002). The social production of injustices has been attributed to the racialized foundations of US society (Omi & Winant, 2014), and to ongoing inequalities among socioeconomic groups and institutions (Kurtz, 2009; Pulido, 1996, 2000). Acknowledging historical inequalities were also central to the evolution of *recognitional justice*—that is, recognition of diversity and group difference (Fraser, 2000; Schlosberg, 2004; Young, 1986). One of the earliest declarative statements on EJ demands—*The Principles of Environmental Justice* (1991), from the First National People of Color Environmental Leadership Summit—foreshadowed these insights in its call for “respect ... of our cultures, languages and beliefs about the natural world” and “to secure our political, economic and cultural liberation that has been denied for over 500 years of colonization and oppression.”

More recently, Global EJ and Critical EJ have emerged as extensions of EJ theory. Global-level EJ studies emphasize structural injustices that reflect persistent power imbalances between nations (Zeitoun, 2013) or between mainstream and minoritized ethnicities (Agyeman, 2001). EJ scholars, in recognition of the global scale of environmental problems, have pushed the discipline beyond its original US context (Walker, 2009), while calling for new and culturally-contextual interpretations of EJ (Álvarez & Coolsaet, 2020; Schlosberg, 2004, 2013). Stakeholder understandings of justice are sensitive to time and place and may not conform to a “universal standard of justice” (Holifield, 2001; Minkler et al., 2008). Critical EJ has pushed traditional EJ to take the rights of non-human species seriously, and to recognize that the liberal state may not be an effective redress mechanism for environmental injustices (Pellow, 2017; Sze, 2020). Both variants, however, remain true to the original EJ focus of disparate burdens, and to the blend of scholarship and advocacy that characterizes the EJ literature.

## 2.2 | Drinking water and environmental justice

While some early EJ studies included water contamination as an indicator of injustice, it is only over the last two decades that EJ scholars have focused on inequalities in drinking water access as an environmental injustice. This has paralleled an international movement to recognize the human right to clean and safe drinking water: in 2002, the UN Committee on Economic, Social and Cultural Rights asserted “[the human right to water] is a prerequisite for the realization of other human rights” (UN Economic and Social Council, 2002); and in 2015, the Sustainable Development Goals included targets for “universal and equitable access to safe and affordable drinking water for all” (UN General Assembly, 2015).

Given the global scope of our review, for the sake of consistency, we employ the definition of “drinking water” provided by the Joint Monitoring Programme (JMP) for Water Supply and Sanitation (2020): “Drinking water services refers to the accessibility, availability and quality of the main source used by households for drinking, cooking, personal hygiene and other domestic uses.” For instance: the *physical accessibility* of water can be measured by the distance to the nearest water source, or the time spent for water collection. The *availability* of water supply can be described by the intermittency of supply, the presence-absence of physical infrastructure, or whether the quantity is sufficient for hygiene and household needs (Lee & Schwab, 2005; Martínez-Santos, 2017). *Quality* is often measured against thresholds determined by a federal or international regulatory agency, such as the World Health Organization, or the US Environmental Protection Agency (40 CFR 141, 1975; World Health Organization, 2018). There are also aspects of access that do not fit into the JMP definition, such as affordability, often indicated by a ratio of water expenditures relative to income (García-Valiñas et al., 2010; Goddard et al., 2021). We use “drinking water access” as an umbrella term encompassing any or all of these aspects (i.e., accessibility, availability and quality), recognizing that culture and

economics may determine what counts as “access” in different contexts. Drinking water injustice can involve one or more of these, and metrics to represent these aspects of water access are continually evolving.

Our review focuses on primary data collection to understand how research on EJ and drinking water has captured the lived experiences of affected communities. Several EJ and drinking water papers represent the relationship between access and social vulnerability using secondary data (e.g., Balazs et al., 2011, 2012). Using secondary data such as the US Census helps to identify population-level trends and mobilize policy decisions and funding to track and rectify injustices. Another contribution of studies using secondary data is to develop narrower hypotheses for further research. Our review focuses on primary data studies because certain research questions, such as uncovering on-the-ground community experiences, are accessible only through the collection of primary data; these questions are important enough to warrant their own review. Furthermore, secondary data can potentially obscure what is happening at more granular levels: for example, it can “invisibilize” small populations such as the unhoused or undocumented (Borneron et al., 2021). By focusing specifically on studies that collected primary data, we surface on-the-ground as well as perceived injustices closest to communities. Our findings and reflections, therefore, reflect a subset of the broader environmental justice literature on drinking water.

### 2.3 | Adjacent fields of inquiry outside of this review

There is a vast and valuable literature concerned with safe and adequate water for the underserved that is outside of this review. These works can be called EJ-adjacent, in that they situate themselves within different frameworks while sharing EJ themes.

The Human Right to Water literature argues for safe water as an inalienable right of all humans, and is less concerned with comparing communities to each other and more concerned with evaluating progress towards universal access (Heller, 2022). Its concept of justice is thus absolute rather than relative, and some scholars have questioned the compatibility of rights-based versus justice-based approaches (Harris et al., 2015). Political ecology (PE) has a long tradition of research on struggles over water but PE papers may not explicitly invoke the concept of justice. One of PE's core deviations from the EJ framing is in how it “sees” the state: whereas the origins of EJ assumed a liberal state that could rectify injustices, PE comes from a Marxist lineage with a state that is to be confronted more than relied on. Ranganathan and Balazs (2015) have usefully termed PE versus EJ concepts as the “everyday” over the “regulatory” state, though, as they point out, this divide is breaking down in newer work; rights and justice movements can work with, against, and outside the state at the same time (e.g., Angel & Loftus, 2019).

A third literature on water security is about people's struggles to access water and the importance of reliability, sustainability, safety, and adequacy (Jepson et al., 2017; Meehan et al., 2020). Several older themes of water access, such as welfare and long-term sustainability, have recently been covered under the “security” label (Hoekstra et al., 2018). The fourth strand, the largest and the oldest of all of these, is Water, Sanitation and Hygiene (WASH). This globally-focused body of work is concerned with analytical studies on water quality, water systems, and their associated health outcomes, including attention to the coping costs of not having adequate and safe water access. It is mainly a literature on ill-health or inadequate infrastructure rather than on injustice. EJ studies on drinking water build upon the contributions and critiques of these adjacent fields, but EJ's empirical core is grounded intellectually and politically in its advocacy-oriented origins, and is thus distinct from these other disciplines in theory and in action.

## 3 | METHODS

This study is structured as a critical review of the drinking water and EJ literature with a focus on studies reliant on primary data. To ensure comprehensive, transparent, and reproducible results, we followed study identification, screening, and selection methods used to conduct systematic reviews. Studies were considered eligible if they focused on a population's access to drinking water and made use of an environmental justice framework. We executed this search in the United States, and placed no restrictions on study setting, language, or publication date. We excluded studies if they did not explicitly focus on drinking water (e.g., those on surface or groundwater) and did not reference EJ. We pre-registered our study protocol on PROSPERO (#CRD42017069837).<sup>2</sup> We amended our original protocol eligibility criteria to include only studies based, fully or partially, on primary data collection (e.g., water samples, surveys, etc.). (See Table S1 in the supplementary materials for a completed PRISMA reporting checklist.)

