California's Sustainable Groundwater Management Act and the Human Right to Water: Opportunities and challenges for environmental justice in collaborative governance

By

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TABLE OF CONTENTS

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ABSTRACT

In recent decades, the search for more appropriate scales and effective methods to tackle complex environmental problems has reshaped the discourse and practice of environmental policy, leading to the widespread adoption of collaborative governance. In contrast to the command-and-control, top-down policies of the past, in collaborative governance multiple decision-makers and stakeholders engage with one another in a more horizontal fashion to develop and implement policy or management objectives that are mutually beneficial. Collaborative governance has been promoted for its utilitarian benefits including reducing conflict, leveraging local knowledge and increasing public acceptability/compliance. But collaborative governance's popularity and widespread adoption also reflect strongly normative democratic. Collaborative governance promises to situate management in a consensus-oriented process with the involvement of diverse stakeholders promoting representation in decision-making, building trust and empowering local stakeholders.

Given this potential to expand participation and enhance democratic legitimacy, equity, and social fairness, collaborative governance seems well positioned to support another growing movement in water policy: Environmental justice. Grounded in a global grassroots movement, environmental justice scholarship has evolved to be a broad and transdisciplinary conversation concerned with distributional and procedural equity in environmental decision-making, regulation and enforcement. Both environmental justice and collaborative governance emphasize the importance of participation in decision-making for the legitimacy and equity of the resulting outcomes.

However, the extent to which collaborative governance and environmental justice are compatible and complementary, both in theory and in practice, should not be assumed. Many scholars have noted that the claims of collaborative governance and its benefits merit skepticism and collaborative governance theory and scholarship has been highly criticized for failing to engage with questions of power and equity Further, tensions between the state as a solution for inequality and the state as a perpetuator of inequality have led some environmental justice scholars to be pessimistic about the prospects of achieving meaningful change in the context of these type of formal policy venues.

This dissertation investigates the intersection of collaborative governance and environmental justice as a place of both challenges and opportunities, eschewing the promotion of governance panaceas in favor of critical appraisal. This is accomplished using California's implementation of the Sustainable Groundwater Management Act (SGMA) as a heuristic case. In doing so this dissertation seeks to contribute not only to the aforementioned literatures but also to California water policy wherein sustainable groundwater management and implementing the state's human right to water declaration (AB685) passed in 2012 are both key priorities.

Chapter one employs novel data and generalized linear modeling to explore low-income community representation in Groundwater Sustainability Agencies. The findings illustrate that while collaborative institutions are more representative as predicted by the literature, these gains are not made evenly across communities, exacerbating representational disparities among them along the lines of income, population, race and incorporation status. Chapter two utilizes semi-structured interviews to surface environmental justice community perspectives on the groundwater reform process. Among the key findings is that the systematic exclusion of drinking water priorities in collaborative groundwater management both directly and indirectly discourages rural drinking water stakeholder participation. As a result, existing power and resource disparities limit the prospects of integrating rural drinking water priorities into regional water planning and leveraging collaborative groundwater governance for source water protection. Chapter three, in turn, draws on participatory action research as well as document analysis and interviews to describe environmental justice organizing around SGMA. In doing so I contribute an important case study on the formative role of social movements in common pool resource management, a topic that has been heretofore underexplored. While confirming many of the challenges for advancing equitable drinking water access documented in the previous two chapters, this chapter posits that the SGMA process itself is contributing to the longer-term transformation of the San Joaquin Valley including through the growth of environmental justice movement, the production of commoners and shifting discourses, all of which constitute an important renegotiation of local socio-natural relations. The fourth and final chapter quantifies and then explores the drivers of (in)equity in Groundwater Sustainability Plans. Findings indicate that while collaborative governance does

offer some opportunity to advance equity goals, the extent and type of effect is limited and the relationships between drivers and outputs are nuanced and complex.

OVERVIEW

This dissertation has been formatted so that the four chapters standalone as individual manuscripts. Each of chapter has its abstract, references and supplemental materials. The titles and abstracts for each chapter are as follows:

Chapter One - Collaborative Governance and Environmental Justice: Disadvantaged Community Representation in California Sustainable Groundwater Management

A consistent critique of the theory and empirical research on collaborative governance is a lack of conceptualization and analysis of the role of political power and inequality. Our paper contributes to this discussion by analyzing the formal representation of small, disadvantaged communities in the 2014 Sustainable Groundwater Management Act in California. Employing primary and secondary data, we model the likelihood of representation in the state's new Groundwater Sustainability Agencies based on key attributes of both the communities and governance settings. We find that the overall collaborative governance is associated with increased representation of these marginalized stakeholders. Importantly, however, even in collaborative settings representation of the smallest, most low-income communities and those lacking political recognition via incorporated cities or public water districts still lags far behind their more advantaged counterparts. In fact, disparities in representation along these lines increased. Using a uniquely interdisciplinary approach our analysis highlights the opportunity afforded by integrating collaborative governance and environmental justice in the shared pursuit of effective and equitable institutions and the inter-related goals of equity and sustainability.

Chapter Two - "Good Luck Fixing the Problem": Small Low- Income Community Participation in Collaborative Groundwater Governance and Implications for Drinking Water Source Protection

There is increasing interest in the potential of source water protection to address chronic challenges with small systems and rural drinking water provision. Such a planning and management approach to increasing safe drinking water access, however, will likely require leveraging multi-stakeholder collaborative

governance venues to this effect. This paper investigates the prospects of doing so using the case of California's groundwater reform process known as the Sustainable Groundwater Management Act or SGMA. Interviews with drinking water stakeholders from small low-income communities in the San Joaquin Valley show how existing power and resource disparities limit the prospects of integrating rural drinking water priorities into regional planning. Long-term, more fundamental changes will be needed to meaningfully transform water management in this direction. Short-term state intervention is needed to protect equity and public good goals, raising potential contradictions between devolved water management and improved drinking water access that need to be addressed.

Chapter Three - Environmental justice organizing as commoning practice in groundwater reform: Linking movement and management in the quest for more just and sustainable rural futures

Despite the commons being a long-standing site of conflict, the role of social movements in common-pool resource management has been under addressed. By exploring the role of environmental justice organizing in the San Joaquin Valley during California's landmark groundwater reform process as a commoning practice, this article seeks to fill this gap and advance our understanding of how collective action can, and is, being leveraged to advance just and sustainable transitions. I argue that through three principal strategies of challenging participation, scope, and authority, the movement has played a formative role in a landscape of intensive enclosure. Applying a commoning lens to the case highlights the important role of not only social movements in commons management but also of commons management as a venue for the rearticulation of regional socio-natural relations. Such opportunities are particularly important in under institutionalized rural areas where opportunities to renegotiate these relations are often few and far between. Understanding the emergence and growth of commoning communities engaged in such efforts provides several important lessons. Individual commoning strategies can help identifying principal constraints and opportunities to transcend them. To be fully understood, however, they need to be considered collectively as well as in context. In doing so, the critical importance of focusing on the work commons do, rather than produce, becomes apparent. Commoning is both a tool and a goal in itself.

Chapter four – Drivers of (in)equity in collaborative groundwater planning

Collaborative environmental governance seeks to engage diverse stakeholders in a participatory process to tackle complex challenges. In doing so the approach purports to be more equitable results than previous top-down approaches. The extent to which collaborative governance achieves this goal, however, is subject to significant debate. Here we use the empirical case of California Sustainable Groundwater Management to measure the extent to which vulnerable small and rural drinking water users are accounted for in collaborative groundwater planning outputs. We then employ Boosted Regression Trees (BRT) to assess potential contributing factors/impediments, or drivers, to doing so. Our results indicate that collaborative regimes, elite power, stakeholder engagement, representation all influence equity in local groundwater reform albeit to a limited extent. Moreover, the quantified influence for most is reduced for enforceable management criteria compared to general plan discussion of equity topics as well as in comparison to local problem severity. One exception is representation which is by far the most influential and the only factor to influence management thresholds more than overall plan content. Notably, between the two models, the relative influence of different forms of stakeholder representation varied, indicating that the degree and form of representation matters. In stark contrast to the often-sweeping claims accompanying the potential of collaborative approaches to environmental management, we find extraordinary complexity and nuance in our attempt to relate potential equity drivers with outputs including non-linear and threshold effects as well as results that are highly contingent on the specific performance measure assessed. This leads us to argue that while clearly not a panacea, any progress in leveraging the potential of collaborative governance to advance more equitable environmental governance will come from research that embraces this complexity including through mixed method and qualitative design

CHAPTER 1 - COLLABORATIVE GOVERNANCE AND ENVIRONMENTAL JUSTICE: DISADVANTAGED COMMUNITY REPRESENTATION IN CALIFORNIA SUSTAINABLE GROUNDWATER MANAGEMENT[1]

Introduction

A consistent critique of the theory and empirical research on collaborative governance is a lack of conceptualization and analysis of the role of political power and inequality (Foster 2002; Franks and Cleaver 2007; Morrison et al. 2017; Purdy and Jones 2012). The critique is more broadly applied to public policy and institutional analysis in general (Knight 1992; Moe 2005). Political institutions provide differential access to decision-making (Besley and Case 2003), while political groups and individuals have higher or lower capacity to participate in governance systems and influence the outcomes (Olson 2009; Sabatier and Jenkins-Smith 1993; Stigler 1971). Thus, there continues to be a need for empirical research focused on the crucial issue of how these factors affect the structure and function of governance institutions.