We searched the following online databases for eligible studies: Web of Science, PubMed/MEDLINE, EMBASE, Cochrane Library, and ScienceDirect. We conducted the search in two phases, in 2017 and 2021 (see Figures S1 in the supplementary materials for disaggregated literature search flowcharts). We also used Google Scholar to conduct a hand-search of additional studies using citation snowballing. We piloted search terms ahead of the full search to ensure they were sufficiently broad to identify a subset of papers that we already knew to be eligible. Table 1 summarizes the search terms, sets, and Boolean operators we used.

### 3.1 | Screening and data extraction protocols

For the first screening phase, three authors (SK, AC, JG) independently screened the titles and abstracts of retrieved studies to flag those potentially meeting our inclusion criteria. We divided titles and abstracts into three random equally-sized and overlapping groups so review decisions were cross-checked by two authors. We removed all duplicate records, as well as those with missing information, at this step. For the second screening phase, the same authors assessed the full texts of potentially eligible studies. As with the first phase, two authors made each review decision, with the third author's opinion sought in the case of disagreement. For the final phase of data extraction, the first author used a standardized, pre-piloted spreadsheet to input and organize collected data. Extracted information included: study setting; study population and participant demographics; details of the study design; recruitment and study completion rates; and all available outcomes and times of measurement. The final set of selected papers was published between 2002 and 2020.

### 3.2 | Data analyses

We included a plan in our PROSPERO protocol to synthesize study characteristics and outcomes, including: negative health outcomes associated with consumption of contaminated drinking water; types of drinking water access, contamination, and exposure; research methods and theoretical foundations; and the distribution of study locations.

We conducted data cleaning, analysis, and visualization using ggplot2 and rnaturalearth in RStudio using R version 4.0.5 (R Core Team, 2021; RStudio Team, 2020; South, 2017; Wickham, 2016).

## 4 | RESULTS

Following a summary of our screening process outcomes (Section 4.1) we report broad trends and patterns across the reviewed studies (Sections 4.2–4.6) using the five organizing questions from the Introduction.

**TABLE 1** Initial search terms and Boolean operators for review of EJ and drinking water.

|                             |     |                                    |
|-----------------------------|-----|------------------------------------|
| Drinking water <sup>a</sup> |     | Environmental justice <sup>a</sup> |
| “Water”                     |     | “Environmental Justice”            |
| “Drinking water”            |     | “Justice”                          |
| “Potable water”             |     | “Social justice”                   |
| “Tap water”                 |     | “Environmental equity”             |
| “Piped water”               | AND | “Environmental equality”           |
| “Municipal water”           |     | “Environmental racism”             |
| “Utility water”             |     | “Distributive justice”             |
| “Bottled water”             |     | “Climate justice”                  |
| “Water system”              |     |                                    |
| “Water district”            |     |                                    |

<sup>a</sup>Boolean operator “OR” used between search terms in each set (AND between sets).

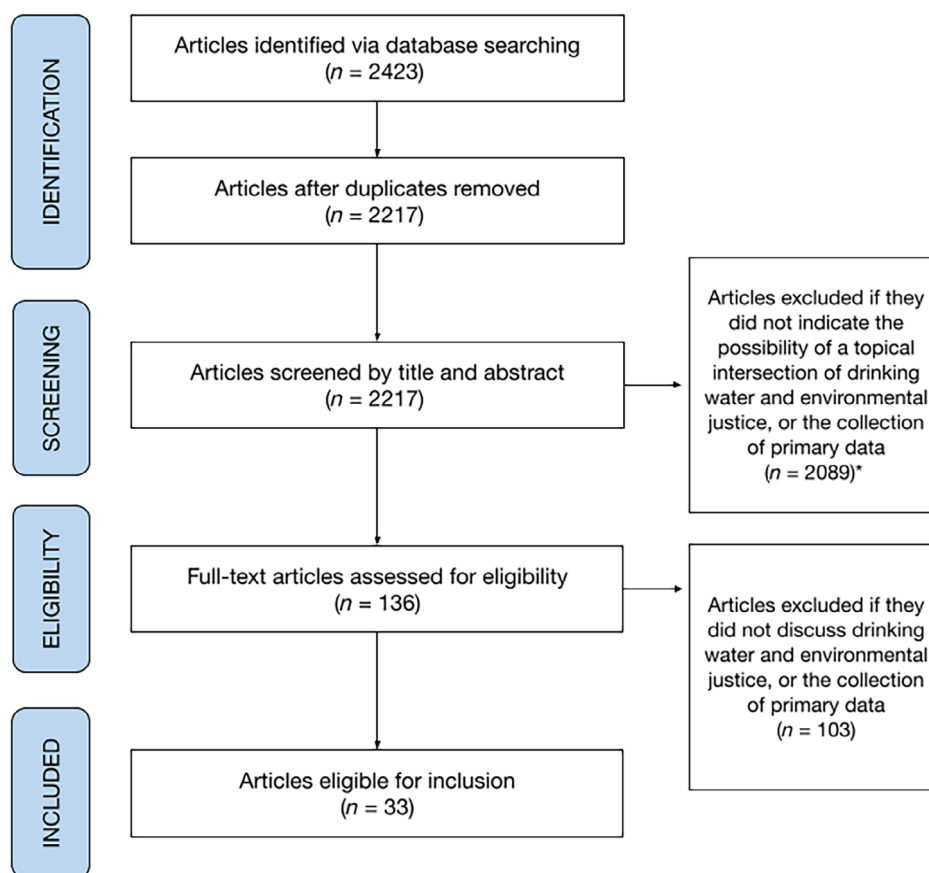
## 4.1 | Study screening and characteristics

Our database search returned 2423 records. After duplicate removal, we screened titles and abstracts as described above, with reviewer agreement of 90.1% ( $\kappa = 0.33$ ). Given this suboptimal inter-rater agreement (Landis & Koch, 1977), we re-clarified our screening process and conducted a second round of review, which resulted in stronger reviewer agreement of 97.8% ( $\kappa = 0.81$ ). We did not find any (additional) eligible papers through citation snowballing. We deemed 33 of the 136 papers subjected to full-text review to be eligible for final inclusion (Figure 1).

Most eligible studies were based in low-income, non-urban, and minority communities in the United States, as we would expect from an EJ-focused literature. (See Table S2 in the supplemental materials for an overview of broad community characteristics.) Ten of the 33 papers are situated outside of the United States. In general, author affiliations are concentrated in the global North. Figure 2 illustrates the global distribution of author affiliations<sup>3</sup> and their study sites.

## 4.2 | What sampling and data collection methods are used?

We observed substantial heterogeneity in study designs, sampling protocols, independent variables studied, outcomes of interest, and the metrics with which these were measured. Just over half the studies in our review collected data using purposive or convenience sampling ( $n = 17$ ). A small number collected data through random sampling ( $n = 5$ ). The remaining studies ( $n = 11$ ) were not specific about their sampling strategy. Interviews are the most common type of data collection method ( $n = 21$ ), followed by surveys ( $n = 15$ ), water quality sampling ( $n = 8$ ), and focus groups ( $n = 2$ ). Sample sizes and sampling units vary considerably across studies (Table 2).



\*While primary data collection was technically also a criteria of inclusion at this screening phase, we found that studies often do not elaborate on their data collection methods in their titles or abstracts; as a result, we opted to err on the side of inclusion at this step.

FIGURE 1 Literature search flowchart (additional details in Figures S1 and S2).