This article contributes to this discussion by analyzing the representation of disadvantaged communities in the new groundwater governance institutions established by the 2014 Sustainable Groundwater Management Act (SGMA) in California. SGMA required local actors in the state's 127 high- and medium-priority groundwater basins to create new groundwater management institutions called Groundwater Sustainability Agencies (GSAs) by June 30, 2017. Next, GSAs have until January 2020 or 2022, depending on their basin condition, to develop mandatory Groundwater Sustainability Plans (GSPs). In other words, GSAs are new administrative agencies with significant authority over groundwater resources within a specific geographic jurisdiction, and GSPs will articulate the operational rules that define the allowable, required, and prohibited use of groundwater resources (Schlager and Ostrom 1992).

The GSA formation process provides an excellent laboratory for analyzing collaborative governance because it provides the opportunity to compare the performance of more or less collaborative institutional arrangements. GSAs can be formed by "eligible entities", which are defined as public water (e.g. water

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districts, public utilities districts) or land-use (e.g. cities, counties) agencies. These eligible entities may act on their own to form single-party GSAs that do not include other actors. Alternatively, GSA eligible entities may enter into one of three types of legal agreement to form multi-party, collaborative GSAs: Memorandums of Understanding/Agreement (MOU/MOA), Joint Powers Authorities/Joint Powers Agreements (JPA), and Special Act Districts (hereafter referred to as Act Districts or ADs). By spanning existing administrative boundaries and including multiple stakeholders, such GSAs fit Emerson et al.'s (2012, 2) definition of collaborative governance as "processes and structures of public policy decision making and management that engage people constructively across the boundaries of public agencies, levels of government, and/or the public, private and civic spheres in order to carry out a public purpose that could not otherwise be accomplished."

In this paper we focus one dimension of institutional performance that links concerns about the democratic norms of collaborative governance and environmental justice: the formal representation of "Disadvantaged Communities" (DACs). California defines DACs as communities with an annual Median Household Income less than 80% of the state's annual MHI.[2] While as an income designation, DACs can be considered at various scales from neighborhood to county, in this paper, as is often the case for state planning and policy, DACs are defined at the level of census places. Census places are defined by the census bureau and include both incorporated places (e.g., cities/towns) and Census Designated Places (CDPs) based on settled concentrations of population that are socially and geographically identifiable but not legally incorporated (US Census Bureau 2012). California counts 685 DAC places; 545 of these are small DACs meaning they have populations less than 10,000. It is these small DACs that face the brunt of California's drinking water disparities (C. Balazs et al. 2011; C. L. Balazs et al. 2012; United Nations General Assembly 2011) and have also historically been marginalized in the context of local, regional and state water management and planning (Francis and Firestone 2010; Ranganathan and Balazs 2015; Recommendations 2015). This fact, combined with the high reliance on groundwater as a drinking-water supply (Disadvantaged

[2] CA Public Resource Code § 75005(g), Water Code § 10723.2, for the 2010-2014 ACS 5-year estimates used in this investigation this amounts to an MHI of $49,191.20 or less.

Community Water Study for the Tulare Lake Basin 2014), and that state's political commitment to the human right to water (Assembly Bill 685, 2012) means that means that SGMA is perfectly situated to elaborate on the intersection of these two important trends (Foster 2002; Patrick 2009).

Under SGMA, GSAs are required to develop and maintain a list of interested parties that must include local DACs and to consider the specific interests of DACs in their groundwater management efforts.[3] But in practice there are no specific state guidelines for meeting these requirements. As a result, there is institutional diversity across GSAs that functionally embodies different levels of formal representation for the 241 of 545 small DACs that are located within the boundaries of one or more newly formed GSAs. Some small DACs are not represented at all in GSA governance or legal structures, while others serve on governing boards with decision-making authority and/or are members of the cooperative agreements creating said agencies. This variance in formal representation is the dependent variable in our analysis in which we develop hypotheses about how individual DAC attributes and the institutional structure of GSAs affect the likelihood of formal representation.

The focus on low-income community representation sheds light on three related questions that have not received enough attention in research on collaborative governance. First, to what extent does collaborative governance adhere to broad normative principles of democracy such as representativeness? According to Leach (2006, 101) "a representative process ensures that the interests of all affected individuals are effectively advocated, either in person or through proxies." Some scholars argue collaborative governance provides intrinsic normative benefits, expanding participation and enhancing democratic legitimacy, equity, and social fairness (Pahl-Wostl et al. 2007). Yet there is a lack of empirical, and particularly quantitative, assessments on this topic specifically for marginalized actors (e.g. minority groups, the poor) (Koehler and Koontz 2008). What evidence we do have suggests that collaborative water governance is often falling short when it comes to these democratic ideals, especially when it comes low-income, less educated and minority stakeholders (C. L. Balazs and Lubell 2014; Koehler and Koontz 2008; W. D. Leach 2006; Samuelson et al. 2005).

[3] CA Water Code § 10723.2 and CA Water Code § 10723.8.(a)(4)

Second, to what extent is collaborative governance pursuing environmental justice, or "distributional and procedural equity in environmental and natural resource decisions" (Foster 2002, 461)? The above mentioned gap in defining the contours of representation of marginalized stakeholders has allowed for little more than speculation about the relationship, either current or potential, between collaborative governance and environmental justice (Foster 2002). Collaborative governance can lead to creative solutions and fruitful relationships, but it can also result in cooptation, undermine trust and be biased towards more powerful actors (Ansell and Gash 2008; Purdy and Jones 2012). In the global quest to define and develop governance, the impact of governance on the poor and marginalized has been systematically overlooked (Franks and Cleaver 2007; Pitts 2011; Purdy and Jones 2012). As a result, there is a significant need for research that critically situates governance, exploring how multi-stakeholder and integrated approaches "relate and interact with the day-to-day concerns" of less powerful actors "in accessing water" (Franks and Cleaver 2007, 304; Purdy and Jones 2012).

Third, and perhaps most importantly, how could collaborative governance contribute to the advancement of procedural justice in environmental policy? While much of the early environmental justice research focused on distributional justice (Holifield 2001; Schlosberg 2009; Walker 2009), who decides and how is entirely relevant to the outcome (Hunold and Young 1998). Robust democratic representation is thus considered a necessary component of achieving environmental justice, while exclusion from decision-making is linked to inequitable outcomes (Lake 1996; Schlosberg 2004; Walker 2009). Despite this recognition, however, the implementation of procedural justice for environmental policy has remained relatively understudied (Lake 1996; Schlosberg 2004; Walker 2009) especially in the new era of environmental deregulation (Castree 2008; Foster 2002; Patrick 2009).

Combined, collaborative governance and environmental justice have the potential to fill longstanding gaps in their respective scholarship, offering a path forward for the pursuit effective and equitable institutions and the inter-related goals of equity and sustainability (Lake 1996; Nijaki 2015; Sze et al. 2018). In the next section, we describe several hypotheses about institutional- and community-level factors that may increase or decrease the likelihood of formal representation of DACs in SGMA grouped around three core

considerations: collaborative institutions, resources and recognition. We then describe the methods and results of an empirical analysis of 241 small DACs in 109 unique GSAs. We end with a presentation of predicted probabilities of representation and a broad discussion of the implications of our findings for formal representation and equity in SGMA and beyond.

Research Questions and Hypotheses: Factors affecting formal representation of disadvantaged communities

What community and institutional level factors affect the formal representation of small DACs in GSAs? To answer this research question, we draw from both the collaborative governance and environmental justice literature, positing hypotheses concerning the role of collaborative institutions, community resources and community recognition. Each hypothesis identifies specific independent variables that may be negatively or positively associated with different levels of formal representation for small DAC in GSAs. By quantitatively testing these hypotheses, we hope to heed David Pitts' (2011) call to move towards assessing and addressing the real-world constraints on equity in these increasingly ubiquitous collaborative venues. While formal representation is only one of many ways that stakeholders can and do participate in groundwater management and collaborative governance, it is an core consideration for environmental justice stakeholders who have often been relegated to advisory roles (Hunold and Young 1998). After stating each hypothesis, we briefly discuss the theoretical basis from the literature.

The role of collaborative institutions

At the heart of the study of collaborative governance is the design of institutions. Institutions are the formal rules and informal norms that structure collective decision-making (Ostrom 1999). Designing institutions to best address the needs and desires of stakeholders and constituents is a long-standing topic in political science, public policy, and public administration. In turn, environmental justice research has consistently critiqued governing institutions for failing to represent the interests of socially, politically and economically marginalized stakeholders. Precisely because SGMA provides for the formation of single-entity or collaborative GSAs, SGMA provides a unique opportunity to analyze the extent to which

collaborative governance institutions enhance the representation of marginalized stakeholders, in this case DACs, and compare them to single-entity non-collaborative GSAs. Hypotheses 1, 2 and 3 therefore explore the role of institutional type and the institutional development process in shaping representation.

H1: Small DACs will be more likely to be represented in collaborative GSAs.

Hypothesis 1 considers simply whether a collaborative approach to GSA formation was employed or not. As described in the introduction, SGMA provides eligible entities the discretion to form either single-party or collaborative GSAs. Under a single-entity GSA scenario, a GSA eligible DAC would only be formally represented by becoming a GSA themselves.[4] For example, the Lockeford Community Services District, which provides drinking water to the unincorporated low-income community of Lockeford, opted to become the exclusive GSA for their existing service boundaries.

Multi-party collaborative agreements, on the other hand, can be formed through legal cooperation agreements such as MOUs, JPAs, or special-act legislation. For example, the Merced Irrigation-Urban GSA was formed via MOU by seven pre-existing independent agencies. Collaborative GSAs inherently demonstrate joint action by spanning existing political boundaries, and many of them go even further by explicitly invoking collaborative principles including hiring environmental conflict resolution professionals and employing consensus or modified consensus decision-making rules. Theoretically then, collaborative GSAs should offer more opportunity for small DAC involvement than single-entity GSAs that do not scale up from their current management regimes (Ansell and Gash 2008). Instead of assuming collaborative GSAs exhibit these collaborative principles, our research measures the variance in the extent to which collaborative GSAs actually represent DACs in comparison to single-party GSAs.

H2. Small DACs are more likely to be represented in more formalized collaborative GSAs.

Hypothesis 2 focuses on the level of formalization among the various types of collaborative GSAs. GSAs have been created using three different forms of collaborative governance as allowed by the law:

[4] Re-purposing an existing agency as a GSA means that a new governing agency, and therefore a new governing board, is not created. See Milman et al (2018) for more discussion of the GSA formation process.

MOU/MOA, JPA, and ADs. MOU/MOAs are nonbinding coordination agreements among multiple parties to pursue shared interest or work. While they do create a unique decision-making structure, they do not create a new agency and each member entity continues to act independently based on their own powers. MOU/MOAs can be dissolved relatively easily, and their development does not require any specific political process that provides opportunity for participation and scrutiny by non-member stakeholders. JPAs are more formal because they allow for either the joint exercise of common powers among two or more members, or the creation a new separate legal entity entirely. Establishing a JPA entails a formal process of notification and filing with the Local Agency Formation Commission but again only requires the consent of the member agencies. ADs, on the other hand, are unique special districts formed by the legislature under state law, and therefore subject to the same mechanisms of democratic accountability afforded any legislative act.

The institutional analysis literature has a long-standing discussion with more ephemeral, informal institutions versus formal institutions (Libecap 1989; North 1990). For example, Ostrom (1990) discusses how it is easier to change informal operational rules versus more formalized collective-choice and constitutional rules. Yet while rigidity due to excessive formalization can constrain flexibility and adaption, institutionalization can also support the stability needed for long-term adaptive collaborative management and changes in existing power structures (Pahl-Wostl et al. 2007). In the case of GSAs, moreover, the administrative and legislative procedures governing the formation of the more formal institutions also provide more mechanisms for democratic accountability, participation, and transparency. Therefore, within these multi-party "collaborative" GSA types we expect increasing formalization to positively affect DAC representation.

H3: Small DACs are more likely to be represented in GSAs with third-party facilitation.

Hypothesis 3 focuses on the role of third-party facilitation. Some groundwater basins elected to use a third-party facilitator from a grant-funded network of SGMA facilitators established by the California Department of Water Resources (DWR) available to all interested GSAs. The practice of facilitation emphasizes stakeholder analysis and engagement as keys to achieving agreement, at the very least to avoid

conflict from excluded stakeholders resorting to legal or legislative workarounds (Fisher, Ury, and Patton 2011). For collaborative governance, facilitation has been shown to be important for bringing stakeholders together, initiating engagement and promoting social learning (Ansell and Gash 2008; Pahl-Wostl et al. 2007). Further, "transformative mediator techniques" and third-party facilitation can increase the participation of resource poor stakeholder groups (Innes, Booher, and Booher 2010; Ozawa 1993). Thus while the relative efficacy of internal versus external leadership in specific collaborative contexts is still very much a point of debate (Ansell and Gash 2008; W. Leach and Sabatier 2003), we expect that through increased support for the participation of less powerful stakeholders, third-party facilitation will increase formal representation of small DACs.

The role of resources

Resources are an important and common theme in both collaborative governance and environmental justice literatures. Hypothesis 4, then, considers how resources impact the capacity of stakeholders to participate in governance and advocate for representation.

H4: Small DACs with higher levels of resources are more likely to be represented in GSAs.

Resource disparities have been found to be barriers to participation for marginalized stakeholders in collaborative governance (e.g. Ansell and Gash 2008; Leach 2006) as well as more broadly for procedural justice (e.g. Hunold and Young 1998; Walker 2009). The finite resource of time, especially for groups that lack paid staff, is perhaps the most limiting factor but a lack of professional expertise (e.g. consultants, lawyers) and financial resources are also significant constraints (Ansell and Gash 2008; Franks and Cleaver 2007; W. D. Leach 2006). We expect to find these challenges at play in SGMA, with DAC representation in GSAs increasing with increasing community resources. While it would be ideal to measure community resources at the community-level, for example, by quantifying the number of full or part-time water district staff, human capital or annual water system budget, such data does not reliably exist for all DACs. To capture community resources in this study, therefore, we rely on population and Median Household Income (MHI) as proxies which can reasonably be assumed to correlate with such considerations.

The role of recognition

Hypotheses 5, 6 and 7 focus on the important role of social and political recognition in achieving procedural and distributional equity (Fraser 1997, 1998; Young 1990). Young and Fraser note a "direct link between a lack of respect and recognition and a decline in a person's membership and participation in the greater community, including the political and institutional order." Quite simply, they argue,"[i]f you are not recognised, you do not participate" (Schlosberg 2004, 519). While recognition in the mind of a particular decision-maker is difficult to directly measure, existing research suggest certain exogenous political and institutional variables are more likely to produce recognition, which in turn increases the probability of representation. Our hypotheses adopt the logic of identifying exogenous variables hypothesized to be related to recognition.

H5: DACs with GSA eligible drinking water providers and those that are incorporated will be more likely to be represented in GSAs.

SGMA delegated the responsibility of forming GSAs to local "eligible entities" defined as public agencies with water management (e.g. irrigation districts, public utilities districts etc.) and/or land-use (e.g. cities, counties) authority. Of the DACs analyzed in this article (i.e. those subject to SGMA), 44% have GSA eligible entities and 56% do not (see methods). For GSA eligible DACs, representation is straightforward. GSA eligible DACs *can* be represented in SGMA either by forming their own single-party GSA, or joining a collaborative GSA (although importantly not all GSA eligible DACs *are* represented). Formal representation of small DACs without a GSA eligible entity is less straightforward, however, it is not impossible. Non-public entities, such as mutual water companies, may participate in collaborative GSAs in partnership with one or more eligible entity. While certainly a "higher bar", this is not uncommon across the state. Milman et al. (2018) found that 36% of the collaborative GSAs included non-GSA eligible entities. For instance, the investor owned utility Cal Water is a voting member on various GSAs including in Solano and Tulare counties. Because there are fewer pathways to representation for non-GSA eligible DACs and because representation for such DACs requires willing GSA eligible partners, we anticipate that GSA eligible DACs will be more likely to be recognized and represented in SGMA than their non-eligible counterparts.