FIGURE 2 Distribution of drinking water studies (blue) and author affiliations (red).

### 4.3 | How is (un)just access to water defined and measured?

Definitions of access include physical accessibility, measured as the presence-absence of piped water infrastructure or sanitation services (Heaney et al., 2011; Lockhart et al., 2020; Seamster & Purifoy, 2021; Wedgworth & Brown, 2013)<sup>4</sup> and water quality, measured as microbiological or chemical contamination (Amiri & Zhao, 2019; Corlin et al., 2016; Eggers et al., 2018). Intermittency and affordability, research themes in related disciplines such as water security (see Wutich et al., 2017), are not discussed in the reviewed papers.

Studies assess disparities in water access in three main ways: perceptions of drinking water access or quality; conditions of water access, that is, piped access or measurements of water quality; and poor health outcomes. (See Table S3 in the supplementary materials for more information on data extraction, including measures of drinking water access and ties to health outcomes.) Research on user perceptions of (in)justice illustrate how injustices are experienced and whether concerns are voiced (Dobbin, 2020; Kozlowski & Perkins, 2016; Rall, 2018; Sansom et al., 2019; Stillo et al., 2019; B. L. Williams & Florez, 2002). For example: priorities such as middle-class lifestyles may be seen as acceptable trade-offs for pollution, muting dissenting voices against water quality injustices within the community (Kozlowski & Perkins, 2016); or “outsider groups” such as Mexican-Americans may be less trustful of their water supply, but also less likely to participate in civic activities concerning water (B. L. Williams & Florez, 2002). While perception-based studies communicate lived experiences of injustices, they do not provide evidence on whether perceptions correspond to measured levels of water contamination—perceptions (such as of odor and taste) may indicate problems with quality, but indicator-less (e.g., smell-less, tasteless) water can also be unsafe.

The most common approach to evaluating disparities in access is the measurement of drinking water contamination in under-served communities. Studies that measure chemical or microbial contamination find elevated levels of contamination in households disconnected from public water systems, often in unincorporated communities and American Indian reservations (Eggers et al., 2018; Flanagan et al., 2016; Heaney et al., 2011). (See Table S4 in the supplementary materials for a summary of the parameters evaluated across studies with sample sizes and methods.) Three papers on microbial contamination measure *E. coli* in domestic well samples (Heaney et al., 2011, 2013; Wedgworth & Brown, 2013), all in majority Black communities. Metals, organics, and disinfection byproducts have also indicated unsafe drinking water contamination in marginalized communities (Corlin et al., 2016; Eggers et al., 2018; Heaney et al., 2013; Wright-Contreras et al., 2017). All but one of these studies found some degree of elevated drinking water contamination.

While many studies ( $n = 26$ ) motivate their work citing the health risks of unsafe drinking water, only three (Amiri & Zhao, 2019; Hargrove et al., 2018; Wedgworth & Brown, 2013) report health outcome data related to drinking water contamination. Wedgworth and Brown (2013) use survey data from 264 households to show a statistical association between gastrointestinal disease and fecal contamination in water supply. In a health survey of two Texas *colonias*,



TABLE 2 Summary of data collection methods used across review.

| Author                             | Study location (s)                              | Used open-ended interviews (n = sample size) | Used surveys (n = sample size) | Used focus groups (n = sample size) | Collected water quality samples (n = sample size) | Sampling strategy |
|------------------------------------|---|--|--------------------------------|-------------------------------------|---|-------------------|
| B. L. Williams and Florez (2002)   | United States                                   | –  | 1183                           | –                                   | –   | Random            |
| King et al. (2006)                 | United States                                   | 12   | –                              | –                                   | –   | Non-random        |
| Mascarenhas (2007)                 | Canada  | 27   | –                              | –                                   | –   | Unclear           |
| Blakeney and Marshall (2009)       | United States                                   | 40   | 73                             | –                                   | –   | Non-random        |
| Castaño-Vinyals et al. (2011)      | Spain   | 1118   | –                              | –                                   | –   | Non-random        |
| Heaney et al. (2011)               | United States                                   | –  | 120                            | –                                   | 94  | Non-random        |
| Otero et al. (2011)                | Spain   | 17   | –                              | –                                   | –   | Unclear           |
| Domènech et al. (2013)             | Nepal   | 18   | –                              | –                                   | –   | Unclear           |
| Heaney et al. (2013)               | United States                                   | –  | 27                             | –                                   | 20  | Non-random        |
| Wedgworth and Brown (2013)         | United States                                   | –  | 305                            | –                                   | 305   | Random            |
| Wutich et al. (2013)               | Bolivia, Fiji,<br>New Zealand,<br>United States | 135  | –                              | –                                   | –   | Non-random        |
| Balazs and Lubell (2014)           | United States                                   | 9  | 30                             | –                                   | –   | Non-random        |
| Balazs and Ray (2014)              | United States                                   | 17   | –                              | –                                   | –   | Unclear           |
| Mehta et al. (2014)                | Bolivia, India                                  | 185  | 91                             | –                                   | –   | Unclear           |
| Joshi (2015)                       | India   | –  | –                              | –                                   | –   | Unclear           |
| Corlin et al. (2016)               | United States                                   | –  | –                              | –                                   | 144   | Unclear           |
| Flanagan et al. (2016)             | United States                                   | –  | 1287                           | –                                   | –   | Random            |
| Kozlowski and Perkins (2016)       | United States                                   | 20   | –                              | –                                   | –   | Non-random        |
| Case (2017)                        | Canada  | 9  | –                              | –                                   | –   | Non-random        |
| Rutt and Bluwstein (2017)          | United States                                   | –  | –                              | –                                   | –   | Non-random        |
| Sitthikriengkrai and Porath (2017) | Thailand  | –  | –                              | –                                   | –   | Unclear           |
| Wright-Contreras et al. (2017)     | Vietnam   | Unclear                                      | 100                            | –                                   | 8   | Unclear           |
| Eggers et al. (2018)               | United States                                   | 30   | 197                            | –                                   | 164   | Non-random        |
| Rall (2018)                        | United States                                   | 15   | –                              | –                                   | –   | Non-random        |
| Hargrove et al. (2018)             | United States                                   | Unclear                                      | 50                             | Unclear                             | –   | Unclear           |
| Amiri and Zhao (2019)              | United States                                   | –  | 13                             | 23                                  | 59  | Non-random        |
| Sansom et al. (2019)               | United States                                   | –  | 13                             | –                                   | 13  | Random            |
| Krings et al. (2019)               | United States                                   | 4  | –                              | –                                   | –   | Non-random        |
| Hale (2019)                        | United States                                   | 40   | –                              | –                                   | –   | Non-random        |
| Stillo et al. (2019)               | United States                                   | –  | 76                             | –                                   | –   | Unclear           |
| Seamster and Purifoy (2021)        | United States                                   | Unclear                                      | –                              | –                                   | –   | Non-random        |
| Lockhart et al. (2020)             | United States                                   | 8  | 21                             | –                                   | –   | Random            |
| Dobbin (2020)                      | United States                                   | 27   | –                              | –                                   | –   | Non-random        |

Hargrove et al. (2018) report water insecurity-related stress, hauling-related injuries, and gastrointestinal illnesses. Amiri and Zhao (2019) distributed a general health questionnaire to their focus group participants, but found their questionnaire was not well-tailored for the literacy skills of their participants. All three studies distance their findings from any claims of causality, reflecting the difficulty of attributing health outcomes to drinking water contamination (e.g., Cumming et al., 2019).