Incorporation provides another related potential pathway to recognition and representation. The current and historic neglect and stigmatization of California's unincorporated communities has been well documented in the literature (C. L. Balazs and Ray 2014; Pannu 2012; Ranganathan and Balazs 2015). Specifically, in water management unincorporated communities have had to fight to literally be on maps and in plans, let alone play a meaningful role in decision-making (Francis and Firestone 2010). For example, in Integrated Regional Water Management, a collaborative water management program that preceded SGMA, participation rates for unincorporated communities have lagged far behind small DAC cities (Self-Help Enterprises, n.d.). This leads us to hypothesize that incorporated DACs will have even higher rates of representation in GSAs than unincorporated GSA eligible DACs.

H6: Small DACs with larger Latino populations will be less likely to be represented in GSAs.

DACs, while defined based on income, are also highly racialized. Nationally, the majority of unincorporated communities are communities of color (Anderson 2007). California is no different (Rubin et al. 2007), and many are immigrant farmworker communities. These intersecting axes of social disenfranchisement (Combahee River Collective 1995; Crenshaw 1990) result in environmental injustices through the disrespect and devaluing of the communities and residents (Kennedy, Schafft, and Howard 2017; Young 1990). The environmental justice literature elucidates the unique challenges of cultural misrecognition and oppression in democratic and participatory venues (Schlosberg 2003) and vulnerabilities of undocumented residents (Agyeman 2005; Foster 2002; Sze 2006). Specifically for collaborative watershed management Samuelson et al. (2005) found that in both of the Texas watershed councils they consider, Hispanics were disproportionately underrepresented. Thus, we expect to observe underrepresentation of small DACs with larger Latino populations in GSA governance.

H7: Higher concentrations of small DACs will result in more representation in GSAs.

As a third and final consideration of recognition, we anticipate the number of DACs in a particular GSA will be related to the broader recognition of the presence of DACs in that particular area. California DACs are not evenly distributed throughout the state but rather are concentrated in the San Joaquin and Salinas Valleys. Statewide the number of DACs within GSA boundaries ranges from 0 to 13 with an average

of 5. We expect that a higher number of DACs in a GSA will increase their political and social visibility, and thus lead to higher rates of representation for each. This hypothesis is supported by the social movement literature where large numbers of actors may reach a critical mass or threshold (Granovetter 1978; Oliver, Marwell, and Teixeira 1985; Poteete, Janssen, and Ostrom 2010) and allow the formation of coalitions (Diani and Bison 2004). However, the literature on common-pool resources and collective action offers a counterargument because large numbers of actors may increase the likelihood of free-riding (Olson 1965). Our empirical analysis will help discriminate between these two arguments.

Methods

Data collection and compilation

To study small Disadvantaged Community (DAC) representation in Groundwater Sustainability Agencies (GSAs), the first task was to identify the small DACs that fall within the geographic boundary of each GSA. To do this, the base dataset for this study was developed using *Esri's ArcMap* by intersecting the Department of Water Resources (DWR)'s DAC mapping tool layer of 685 DAC Places[5] with the DWR SGMA portal map layer of the 269 exclusive GSAs formed as of January 1, 2018.[6] Subsequently, intersections for the 139 non-small DACs (population greater than 10,000) were removed as were intersections that constituted less than 10% of the DAC's total area. Two additional census designated places that were University of California campuses we also removed.

Of these 241 small DACs, 203 are located entirely within one GSA, 36 are split between two GSAs and 2 are trifurcated (see Figure 1 for an example from one hydrologic region). Thus our units of analysis are the 281 intersections between the 241 small DACs and 109 GSAs. This unit of analysis is important because

[5] Due to the census methodology for defining places based on parcel density, this analysis likely misses the smallest and most disperse DAC communities in the state. Despite this shortcoming, we believe that places are the most politically and geographically meaningful unit of analysis because, unlike census blocks or tracts, they typically represent recognizable and nameable communities and because they more closely mirror public water system boundaries which typically serve as the unit of representation for DACs in water management. Additionally, in rural areas, places are typically the smallest unit compared to tracts and blocks.

[6] Because GSAs have the ongoing ability to adjust their boundaries and structure, in theory DAC intersections and representation is not static in time. In reality, thus far few, if any, meaningful changes have occurred after filing for GSA status.

it allows for the testing of hypotheses at both the GSA and community level, capturing variance in specific characteristics that can help us understand the factors that drive formal representation. To measure various independent variables, we joined the intersection dataset with data from the DWR Water Management Planning Tool, California's Safe Drinking Water Information System (SDWIS) and demographic data from the 2010-2014 ACS 5-year estimates.[7] Information from each of the 109 GSA's formation notification submitted to DWR was hand coded from the SGMA portal between January 2nd and February 28th, 2018 including the dependent variable (described below) and GSA type. The incorporation status of each DAC was added using the list of California cities compiled by the League of California Cities. To add information related to drinking water provision in each community, a second *Esri ArcMap* intersection between DAC places and public water system boundaries from both the California Environmental Health Tracking Program's Drinking Water Systems Geographic Reporting Tool (Water Boundary Tool) as well as approximated public water system boundaries from the Office of Environmental Health Hazzard Assessment (OEHHA) was also appended. Finally, whether or not a GSA had received state funded facilitation support services for GSA formation was added using the list maintained on the DWR website. Appendix A provides a description and source for each dataset employed.

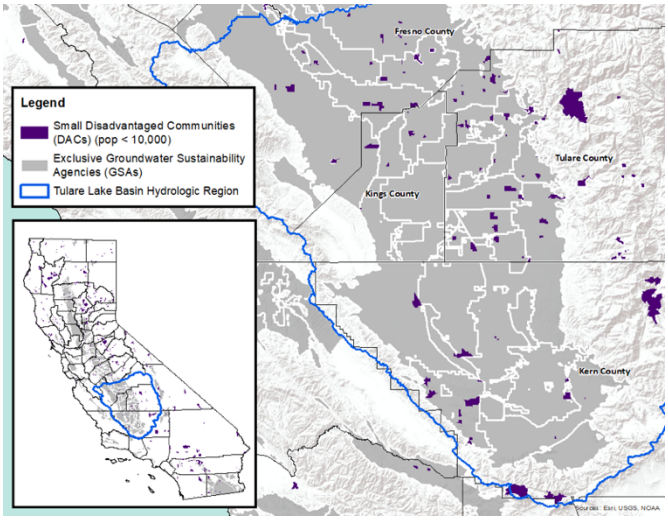

Figure 1. A map of small DACs and exclusive GSAs in the Tulare Lake Basin, California's hydrologic region with the largest number of small DACs.

[7] While not the most recent 5-year estimates available, 2010-2014 estimates are used for all demographic data in this study to align with their use in the DWR DAC mapping tool which is the tool provided by the state for the purposes of including DACs in regional water management and the most readily available information identifying DACs during the GSA formation process.

Dependent variable: Formal Representation

Based on the existing documentation, the dependent variable in this paper is limited to formal representation, defined as a community specific representative having a specific and direct role in agency governance. Unsurprisingly, the vast majority (236 or 84%) of small DACs are not formally represented in their respective GSAs. Among the 45 cases where a small DAC was formally represented, representation occurred in one of four ways. In 9 cases, DAC cities or eligible entities primarily serving an unincorporated DAC, elected to serve as a GSA by themselves, making them the exclusive groundwater manager for their boundaries. In 17 cases, DACs occupied one or more voting board seats of a collaborative GSA, typically allocated to their drinking water district or when incorporated, the city itself. In another 17 cases, DACs were involved with a shared governing board seat.[8] In the final two cases, a DAC was not a member of their GSA's board of directors, but they were formal signatories and members to the Joint Powers Agreement creating the GSA. While we had originally intended to develop a multinomial logit distinguishing between these different types of formal representation, due to this very limited distribution, the dependent variable is constructed as a binary variable with zeros representing a lack of formal representation for a small DAC in an overlapping GSA and ones representing communities with any type of formal representation in an overlapping GSA. Non-community specific actors such as county Board of Supervisors or large regional water districts serving small DACs directly or indirectly are excluded from consideration here as formal representatives. Future research could consider, and compare to this and other studies, the degree and impact of these forms of representation.

[8] In four of those cases the seat was shared among a delineated group of two to five DACs who would elect and rotate representation among themselves. These DACs were coded as one for the dependent variable, indicating that they are participating in governance although admittedly their participation is different than in the majority of other cases where communities have their own vote. In contrast, in two other GSAs, DACs were involved in the nominating process for a more open-ended Public Water System and or DAC/Public Water System board seat. While these two seats were not explicitly limited to representing those on the nominating committee we coded those DACs on the nominating committee as participating as well using the logic that they had a formal role in the governance process albeit slightly more removed coded those DACs on the nominating committee as participating as well using the logic that they had a formal role in the governance process albeit slightly more removed.

Independent Variables

Table 1 summarizes the independent variables considered in the analysis, the majority of which were drawn directly from the dataset described above. Two additional independent variables required further analysis: Number of DACs and GSA eligibility. Number of DACs indicates a count of how many other small DACs are located within the same GSA. This number was summarized in R and appended as a new column in the dataset.

The variable GSA eligibility was a bit more complicated to develop. As previously mentioned, SGMA delegated the right/responsibility to become or create a GSA to public water and land-use agencies. Thus, we expect small DACs with such institutions to be more heavily involved and represented. We include GSA eligibility as a model term, rather than a prerequisite for inclusion in our data set for two important reasons: First, while only one instance of this was observed for our small DAC dataset, as previously mentioned non-GSA eligible entities can and do regularly participate in collaborative GSAs as associate members, decision-makers and/or affiliated parties. Second, by controlling for GSA eligibility as a model term rather than excluding non-GSA eligible small DACs from the dataset allows for a quantitative consideration of the effect of this policy decision, enabling a more full discussion of the political/institutional barriers to formal small DAC representation.[9]

To develop a binary term for whether (1) or not (0) a given DAC had a GSA eligible representative then, we first needed to identify which water districts and land-use agencies represent each DAC and second, for water districts, determine if they are public.[10] Incorporated cities are land-use agencies, such that all incorporated DACs were automatically coded as GSA eligible. For the remaining unincorporated DACs, we presume the only GSA eligible representative would be the local public water system. This is because, besides cities and drinking-water providers, other common water and land-use agencies such as counties, stormwater districts, irrigation districts etc. tend to operate at a county or regional level and therefore are not uniquely representative of any individual tiny unincorporated community. Thus, for those unincorporated

[9] We also ran an alternative model for only GSA eligible small DAC intersections, see appendix C.
[10] Because all land use agencies are public agencies, this second step applies only to water districts.

communities that have a public water system, we used SDWIS to determine if the provider was GSA eligible (publicly owned) or non-GSA eligible (privately owned). In implementing this coding procedure, we excluded from consideration those drinking water providers where the DAC constituted less than half of their service area/service connections as such a provider is also not uniquely representative of that DAC. Any unincorporated DAC with one or more public drinking water provider meeting this service provision criteria was assigned as GSA eligible. A DAC either with a) no identified public water system (presumably served by domestic groundwater wells), b) a privately-owned public water system, or c) a public water system that did not meet the service provision threshold (DAC represents less than 50% of the population served by that system) was assigned not GSA eligible.

We added two additional controls, also summarized in Table 1, to capture the extent to which DACs have an interest or stake in the groundwater basin managed by a specific GSA. First, using SDWIS, we included whether or not each DAC is reliant on groundwater for their drinking water supply. DACs not intersecting any public water systems were assumed to be reliant on domestic groundwater wells for their drinking water supply. Second, we included the percent of the DAC area covered by the respective GSA as an approximation of the potential impact of groundwater management under that agency to the community.

Table 1. Model terms

Term (unit of analysis)	**Hypothesis**	**Type**	**Descriptive Statistics**
GSA Type (GSA)	H1, H2	4 category factor	52% “Single”, 11% “MOU/MOA”, 31% “JPA”, 5% “AD”
Facilitation Support Services (GSA)	H3	Dummy variable Y/N	43% have facilitation services
Population (DAC)	H4	Numeric	$\mu = 2314$, $\sigma = 2455$
Median Household Income (DAC)	H4	Numeric	$\mu = \$33{,}310$, $\sigma = \$8{,}650$
Incorporation (DAC)	H5	Dummy variable Y/N	15% Incorporated
GSA eligible (DAC)	H5	Dummy variable Y/N	44% GSA eligible
Percent population Latino (DAC)	H6	Numeric	$\mu = 57\%$, $\sigma = 32\%$

Number of DACs (GSA)	H7	Count	$\mu = 5$ DACs, $\sigma = 4$
Groundwater Reliance (DAC)	Control	Dummy variable Y/N	91% groundwater reliant
Percent intersection with GSA (DAC)	Control	Numeric	$\mu = 81\%$, $\sigma = 29\%$

Model choice

A binomial logit model was employed to test the relative impact of collaborative institutions, resources and recognition on DAC representation in GSAs. The model coefficients represent the log odds of representation (probability of representation)/(probability of non-representation). The exponentiated coefficients then, are odds ratios, or the change in odds of representation, per unit change in the relevant predictor variable, holding the values of other variables constant. For example, the model coefficient for incorporation is 1.42 which means the odds ratio of representation for an incorporated DAC is exp(1.42)= 4.14, indicating that the odds of representation for a DAC city are more than 4 times (or 314%) larger than the odds of representation for an unincorporated DAC (Figure 2).[11] Due to a few instances of missing community MHI data, only 273 of the 281 small DAC-GSA intersections are included in the model.

Results

Model Results

Figure 2 shows the coefficient plot the logit model that is fully reported in Appendix B. The model is a significant improvement over the null model, with a McFadden pseudo R^2 of 0.57. The model is also highly predictive with a Receiver Operating Characteristic (ROC) curve area of 0.95 and a Proportional Reduction of Error (PRE) of 40%. In this section we first present the results related to each model term, then we turn to predicted probabilities to further tease out the nuanced effects of the independent variables.

[11] All work was done in RStudio version 1.0.153 with the following packages: tidyverse, dplyr, car, pscl, pROC, ggplot2, cowplot, stargazer, MASS, rms, DAMisc.

Regarding collaborative institutions, all three collaborative GSA type categories show a positive effect on representation compared to the reference category of single entity, non-collaborative GSAs. Exponentiating the coefficients as described above, MOU/MOA GSAs are associated with a more than 600% increase in DAC representation and JPAs are associated with a more than 300% increase relative to a single entity GSAs. By comparison, the odds that a DACs is represented in an AD GSA is more than 350 times greater than in a single entity GSA. H3, regarding facilitation, is not supported with the 90% confident interval centered on zero.

Regarding resources, both population and MHI have a fairly large positive effect on DAC representation. Per 1,000 person increase in population, a DAC's odds of representation increase by 25%. Per $5,000 increase in a community's MHI, the odds of representation increase by 40%.

The results for recognition are more mixed. Whether a community has a GSA eligible drinking-water provider and whether that DAC is incorporated both also have positive impacts on representation in a GSA. A DAC with a GSA eligible entity is more than 100 times more likely to be represented than one without and an incorporated DAC is more than four times more likely to participate than an unincorporated counterpart, confirming H5. The number of DACs within a given GSA, rather than having a positive effect as hypothesized, decreased chances of representation by 14%. The percent of the population that is Latino also has a negative impact, but it is not significant.

Of the two controls included in the model, only one demonstrated the expected degree of impact. While the percent a DAC was intersected by a GSA significantly increased representation, whether a community was reliant on groundwater for their drinking water supply shows a much smaller and statistically insignificant affect.

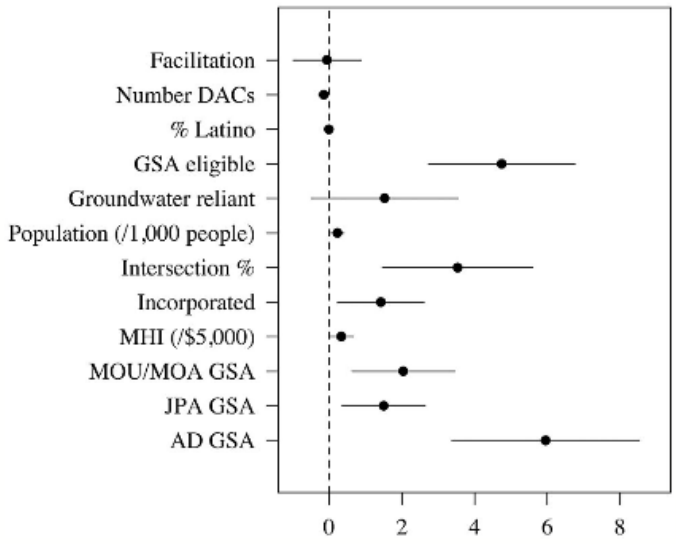

Figure 2. Coefficient plot with 90% Confidence Intervals

Predicted Probabilities of Representation

Overall, the model predicts a representation rate of 0.2% for California's small DACs in non-collaborative settings compared to between 5% and 24% for DACs in collaborative GSAs depending on the type. However, as we see above, specific characteristics at the community and GSA level play an important role in shaping these predictions. To help interpret the results of our analysis, therefore, we calculate predicted probabilities of representation for hypothetical DACs illustrating different combinations of the predictor variables.[12]

Figure 3 illustrates the predicted probability of representation for small DACs in all four GSA types by population and MHI for non-GSA eligible unincorporated communities, GSA eligible unincorporated and incorporated cities respectively. Both MHI and population have a consistent positive effect on representation in each case. As both MHI and population increase, regardless of GSA eligibility or incorporation status, so does the predicted probability of representation. Notably while the population graphs span the entire range of the state's classification of "small" (10,000 people), the majority of California's small DACs are extremely small (median = 1214); thus this is a major reason why the representation of DACs is low overall. Still,

[12] All other variables were set to their means (if numeric) or modes (factors) except percent intersection which was set to its mode (100%) rather than its mean (81%).

moving from the 1st quartile (424) to the 3rd quartile (3,769) in population represents an increase in predicted probability of representation of 9%. For MHI, moving from Q1 ($27,297) to Q3 ($40,000) results in a very similar magnitude increase (10.1%).