#### 4.4 | What forms of environmental injustice are most commonly discussed?

Most studies ( $n = 28$ ) present drinking water disparities as distributive injustice. Distributive injustices include water quality falling short of meeting safe drinking water standards (Amiri & Zhao, 2019; Corlin et al., 2016; Heaney et al., 2011; Wedgworth & Brown, 2013), or the inability to tap into municipal services (Heaney et al., 2013; Lockhart et al., 2020; Seamster & Purifoy, 2021). Potential contamination sources range from polluting industries (Amiri & Zhao, 2019; Blakeney & Marshall, 2009; Sansom et al., 2019), disinfection byproducts (Castaño-Vinyals et al., 2011), or fecal contamination in private wells (Heaney et al., 2011; Stillo et al., 2019; Wedgworth & Brown, 2013). Studies on inadequate water quantity are less common; authors attribute disparities to large-scale infrastructure projects, inadequate state planning, or deliberate exclusion from municipal services (Domènech et al., 2013; Hale, 2019; Joshi, 2015; Lockhart et al., 2020; Otero et al., 2011; Seamster & Purifoy, 2021).

Procedural injustice is the second-most common type of injustice discussed in our review ( $n = 16$ ). Cases of procedural injustices include under-representation of disadvantaged communities in regional water management planning (Balazs & Lubell, 2014; Dobbin, 2020); lack of voice and agency at the municipal level (Rutt & Bluwstein, 2017); or the revocation of public deliberation in the name of emergency management (Krings et al., 2019). Institutional norms and histories shape local expectations of citizen involvement and state accountability (Wutich et al., 2013).

While most studies ground their research designs in one of these two forms of injustice, some authors discuss two additional forms. The first of these is recognitional injustice ( $n = 6$ ), or the lack of “recognition of harm, and recognition of other ways of knowing” (Mascarenhas, 2007). This may appear as personal attacks and discreditation of lived experiences (Rutt & Bluwstein, 2017); disdain for the poor (Rall, 2018); or official refusals (or inability) to recognize harm to cultural, spiritual, and ecological traditions (Mascarenhas, 2007). Occupational injustice is the second form, explicitly explored by only one study that evaluated how the consequences of poor water quality spill over into individuals’ abilities to carry out everyday activities (Blakeney & Marshall, 2009). Activities that must be adapted because of water supply conditions—cooking routines, personal hygiene, organization of workdays—are tangible examples of how a water injustice morphs into “occupational injustice,” affecting almost all aspects of daily life.

Though several distinct forms of injustice are identified in the literature, numerous studies in our review illustrate how these different types of injustice are co-produced or reinforce one another. (See Table S5 in the supplementary materials for a summary of how studies explicitly and implicitly engage with different forms of justice.) Deference to certain types of expertise can lead to the disqualification of testimonies in participatory processes (Mascarenhas, 2007; Sitthikriengkrai & Porath, 2017). Distributive injustice can result in psychosocial effects such as the degradation of spirit and the loss of hope (Blakeney & Marshall, 2009), or manifest as occupational injustices through barriers to handwashing, laundry, or cooking (Blakeney & Marshall, 2009; Lockhart et al., 2020). When recognitional justice is encouraged—such as through the availability of bilingual materials—it can lead to more fruitful and generative participatory processes (Balazs & Lubell, 2014). Table 3 contains examples of relationships that we pulled from our reviewed works.

As mentioned earlier, environmental injustices are often described in collective or community-level terms. We find the papers in our review also raise individual or household-level dimensions of injustice that do not fit neatly into this distributive-procedural-recognitional framework. When the polluter is also the main regional employer, those vocal about the environmental injustice can be met with physical intimidation and social ostracization, presenting obvious challenges to accessing procedural channels (Kozlowski & Perkins, 2016; Rall, 2018). The pervasive influence of societal patriarchal and misogynistic norms are also apparent, when men are expected to “man up” and “sacrifice themselves for work” (Kozlowski & Perkins, 2016) and women are described as “hysterical,” a “crazy housewife,” or asked (by a government official) whether they are “on their period” (Rutt & Bluwstein, 2017). In describing how jealous, grudge-bearing vendors can deny service to would-be customers, Wutich et al. (2013) contend such experiences can be *more* distressing than distributive or procedural injustices.

#### 4.5 | How are affected communities resisting or coping?

In the absence of drinking water access, communities may engage in active protest and resistance, as well as everyday acts of coping. In states with enforceable environmental regulations, some communities find success in partnering with nonprofits and other external actors to win monetary compensation and regulatory enforcement (Sitthikriengkrai & Porath, 2017). Support from external partners may be the only way for these lived experiences to gain credibility in the

TABLE 3 Examples of how different forms of justice reinforce one another or are co-produced.

| Author                             | Examples   |
|------------------------------------|--|
| Mascarenhas (2007)                 | (1) Relaxed monitoring and reporting requirements for industry made it difficult to have environmental harms be properly recognized. (2) Deference to specific types of expertise enabled the disqualification of testimonies in participatory processes.  |
| Blakeney and Marshall (2009)       | Distributive injustice produced psychosocial effects, affecting the ability to push for recognitional justice: "People's spirit ... has degraded ... because of the degradation of the river ... if you spend all that time being unable to combat it, sometimes you just kind of lose hope and join in and think that the river is unrecoverable."  |
| Doménech et al. (2013)             | Compensation measures for environmental degradation were proposed based on direct losses related to fields, houses, or trees (i.e., to land ownership), funneling benefits to land-owning castes over landless ones.   |
| Heaney et al. (2011, 2013)         | Community-based methods—specifically, the collaborative effort to collect and analyze drinking water data in data-sparse places—positioned researchers and communities to engage with multiple forms of (in)justice simultaneously.  |
| Wutich et al. (2013)               | (1) Personal-level injustices short-circuited otherwise-just institutions. (2) Valuation of different justices can be hierarchical, that is, some are more distressing than others depending on context.   |
| Balazs and Lubell (2014)           | (1) Social learning (learning across stakeholders) connected procedural justice goals to distributive justice outcomes through increased representation of traditionally marginalized groups and their water challenges. (2) Efforts at inclusivity within these meetings—such as providing bilingual options—helped attendees feel "safe" for the first time.   |
| Balazs and Ray (2014)              | Residents from East Orosi were repeatedly turned away by water board administrators when seeking clarification on their water quality reports because of their Spanish accents.  |
| Mehta et al. (2014)                | Different realities of citizenship (facilitated by recognitional and procedural injustice) resulted in varied distributive outcomes of drinking water access.  |
| Kozlowski and Perkins (2016)       | "DuPont families" (families with kin employed by DuPont) alienated, ostracized, and even physically intimidated those critical of DuPont, making it difficult or uncomfortable to participate in social functions (such as going to church) or to voice their opinions.  |
| Case (2017)                        | Grassroots activists' efforts to address procedural injustice—for example, by writing memos, organizing public workshops, appealing to higher levels of government, or harnessing the media—paved the way for distributive justice.  |
| Rutt and Bluwstein (2017)          | Public officials suppressed civic engagement with misogynistic and paternalistic language.   |
| Sitthikriengkrai and Porath (2017) | (1) Cultural difference and prejudice made it difficult for Karen villagers to advocate for their experience of environmental degradation—which threatened their community fabric as well as their capacity to cope—in "strict legal and/or empirical terms." (2) Engagement with civil society can exacerbate recognitional injustice if EJ communities are mischaracterized, such as when villages are reduced to "a community of beggars" and thereby stripped of their sense of dignity. |
| Rall (2018)                        | Community organizers found that fighting the stigmatization and internalized oppression of the poor was key to overcoming class divisions (for movement building), which had manifested as blaming, criticizing, criminalizing, and ignoring those unable to cope.   |
| Amiri and Zhao (2019)              | Similar to Heaney et al. above, community-driven project design enabled researchers and communities to engage with multiple forms of (in)justice at once.  |
| Krings et al. (2019)               | Emergency management created a special scenario in which traditional channels of participation and civic engagement were closed off, resulting in (and entrenching) distributive injustice.  |
| Seamster and Purifoy (2021)        | A predominantly white and wealthy community actively obstructed a neighboring Black community's pursuit of procedural and distributive justice by denying the acquisition of basic amenities such as water and sanitation.   |
| Lockhart et al. (2020)             | Lack of access to drinking water directly affected peoples' abilities to participate in daily activities (e.g., handwashing, laundry, cooking). These effects were mitigated by personal connections or by monetary means, the latter of which is facilitated by socioeconomic status.   |