Yet comparing the graphs from left to right moving from a non-GSA eligible to a city scenario, it is clear that resource-related gains (or loses) in representation are not made equally across all small DACs. Instead, recognition in the form of a community's institutional and political infrastructure is a clear driver of representation. The predicted probability of representation for a non-GSA eligible DAC shows a consistent steep increase along the resource gradients for Special Act Districts (blue line), but excluding AD GSAs, for MOU/MOA, JPA and Single GSAs the predicted probability of representation never exceeds 6%. In contrast, for cities, the predicted probability of representation ranges between 29 – 100% depending on resources and GSA Type. In all cases, Special Act Districts are associated with the highest chance of representation, followed by MOU/MOA and JPA GSAs with single entity GSA having the lowest level of formal representation.

Combining the resource and institutional effects we can calculate best case and worst-case scenarios for small DAC representation in GSAs by GSA type.[13] For single non-collaborative GSAs, a Q3 (population and MHI) city has a predicted probability of representation of 57.9%, compared to 0.06% for a Q1 (population and MHI) non-GSA eligible DAC. For MOU/MOA, JPA and AD GSAs, a Q3 (population and MHI) city has a predicted probability of representation of 91.3%, 86%, or 99.8% respectively compared to 0.4%, 0.3%, or 18.3% for a Q1 (population and MHI) non-GSA eligible DAC. Thus, based on these three variables, the percent change in probability of representation is largest between for single GSAs (96,400%) but the actual increase in probability of representation is much larger for collaborative GSAs (average increase of 86%) than non-collaborative GSAs (58%). Table 3 presents these scenarios in tabular form.

[13] Again, holding all other predictors at their mean/mode with percent intersection set to 100%.

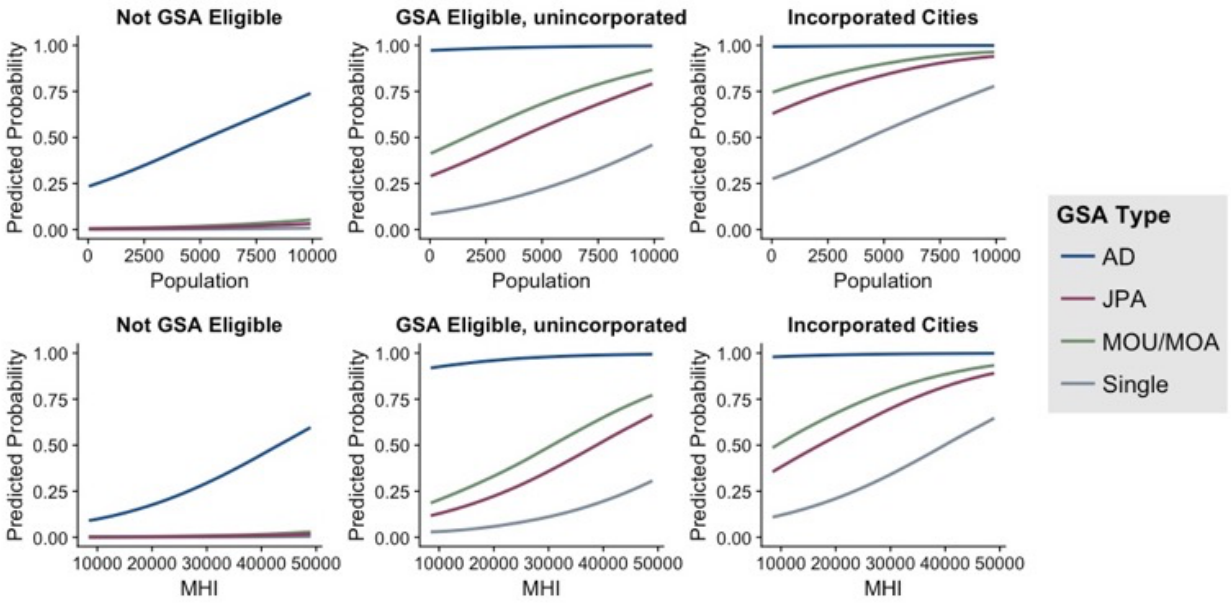

Figure 3. Predicted probabilities of DAC representation in GSAs by MHI, Population, GSA Type, incorporation and GSA eligibility.

Table 3. Best- and worst-case scenarios for predicted probabilities of formal representation of small DACs in GSAs by institution type.

GSA Type	Worst case (Q1 for MHI and population and not GSA eligible)	Best case (Q3 for MHI and population and city)
Single entity GSAs	0.06%	57.9%
MOU/MOA	0.4%	91.3%
JPA	0.3%	86%
Act Districts	18.3%	99.8%

Discussion

Clearly formal representation of DACs in GSAs is far from typical: Only 16% of DACs are formally represented, and only 28% of GSAs with DACs inside their boundaries have a formal institutional arrangement for representing them. But to what extent can we say this constitutes underrepresentation of DACs? Three considerations are relevant to this question. First, we know that from the set of all GSA eligible entities (including DACs and non-DACs), 46% are formally represented in GSAs, compared with 35% when looking only at DACs that are GSA eligible (Méndez Barrientos, Bostic, and Lubell 2019).

Second, while only 1 unique collaborative GSA (0.02%) has a non-GSA eligible DAC that is formally represented, overall 36% of the state's collaborative GSAs have non-GSA eligible entities formally represented (Milman et al. 2018). Finally, of the nearly 1,500 board seats across all GSAs (citation redacted), DACs currently occupy about 3% whereas dedicating one seat for small DACs in each of the 109 GSAs would constitute only 7.5% (109/1448) of existing seats. These numbers all suggest that DACs are underrepresented among both eligible and non-eligible actors, and increasing representation would not mean that DACs would constitute anywhere near a majority of board seats. Thus, understanding the equity challenges in implementing collaborative governance requires analyses such as this article, which identifies the factors driving small DAC representation.

Our findings highlight several key characteristics that impact representation and some surprising ways that they combine to shape this reality of GSA governance. Table 2 summarizes our hypotheses and whether they were supported by the results. First, institutions clearly matter—collaborative governance is associated with an increased probability of formal representation for small DACs. There are, however, two important considerations to note when interpreting this result. One is the endogenous nature of institutional development and change. We cannot make a strong causal claim that collaborative institutions change the level of representation because the creation of the institutions is a path dependent process that depends in part on the existing constellation of actors and their associated resources and policy preferences. For example, the same structural and resource advantages that promote DAC representation in GSAs may also correspond to an increased capacity to advocate for the creation of more inclusive, collaborative institutions in the first place. Second, the predicted probability scenarios above demonstrate a concerning potential of collaborative governance to increase disparities in representation along these same lines. Net gains in predicted probability of representation are largest for higher income and larger DACs as well as those with GSA eligible entities or that are cities. Hence, the benefits of collaborative governance themselves are not equally distributed, which could reinforce relative disadvantages among communities. Nevertheless, our results suggest that collaborative institutions are a positive pathway, albeit a potentially discriminating one, to more formal representation of DACs in SGMA going forward. It is crucial, therefore, to explore exactly why some GSAs

selected collaborative institutions, including the involvement of DACs and other environmental justice actors in previous water policy processes. This includes analysis of the costs and benefits of making collaboration mandatory, or incentivizing it, rather than optional in state or national management initiatives like SGMA.