TABLE 3 (Continued)

| Author        | Examples   |
|---------------|--|
| Dobbin (2020) | Collaborative groundwater governance increased recognition justice, as large water agencies became (more) aware of smaller ones (and their issues) or as new relationships were established across different stakeholders. |

eyes of the government (Krings et al., 2019). Community activists also strategically use the media (Case, 2017; Sitthikriengkrai & Porath, 2017) or direct action (Domènech et al., 2013) to shame or force the government's or industry's hand into enacting change. Perhaps unsurprisingly, however, protestors and resisters have often been targeted and shut down by the state (Mascarenhas, 2007; Rutt & Bluwstein, 2017).

Communities also partner with community-based organizations and universities for assistance in quantifying lack of water access, fighting for political representation, or providing a platform for community voices (Rall, 2018). Participatory Action Research (PAR) methods encourage more equitable community-researcher dynamics (Amiri & Zhao, 2019; Blakeney & Marshall, 2009; Eggers et al., 2018; Heaney et al., 2011), and shape the research design itself with local knowledge (Heaney et al., 2013). (See Table S6 in the supplementary materials for more information on study motivations, drivers of site selection, and community partnerships.) Such collaborations are not *inherently* good; community partners could perpetuate injustices by prioritizing agendas that serve them more than the community itself (Sitthikriengkrai & Porath, 2017). Collectively, however, PAR-based studies represent an effort to challenge extractive research dynamics by encouraging the community to harness research as an empowerment opportunity.

Outside of resistance and protest, acts of coping to procure water take place at both the individual and community level. Some examples of individual coping mechanisms are to rely on extra-household resources such as friends and family, laundromats, or hotels for cooking, washing, and bathing (Blakeney & Marshall, 2009; Eggers et al., 2018; Lockhart et al., 2020). Other options are to buy bottled water or to haul water from nearby municipal water supplies, an ostensibly safer source but a significant financial burden (Balazs & Ray, 2014; Blakeney & Marshall, 2009; Eggers et al., 2018; Krings et al., 2019; Lockhart et al., 2020). Hargrove et al. (2018) estimate that it costs households with median annual incomes of 15,000 USD roughly 70 USD per month to haul water; at 5.6% of income, this is well above most accepted affordability thresholds (Goddard et al., 2022). At the community level, neighborhoods pursue service extension and/or consolidation with nearby systems (Seamster & Purifoy, 2021), and mutual-aid water committees step up to buy from municipal providers, or procure water through unofficial or illegal means (Mehta et al., 2014). Coping looks different for the rich and the poor: while the poor may rely on “hidden” pathways such as illegally siphoning water from city pipes, the rich are more easily able to augment their access by purchasing water or water purification technologies (Joshi, 2015; Mehta et al., 2014).

#### 4.6 | What, if any, mechanisms of redress are advocated?

A core tenet of the environmental justice framework is that, when injustices are uncovered, a means of redress or mitigation is necessary. In the reviewed literature, reform proposals for corrective justice and redress are usually inferred rather than made explicit. Most calls for accountability are directed at the state (Domènech et al., 2013; Kozlowski & Perkins, 2016; Krings et al., 2019). Some studies suggest mitigative measures to improve drinking water conditions, such as the installation of public water fountains for unhoused people (Hale, 2019), or, in the case of Flint, charging city officials with involuntary manslaughter (Krings et al., 2019). Others propose policy initiatives at one or two levels above a community-specific intervention. These include calls for state policy to support more regional solutions (Balazs & Lubell, 2014); increased government funding to develop technical, managerial, and financial capacity for communities (Balazs & Ray, 2014); or even a broad call for “stable economic development” that would protect human health (Kozlowski & Perkins, 2016). Advocacy directed at the state-run public health department can be an explicit component of community-based participatory research projects (Amiri & Zhao, 2019). Non-state pathways of redress appear as supportive mechanisms towards eventual reparation; examples include advocacy for public outreach to be sensitive to socio-economic status (Flanagan et al., 2016), or for activists in White communities to challenge race and class privileges (Kozlowski & Perkins, 2016).

Many under-served communities fall outside the reach of state assistance for drinking water provision, and struggle with recognition and citizenship in addition to access to water. US-based studies discuss this struggle in unincorporated and predominantly Latinx or Black communities, American Indian reservations, and US–Mexico border *colonias*. Some studies explicitly place the blame of drinking water disparities on the state for neglecting basic services for indigenous populations and for poor regulatory enforcement (Corlin et al., 2016; Eggers et al., 2018; Mascarenhas, 2007). Others point to historical neglect of and discrimination against low-income Black communities (Lockhart et al., 2020; Rall, 2018; Seamster & Purifoy, 2021; Stillo et al., 2019). Internationally, this form of neglect especially pertains to peri-urban or semi-rural spaces (Mehta et al., 2014; Wright-Contreras et al., 2017; Wutich et al., 2013). Collectively, the literature shows that the boundaries of state oversight (and thus accountability) often coincide with disparities in access to safe water.

Several studies document the paradox of redress when the state itself is complicit in the persistence of environmental injustices. For instance, histories of unequal land and water changes have been officially rewritten as heroic responses to water scarcity (Otero et al., 2011); struggles for access to water go hand-in-hand with other rights violations (Mehta et al., 2014); state structures have historically had discriminatory and exclusionary effects on indigenous and Black populations (Eggers et al., 2018; Rall, 2018; Seamster & Purifoy, 2021; Stillo et al., 2019); and where, eventually, activists have succeeded in acquiring safe water, it may have needed years of “pushing, pushing” (Case, 2017). The irony of the EJ literature leaning on the state for redress when the state is also a perpetrator of injustice is a point we return to below.

## 5 | DISCUSSION

We organize our discussion around the questions and findings presented in the section above, with a focus on how they relate to the broader EJ literature.

### 5.1 | Access

Studies on perceptions of (poor) water quality give us unique insights into the lived water access conditions of many communities, especially in places where water quality data is unavailable. While perceptions matter, they may not by themselves signal distributional injustices in water access without independent verification of water quality. Perceptions can be influenced by many factors (de França Doria, 2009): people can think water quality is poor when it is in fact good (Rozin et al., 2015), or believe bottled water is of high quality when it may not be (Cohen & Ray, 2018; A. R. Williams et al., 2015). We contend that treating the perception of poor water quality as a distributional injustice by itself, as several of our reviewed studies have done, raises questions about construct validity. Perception-based data on a sample of respondents within areas in which distributional injustices have already been established could usefully combine the strengths of primary and secondary data.

Perceptions can, however, signal procedural injustices, or show *why* access inequalities persist. Perceptions of poor water quality that the water utilities pay no attention to, or dismiss out of hand, can be signs of procedural injustice. Perceptions can uncover how, even in a community with a well-documented environmental burden, there may be different views on whether that burden is an *unjust* one (Kozłowski & Perkins, 2016). Perceptions are also central to recognitional injustice, particularly when they relate to how the community is treated by the utility or by the state (B. L. Williams & Florez, 2002). Studies on community perceptions of poor water quality, or distrust of the water utility or of the state, are best conducted with primary data collection. Studies using only publicly-available data cannot reveal how under-served communities *feel*.

Several studies on poor water quality compare their findings against WHO or EPA benchmarks for drinking water standards, but do not refer to a comparison community (or regional / national averages) to attempt to evaluate *disproportionate* harms (Corlin et al., 2016; Heaney et al., 2011, 2013; Wedgworth & Brown, 2013). Even if the study communities are minoritized because of race or ethnicity, without a comparison with a larger population, disproportionate harms cannot be specifically established. These studies, therefore, implicitly rely on an absolute framing of justice, which considers a failure to reach a minimum standard (e.g., to stay below a federal maximum contaminant level) inherently unjust (Feinberg, 1974; Montague, 1980). The original concept of EJ, however, was distinctive in its focus on fairness and equity for specific communities with respect to others (Taylor, 2000). The convergence of injustice as a

violation of universal standards with injustice as a disproportionate burden for particular communities—which we find primary studies often assume—brings justice-oriented studies closer to adjacent frameworks such as the human right to water or water security (Cook & Bakker, 2012; Gleick, 1998; Sultana & Loftus, 2015). Research using secondary data can more readily identify disproportionate harms using statistical analysis.

## 5.2 | Justice

Early EJ studies have been critiqued for their characterization and analyses of distributional injustices as “snapshots” in time (Been & Gupta, 1997; Pastor et al., 2001), and for ignoring the production of injustices as structurally racial projects (see Omi & Winant, 2014). While this is not true of all studies in our review, many are of a descriptive, “snapshot” nature, in part because they use mainly primary data. These studies do not explain how and why water access injustices arose, nor why they persist, though understanding past and ongoing power dynamics between stakeholders is critical for understanding why otherwise unacceptable conditions of water supply come to be considered “natural” (Otero et al., 2011).

“Snapshot” studies have played a critical role in the development of EJ as a field: indeed, the discipline emerged as a form of praxis, at the convergence of environmental activism, broader social movements, and scholarly research (Sze & London, 2008; Taylor, 2000). Even today, requests to the government for water quality testing, infrastructure assessment, and service connections or annexation are often ignored in the United States (Lambrinidou, 2018; Pulido, 2016) and abroad (Nganyanyuka et al., 2018). Documenting distributional inequities and characterizing harms therefore remain crucial for keeping the field grounded, and for providing ongoing, evidence-based tools for environmental advocates and for communities.

Several studies explore how multiple forms of injustice—distributional, procedural and recognitional—co-occur (Mascarenhas, 2007; Mehta et al., 2014; Sitthikriengkrai & Porath, 2017; Wutich et al., 2013). The acknowledgement of plural injustices is in line with calls to avoid ahistorical documentation of distributional inequities, and to instead analyze how multiple forms of injustice are mutually co-constitutive (Malin & Ryder, 2018; Pellow, 2017; Schlosberg, 2013). Throughout the reviewed papers, we see that recognitional injustice often undergirds ongoing distributional or procedural injustices (Fraser, 2000; Schlosberg, 2004), but also that distributive and procedural injustice can in turn engender recognitional injustice. Such recognitional injustice often results in psychosocial stressors (Blakeney & Marshall, 2009), which exacerbate environmental health disparities across race and class lines (Gee & Payne-Sturges, 2004; Morello-Frosch et al., 2011); as Sitthikriengkrai and Porath (2017) observe, “such indifference and neglect becomes part of the environmental injustice they are suffering.” Our review captures ways in which distributive, procedural, and recognitional injustices are co-produced. Collectively, these studies show how community struggles to obtain drinking water access are underlain by long histories of disenfranchisement and resistance, rather than singular sources or events of degradation.

We offer the schematic in Figure 3 to diagram how forms of (in)justice—with the important inclusion of occupational justice—are situated with respect to one another. The arrows emphasize the multidirectional relationships of (in) justice production and reinforcement we took note of above, with occupational justice at the center to symbolize how distributive, procedural, and recognitional injustices can morph into “daily life” effects.

## 5.3 | Community resistance and coping

Communities and community-based organizations have responded to the lack of access to safe water with various forms of resistance (see Results Section 4.5). Protest and resistance can be effective, be ignored (Heaney et al., 2013), or be actively shut down (Rutt & Bluwstein, 2017). Communities may also have internal divisions, as early EJ literature recognized (Bullard, 1990), and protest can be seen as a threat to the benefits of job security even when the harmful effects of polluting are obvious (Kozlowski & Perkins, 2016). Community-based participatory research approaches have been promoted as empowering communities to own their water quality data, to demand greater access to procedural justice in the future (Heaney et al., 2011), and as part of a project of social transformation (Mertens, 2010).

Organized resistance is always a risk (Scott, 2012), and the complexity of tracing drinking water contamination is itself an impediment to protest (Sitthikriengkrai & Porath, 2017). Establishing a causal connection between polluters, pollutants, and communities has been a major goal of traditional EJ research (Been & Gupta, 1997; Mohai &