Regarding degrees of formalization among collaborative GSA types, while the relationship between formalization and representation was not consistent, with MOUs outperforming JPAs, the only significant difference in representativeness between the three collaborative institution types is for the most formalized type, AD GSAs. This could indicate that a certain high threshold of formalization promotes representation. Alternatively, the findings could highlight the important role of political accountability and public scrutiny given that special-act districts are formed through the legislative process where broader political considerations and potentially different political priorities are considered. California's Human Right to Water is a state directive, resulting in significantly more attention at the state level where environmental justice advocates generally also enjoy greater influence compared to the local level. More research should explore the relationship between institution types, the formation process, and representation in collaborative governance as these results indicate that at least sometimes, it may really matter. The formation process could also present a potential intervention point for designing and implementing decentralized policies with greater attention to social equity for example by adding more guidance or requirements around the formation of collaborative groups. Of course, an alternative and potentially more effective route to representativeness could be mandating specific types or thresholds of representation as was done in the creation of Resource Advisory Councils under the Bureau of Land Management (Olinger 1998).

In SGMA, resource disparities account for as much as a two-and-a-half-fold difference in the representation of small low-income communities in water management, highlighting the magnitude of this longstanding environmental justice concern. Given that the majority of small DACs are extremely small, population size is a clear limiting factor shaping our findings that just 16% of small DACs are represented in GSAs. Yet the potential for improving representation by supporting under-resourced actors with outside resources for participation is evident. California's small DACs would likely benefit a great deal from additional resources for SGMA implementation such as stipends for meeting participation, ongoing support

from technical assistance providers or funding to hire their own experts. This type of support has been called from by water justice advocates in California specifically (Recommendations 2015) and more broadly in the literature (e.g. Hunold and Young 1998).

Political recognition through incorporation and GSA eligibility is also important. More than half of the unique small DACs considered (140 out of 241) do not have a public water or land use agency putting them at a distinct disadvantage for participation in SGMA. Thus the design of SGMA clearly limited small DAC representation from the outset. But even among GSA eligible DACs, incorporation, which applies to even a more limited group of DACs (15%), has a further significant and large positive effect on formal representation. Thus, we confirm that political representation by community institutions provides a source of recognition that enables representation. This raises concerns about the potentially constraining role of California's governance landscape in impeding community representation in regional and state water management. It also raises a potential opportunity to increase representation by carefully attending to the organization of stakeholders prior to or during the formation of a collaborative entity (Purdy and Jones 2012).

Surprisingly, rather than the number of DACs increasing their representation in groundwater management, the opposite effect was observed. For each additional DAC in a region, formal representation in governance decreases by nearly 25%. One explanation for this is that rather than increasing the visibility of DACs, or maybe in addition to doing so, increased numbers of communities increases competition among them for a potentially finite number of decision-maker positions. Of the 31 GSAs with DACs as decision-makers, twenty-four had just one DAC decision-maker and of the seven that had more than one, in just two of them was each of the DACs entitled to their own independent vote. This suggests that coordination among DACs at the regional scale could increase DAC representation in SGMA and other water policy processes and emphasizes the importance of formal and informal coalitions in securing representation in heterogeneous and polycentric settings (Tormos-Aponte and García-López 2018).

Two additional explanatory variables were not significant in the estimated model. The effect of facilitation is negligible and statistically insignificant. Endogeneity is a potential explanation here. It could be

that facilitation is more likely to be called upon in those basins with more challenging or complicated stakeholder and institutional landscapes. It is also somewhat surprising that the percent of a DAC that is Latino shows no evidence of significantly impacting formal DAC representation in GSAs. Whether this insignificant finding reflects a genuine lack of relationship or indicates that percent Latino is an inadequate measure of racial inequities in the process would require further investigation. Of note, because DACs are already significantly more Latino than the rest of the state, that race may play a significant role in shaping representation among a broader subset of communities or stakeholders cannot be ruled out by these findings. Indeed, how resources, recognition, institutional factors all influence representation among a more diverse set of stakeholders in collaborative natural resource management is an area for further research that could prove fruitful for differentiating between the unique needs of environmental justice and low-income communities and those that may be shared with other actors.

Interestingly, groundwater reliance, included here as a control, had relatively little to do with small DAC representation. This may be because reliance on groundwater for drinking-water supply is an overly narrow conception of interest when it comes to groundwater management and therefore an individual communities' interest in SGMA. Given the interconnectedness of hydrologic resources and the social, economic and environmental importance of groundwater in the state, a broader look at actor interest in groundwater management, for example a measurement of regional groundwater reliance or economic impact, may be more appropriate in the future. Anecdotally, this understanding is supported by the fact that irrigation districts are among the most active players in SGMA statewide, despite the fact that many do not use groundwater directly. It also could be the case that given the important relationship between incentives and constraints for motivating participation in collaborative governance (Ansell and Gash 2008), for highly under-resourced stakeholders like DACs, interest may simply be less relevant. Such an interpretation would have major implications for SGMA and other similar collaborative governance programs which often rely on outreach as a primary tool to increase participation among such groups.

Table 2. Summary of findings regarding study hypotheses

Number	Hypothesis	Finding
1	Small DACs will be more likely to be represented in collaborative GSAs.	Supported - All three forms of collaborative GSAs were significantly more representative of small DACs than single-entity GSAs
2	Small DACs are more likely to be represented in more formalized collaborative GSAs.	Inconclusive – While the most formalized form of GSA, Act Districts, were associated with significantly increased small DAC representation, MOU and JPA GSAs were not significantly different in their effect despite representing different levels of institutionalization
3	Small DACs are more likely to be represented in GSAs with third-party facilitation.	Not supported – Facilitation demonstrated a negative effect on formal DAC representation but was not significant
4	Small DACs with higher levels of resources are more likely to be represented in GSAs.	Supported – Both community MHI and population were significantly associated with increased formal representation
5	Small DACs with representation by formalized public institutions, including cities, are more likely to be represented in GSAs.	Supported – Both incorporation and representation by a GSA eligible entity were significantly associated with increased formal representation
6	Small DACs with larger Latino populations will be less likely to be represented in GSAs	Inconclusive – The percent of a small DAC's population that is Latino demonstrated the hypothesized negative effect on representation but was not significant
7	Higher concentrations of small DACs will result in more representation in GSAs.	Not supported – Increasing the number of small DACs in a GSA had a significantly negative impact on formal representation for each small DAC

Conclusion

We conclude by returning to the three main questions framing our analysis. First, to what extent does collaborative governance adhere to broad normative principles of democracy such as representativeness? That overall collaborative governance pathways enhanced the representativeness of SGMA is encouraging,

however, from a theoretical perspective, more work is needed to understand the causal processes driving the selection of collaborative institutions (for example the extent that the political organization and involvement of DACs was a driver of institutional design). Perhaps more importantly, representation is shaped by outside factors such as resources and recognition that do not disappear when a collaborative approach is pursued. These findings caution against relying on collaborative governance alone to achieve representation, particularly in governance settings where resource and recognitional constraints could lead to significant harm to marginalized actors. The extent to which these problems abound in the field requires further research, but the lesson is clear: when it comes to policy implementation, motivating principles do not automatically translate into tangible outcomes. While it is important that collaborative governance aspires to be inclusive, achieving that aim requires constant oversight, assessment and planning. While this study pertains only to formal representation, future work should consider the extent and drivers of various others forms of representation for low-income communities in SGMA and elsewhere. Such studies could then facilitate comparative analyses of the pros and cons of the different approaches.

Second, to what extent is collaborative governance furthering environmental justice? Key to answering this question will be future work linking formal and other forms of small DAC representation to the distributive outcomes of SGMA. Clearly, the fact that many DACs lack representation in GSAs suggests that many communities are likely to remain marginalized as SGMA is implemented. Developing collaborative institutions may help but is clearly insufficient in the face of persistent structural inequities. This is especially true if further analysis reveals that installing collaborative governance in the first place requires DACs to organize and overcome these very same political barriers. But even where small DACs are formally represented, this study is unable to proclaim the achievement of procedural justice let alone the likelihood of distributive justice in future management outcomes. Environmental justice means more than small DACs simply having a seat at the table. It remains an open question whether or not formal DAC representation, and in what ways, will translate into greater accountability and more equitable outcomes. It is entirely possible that even formal representation is insufficient for achieving equity in groundwater or other types of water governance.