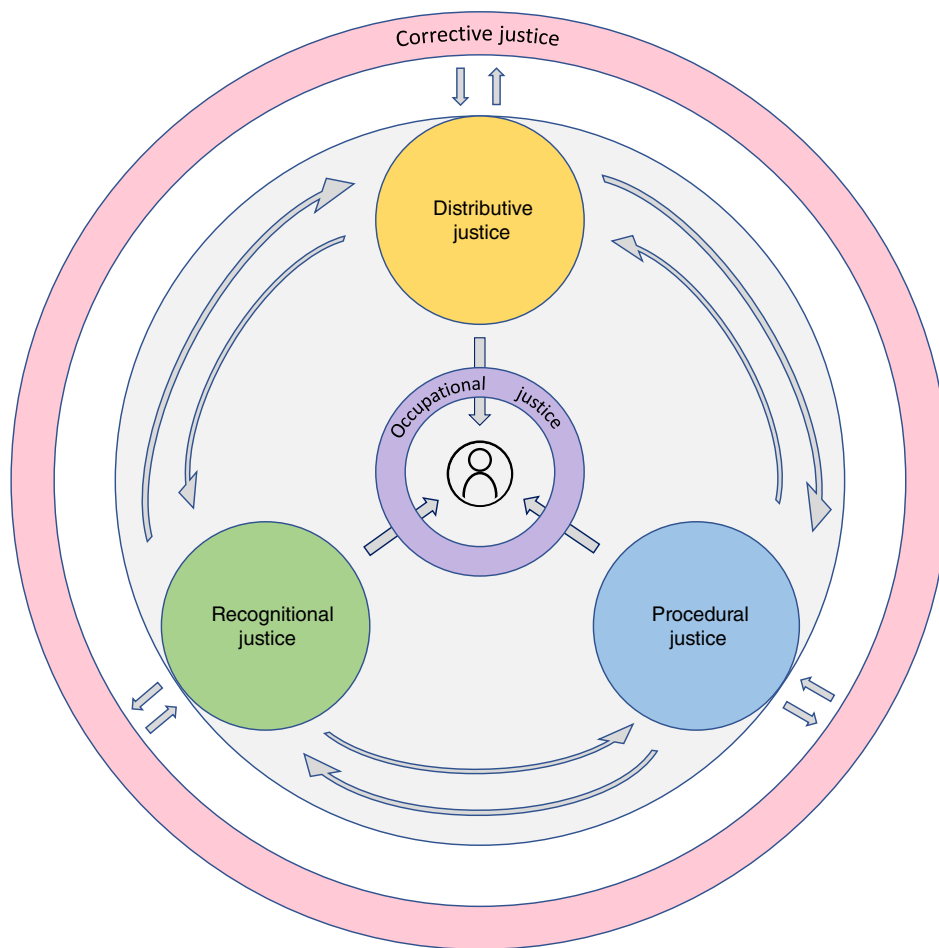


FIGURE 3 The multidirectional relationships between different types of justice.

Saha, 2015; Pastor et al., 2001). The drinking water contamination papers in our review, however, do not always identify a polluter, and none are designed to assess a causal relationship between polluter and pollutant. For instance, studies may point to inadequate household infrastructure (such as failing on-site septic tanks, or old private wells) as potential causes of water quality degradation (Heaney et al., 2011, 2013; Wedgworth & Brown, 2013), with no external actors held responsible. Tracing the causes of nonpoint water pollution sources that contaminate ground- and surface water, possibly over long periods, is particularly difficult (Loague et al., 1998). The challenges of attribution give rise to the question: if we cannot establish the entity (or entities) responsible for poor drinking water quality, how do we connect distributive injustice to corrective justice?

Where resistance and protest are not feasible, too risky, or challenging to organize due to intra-community differences (Naman & Gibson, 2015), communities have to cope with inadequate water quality or quantities (Venkataramanan et al., 2020). Balazs and Ray (2014) describe a “composite drinking water burden” in which “exposure and coping are mutually constitutive, cyclical, and multilevel”—illustrating a vicious cycle in which under-resourced communities are forced to take on additional costs such as purchasing bottled water or expensive household-level filtration systems. Coping costs can also be incurred in other aspects of life, such as home maintenance costs or heightened levels of social anxiety (Blakeney & Marshall, 2009; Lockhart et al., 2020), or having to share water with neighboring households (Wutich et al., 2018). Current EJ research on drinking water disparities alludes to, but could more comprehensively assess, these financial and psychosocial coping costs in their analyses of injustice. These costs are widespread, and therefore research focused only on the direct effects of poor water quality understates the full costs of environmental injustice. It is possible to measure at least some of these costs, as studies in low-income settings have shown (Burt et al., 2018; Pattanayak et al., 2005).

Less common in US studies, but quite prevalent in those based in the Global South, is the analysis of unauthorized use as a form of coping (Joshi, 2015; Mehta et al., 2014). This can include tapping into municipal water systems without

permission, refusing to pay utility bills when they are unaffordable, or illegally sinking a private or community well. These coping mechanisms are distinct from buying or boiling water; they are examples of what has been called the “quiet encroachment of the ordinary” (Bayat, 2000). Or, as Scott (2012) would say, these are unobtrusive forms of law-breaking that “do not shout.” The Global EJ (GEJ) literature, theorizing from the South more broadly, has framed such acts as strategic responses to poverty or inequality (e.g., Burt & Ray, 2014). The US-based literature, by contrast, discusses non-payment (and subsequent shut-offs) of water services in cities such as Flint or Baltimore as forced upon the poor (Mack & Wrase, 2017; Swain et al., 2020)—but not as a form of silent insubordination under scarcity.

Overall, the drinking water as well as the broader EJ literature show that resistance is a dynamic process during which the nature of resistance, the environmental conditions, and the needs and priorities of the community itself, are mutually shaped and reshaped. The critique of “snapshot” studies of distributional disparities is even more salient with this recognition.

## 5.4 | Redress and the role of the state

In addition to distributional, procedural and recognitional justice, redress, or corrective justice, is central to the EJ framework. Corrective justice calls for penalizing those who have broken environmental laws, and for remedying the damages inflicted as a result of lawbreaking (Kuehn, 2000). Holding the polluter accountable, while a key demand of EJ activists (Bullard & Wright, 1993), is a challenge for drinking water contamination because attribution of cause to nonpoint sources is difficult (as discussed above). Even when both the source and harms of pollution are evident, redress is complicated when the responsible companies are no longer in existence, as in the case of uranium mines in Navajo Nation (deLemos et al., 2009; Harmon et al., 2017). When holding a distinct polluter accountable is not feasible, the position within the traditional EJ literature is that the state should step in and either mitigate the harms to the community and/or be held accountable for its own lax enforcement (Kuehn, 2000). This observation applies to most of the papers in our review, which (often only implicitly) call upon the state for redress.

Historically, the state has played a central role in corrective justice, as either the arbiter or the regulator, to remedy environmental injustices. However, Critical EJ (CEJ) scholars have argued that automatically turning to the state as part of the solution is naive, because the state has allowed injustices to continue, or has actively perpetrated injustices itself, especially in Black and Indigenous communities in the United States (Kurtz, 2009; Pellow, 2017; Pulido, 2016). Many CEJ scholars have joined forces with political ecologists, arguing that the concept of justice within the EJ movement in the United States is inherently liberal, and that racism and exclusionary practices have characterized such liberalism (Pulido, 2016; Ranganathan, 2016). Reliance on the state to mete out justice, therefore, at worst reinforces the hegemonic power structure that produces injustice (Pellow, 2017; Swyngedouw & Heynen, 2003), and at best dilutes the transformative power of demands for justice by compromising with the liberal state (Pulido et al., 2016).

The critique that EJ falls back on the state as arbiter when the state is also an enabler, and thus the call to look beyond the regulatory state in search of transformative coalitions (Pellow, 2017; Ranganathan & Balazs, 2015), must be taken seriously. Pulido et al. (2016) have argued that the EJ movement, relying on the state, has improved environments for relatively few marginalized communities. We find, however, that even the outlines of proposed transformative solutions remain vague, as does strategic guidance for the EJ movement to seek redress outside the state (see also Purucker, 2021).

Extra-state redress is a particular challenge at the scale of drinking water systems. The global reality is that in countries with near-universal access to drinking water, most households have water provided or regulated by state or local water agencies (Ray & Smith, 2021). In unincorporated California, London et al. (2021) show how informality—taken broadly as conditions *outside* of formal state or market institutions—can obstruct the attainment of water justice. Some of the most deprived areas discussed in the reviewed papers were in such informal, liminal spaces, such as peri-urban areas or unincorporated communities, where the regulatory state is weak or non-existent at the necessary scale (Heaney et al., 2011; Mehta et al., 2014). Successful non-state community-managed drinking water systems do exist, for example, in Paraguay, Bolivia and Peru (Loach et al., 2000; Marston, 2014; Whittington et al., 2009), but their potential for replication at scale is unknown.

In light of past (and ongoing) debates about redress and the primacy of the state, Sze and London (2008) have argued that the state needs to be brought “back in” (following Skocpol, 1985), despite its failures, and despite its exclusions. The “state” as they see it is not a uniform entity, but a fractured one, that actively participates in the distribution of environmental protections and harms at the same time. Pushing back against the argument that EJ is too movement-



oriented to be theoretically sound (see Swyngedouw & Heynen, 2003), Sze and London argue that EJ has always been about understanding how power manifests itself through race and class to produce benefits and harms, and that making demands of a fractured state is a distinctive feature of EJ theory and practice. Others have advocated for new modes of water governance that prioritize inclusivity and meaningful engagement of civil society actors (Harris et al., 2017). The state can also be understood as an evolving (rather than fixed) entity whose form emerges through “the process of struggle,” and that cannot be either dismissed or reified (Angel & Loftus, 2019). While the drinking water justice papers in this review would (in the main) be compatible with these positions, relying on the state for redress while recognizing it as a producer of persistent inequalities remains a tension within environmental justice work.

## 5.5 | Limitations

With our focus on primary data (as bound by our inclusion–exclusion criteria), our analysis is restricted to a subset of the broader literature on environmental justice and drinking water. A review of secondary data-based studies could have revealed additional insights, such as on population-level trends or spatial patterns of access across larger geographies.

In literature reviews, it is good practice to integrate some form of quality or bias assessment to assess the evidence (Khan et al., 2003). We found this difficult to do given the heterogeneity of research designs and methods used across the reviewed works. Standards vis-à-vis research design, data transparency, sample size, sampling units and sampling techniques can vary widely within interdisciplinary research areas (Agrawal, 2003). However, even papers with similar goals in our review (e.g., studies on contamination) do not share research practices or outcome metrics. As this research area continues to grow, a comparative meta-analysis will eventually be possible, but only to the extent that researchers develop commensurable definitions and research designs. Wider adoption of commensurable metrics and methods could make disparate case studies more comparable and their results more amenable to aggregation. Measurements of chemical and biological drinking water contamination, or the affordability of supplementary water supplies, are examples of where standardization can be useful. Context-specific aspects of environmental justice, on the other hand—for example, local and/or indigenous definitions of what is “just”—may not share common outcomes or fit neatly into a liberal juridical framework. Whatever the chosen metrics and approaches, authors should at a minimum be transparent about the strengths and limitations of their study designs.

## 6 | CONCLUSION

We reviewed 33 primary data-based studies published between 2002 and 2020 on environmental (in)justice with respect to adequate and safe drinking water access. This review offers four key contributions to the broader literature on drinking water and EJ. First, our literature review, to our knowledge, is the first on environmental justice and drinking water specifically. By identifying the strengths of our reviewed works alongside gaps in the literature, we suggest that combining primary with secondary data can enrich EJ research (potentially beyond the drinking water domain). Second, by focusing on primary data-based studies, we draw out insights pertaining to drinking water and EJ, such as user perceptions of water quality or activist narratives of resistance. We show, for example, how EJ struggle is a dynamic process, through which community priorities co-evolve with environmental conditions (e.g., availability of drinking water) and political responses (e.g., resistance or cooperation by government and industry) over time. We show how perceptions—how people in communities *feel*—give shape to cases of procedural injustice or calls for recognitional justice. These observations are necessarily excluded in papers relying mainly on secondary data but remain essential to understanding EJ struggles over drinking water access. Third, we show that primary data-based EJ studies on drinking water are predominantly predicated on redress by the liberal state, though the broader EJ literature contains active critiques of the liberal racialized state, especially in the United States. Fourth, we demonstrate how multiple types of injustice are often co-produced and mutually-reinforcing.

As might be expected, most of the reviewed studies were concerned with drinking water access difficulties in marginalized communities—by race, ethnicity, and socio-economic status. While many drinking water and EJ studies refer to health impacts, relatively few are designed to measure drinking water exposures and associated health outcomes. Distributional and procedural injustices remain the dominant forms of injustice in the reviewed literature. Community protests and resistance when faced with drinking water challenges are also a common theme, but several studies

describe years of “pushing” and years of neglect before state agencies offer any redress (if at all). Critical EJ theorists have therefore argued that relying on the state, which is often complicit in perpetuating injustice, is not a useful way forward for the field. However, what communities should walk towards when “walking away” (Pellow, 2017) from the state is ill-defined in the EJ literature. Overall, few of the reviewed studies are designed to explicitly assess responsibility. The accountability for redress under different forms of water governance remains an important area for future research.

The original EJ framework has broadened out to GEJ, which connects local EJ struggles to larger political economy forces, and to CEJ, which argues for a more critical examination of the role of the state as well as for a more inclusive role for gender and ecology within EJ. Drinking water studies appear within the GEJ strand, but to a lesser extent in the CEJ strand. (See Table S7 in the supplementary materials for a breakdown of how our reviewed papers overlap with GEJ, CEJ, and Pellow's (2017) four pillars of CEJ.) US-based studies, in particular those influenced by CEJ, have started to analyze the structural racism that underlies the liberal US state as part of their analysis of EJ and water (Pulido, 2016; Ranganathan, 2016). Future EJ research can take the field towards a more nuanced understanding of how racial policies and governance structures—liberal and otherwise—have shaped the drinking water disparities of today. GEJ studies have accepted the juridical redress framework of EJ to varying degrees, but US-based studies have yet to incorporate the strengths of many global studies (such as a detailed account of coping costs, or theorizing coping as a form of resistance when legal means of access seem infeasible). What US-based EJ studies can learn from the Globally-framed EJ literature is also an important area for future research.

## AUTHOR CONTRIBUTIONS

**Seigi Karasaki:** Conceptualization (lead); data curation (equal); investigation (lead); methodology (equal); visualization (lead); writing – original draft (lead); writing – review and editing (equal). **Jessica J. Goddard:** Conceptualization (equal); investigation (supporting); methodology (equal); writing – review and editing (equal). **Alasdair Cohen:** Conceptualization (equal); investigation (supporting); methodology (lead); writing – review and editing (supporting). **Isha Ray:** Investigation (supporting); supervision (lead); writing – original draft (supporting); writing – review and editing (equal).

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## CONFLICT OF INTEREST STATEMENT

The authors have declared no conflicts of interest for this article.

## DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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## ENDNOTES

- <sup>1</sup> EJ can also be centered around the distribution of disproportionate *benefits* or privilege, but this benefit-oriented framing is less common (see Stewart et al., 2014; Sunter et al., 2019; Szasz & Meuser, 1997).
- <sup>2</sup> PROSPERO is an online database for pre-registering (systematic) reviews, designed to minimize the possibility of duplicate research projects and to reduce reporting bias.
- <sup>3</sup> For authors affiliated with more than one institution, we made our best judgment on which was their primary institution at the time of publication. We included all authors for multi-authored papers.
- <sup>4</sup> The Seamster and Purifoy paper was included as it was published online in 2020.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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