Finally, how could collaborative governance contribute to the advancement of procedural justice in decision-making? By providing increased representation, collaborative governance has an important place in the democratization of natural resource management but does not replace the need to address longstanding barriers to accessing decision-making processes themselves. Our findings support Pahl-Wostl et al.'s (2007) assertion that the process and structure of collaborative governance are too narrow of a focus to produce fundamental change in water governance. This should not excuse the discipline from attending to such considerations, rather it should be a call to account for and proactively address the role of inequitable resources and recognition as part of the collaborative governance agenda. Failing to do so may not only perpetuate inequality in representation in resource management but actually increase it. We therefore echo the concerns raised by Foster (2002, 463) that "[w]ithout greater attention to [the social, structural, and institutional conditions necessary to realize its own promises] – particularly the existence of social capital within communities seeking to form collaborative structures – devolved collaboration threatens to simply reinforce some of the regulatory dysfunctionality it seeks to displace".

How much representation, and in what forms, is necessary to achieve environmental justice in collaborative governance? Alternatively, what additional pathways or conditions can support that goal? While the answer to these questions are highly context dependent (Foster 2002), our analysis does highlight the potential of additional empirical and theoretical analyses to further these conversations. How do specific mechanisms and types of representation compare when it comes to promoting distributive justice and community perceptions of procedural fairness? What mechanisms exist to effectively address resource and recognitional disparities? What is the role of scale?

In our view, much like with SGMA itself, the potential of collaborative governance to invigorate democracy in environmental governance and achieve social justice ends has distracted us from the hard work necessary to accomplish these goals, at least to their fullest potential. In this paper we combine collaborative governance and environmental justice theory to provide a quantitative environmental justice assessment of representation in California's groundwater reform process. In doing so we hope to provide a model, and incentive, for similar studies in diverse natural resource contexts that can support the growth of empirical,

policy-informing, research on social equity in public administration and environmental management (Pitts 2011). Collaborative governance scholars have a lot to learn from environmental justice scholars and practitioners who underscore the importance of procedural justice and recognition in decision-making and have decades of experience exploring the complicated interplay of the political, social and economic marginalization of low-income communities of color (Hunold and Young 1998; Schlosberg 2004). In turn, environmental justice scholars and practitioners have both a lot to offer and a lot to gain in furthering the pursuit of equity in these increasingly ubiquitous venues. Knowing that collaborative forums have the potentially to significantly increase representation, as well as potentially increase disparities in representation, should be a motivation for all to start that work. After all, both are "part of a larger project, already well underway in numerous disciplines, to both theorize and construct a democratic public sphere … Linked to this broader agenda, the quest for environmental equity can contribute to rather than challenge the ideal of democratic practice" (Lake 1996, 171–72).

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Supplemental Information

Appendix A: Data sources and descriptions

Data	Source	Description	Data Accessed	Link (if available)
SGMA portal	Department of Water Resources (DWR)	Digital archive of all GSA notifications	January – February 2018	https://sgma.water.ca.gov/portal/gsa/all
Facilitation Support Services webpage	Department of Water Resources (DWR)	Map identifying all groundwater basins and subbasins that received "Phase 1" (GSA formation) facilitation support services	June 2018	https://water.ca.gov/Programs/Groundwater-Management/Assistance-and-Engagement
DAC mapping tool	Department of Water Resources (DWR)	Map of Disadvantaged Communities in California by census place, tract and block.	December 2017	https://gis.water.ca.gov/app/dacs/
Alpha listing of California cities	League of California Cities	2011 list of California Cities	March 2018	https://www.cacities.org/Resources/Learn-About-Cities/Alphabetical-List-of-Cities.aspx
Drinking Water Systems Geographic Reporting Tool (Water Boundary Tool, WBT)	California Environmental Health Tracking Program	Map of Public Water System boundaries in California	June 2018	http://cehtp.org/water/
Approximated public water system boundaries	Office of Environmental Health Hazzard Assessment (OEHHA)	Approximated boundaries for Public Water Systems not included in WBT used in CalEnviroScreen 3.0	June 2018	https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30
2010-2014 estimates	American Community Survey (ACS)	Ongoing survey by the U.S. Census Bureau to collect information such as income and ancestry	April 2018	https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk

Safe Drinking Water Information System	State Water Resources Control Board	US EPA database Safe Drinking Water Information System (SDWIS) as well as the Drinking Water Quality results hosted on the EDT Library dataset	June 2018	https://sdwis.waterboards.ca.gov/PDWW/

Appendix B: Full model results

Model coefficients and standard errors

	Dependent variable:
	Representation
GSA type - AD	5.95*** (1.57)
GSA Type - JPA	1.50** (0.70)
GSA Type - MOU/MOA	2.04** (0.86)
MHI (per 5,000)	0.33* (0.20)
Incorporated	1.42** (0.72)
Percent intersected by GSA	3.53*** (1.26)
Population (per 1,000 people)	0.23** (0.11)
Groundwater reliant	1.53 (1.23)
GSA eligible	4.75*** (1.23)
Percent Latino	-0.01 (0.01)
Number of DACs	-0.15* (0.09)
Facilitation	-0.06 (0.57)
Constant	-13.17*** (2.64)
Observations	273
Log Likelihood	-53.07
Akaike Inf. Crit.	132.13
Note:	*p**p***p<0.01

Appendix C: Subsetted model results for comparison

For comparisons sake, we ran a second binomial logit model on a subsetted dataset (n=124) for only those small DACs with GSA eligible entities. This model includes all of the same predictors except the GSA eligibility term. As one would expect, the substantive results are unchanged. Both the size and magnitude of the various independent variables and controls changed relatively little except for the Act District GSA type coefficient which explodes due to the fact that without non-GSA eligible DACs, formal representation rates among the small DACs in these few GSAs is 100%, thereby eliminating all variance. Lastly, the effect of facilitation support services reverses sign, indicating a small positive effect on small DAC representation, but it remains insignificant. The results for this alternative subsetted model are fully reported below.

Model coefficients and standard errors

	Dependent variable:
	Representation
GSA type - AD	20.01 (1,214.08)
GSA Type - JPA	1.23* (0.70)
GSA Type - MOU/MOA	2.02** (0.86)
MHI (per 5,000)	0.29 (0.21)
Incorporated	1.45** (0.72)
Percent intersected by GSA	3.38*** (1.23)
Population (per 1,000 people)	0.22* (0.11)
Groundwater reliant	1.76 (1.26)
Percent Latino	-0.01 (0.01)
Number of DACs	-0.12 (0.09)
Facilitation	0.14 (0.57)
Constant	-8.50*** (2.47)

Observations	124
Log Likelihood	-47.76
Akaike Inf. Crit.	119.53

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

CHAPTER 2 - "GOOD LUCK FIXING THE PROBLEM": SMALL LOW-INCOME COMMUNITY PARTICIPATION IN COLLABORATIVE GOVERNANCE AND IMPLICATIONS FOR DRINKING WATER SOURCE PROTECTION1

Introduction

The inconsistent and underperformance of small drinking water systems is a long-standing national and international challenge that continues to render rural communities, and in particular low-income communities of color and indigenous communities, disproportionately vulnerable to unsafe and unaffordable drinking water (Allaire, Wu, and Lall 2018; Balazs and Ray 2014; Bradford et al. 2016; McFarlane and Harris 2018). This challenge has historically been primarily tackled as a technical one, obscuring the inherently political nature of water provision and access. As a result, compliance violations among these systems is often treated as inevitable, a curse of "geography and scale that can be mitigated but not resolved" (McFarlane and Harris 2018, 385).

Thanks to a growing body of literature on drinking water governance, however, the way we think about the causes of, and solutions to, drinking water disparities has begun to change. One important example of this is the solution of source water protection, which broadly refers to targeted efforts to protect drinking water supplies by focusing on protecting sources, be they surface water or groundwater (Ivey et al. 2006; Patrick, Kreutzwiser, and De Loë 2008). Source water protection is not a single activity but rather a diverse array of complimentary strategies such as vulnerability mapping, land use planning and regulation, and public outreach among others (Minnes 2018; Patrick 2009; 2011). As a planning-based approach to improving drinking water outcomes, source water protection emphasizes "source-to-tap" for the prevention of contamination and maintenance of adequate, sustainable supplies (McFarlane and Harris 2018, 37).

While still understudied and underutilized, precisely because it is particularly well suited for addressing chronic challenges with drinking water provision, source water protection is often promoted

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for its potential to advance safe drinking water access (McFarlane and Harris 2018; Patrick 2011). Compared to the high costs of treatment and remediation, source water protection is exceedingly cost effective (Ivey et al. 2006; Patrick, Kreutzwiser, and De Loë 2008). This characteristic is particularly important for small systems without the benefit of economies of scale and also often corresponds with reduced managerial and technical costs for small systems which are typically the least capable of dealing with them (De Loë and Kreutzwiser 2005; Gunnarsdottir, Gardarsson, and Bartram 2015; Patrick 2011). Source water protection also has the added benefit of addressing private domestic groundwater wells, which tend to have even fewer solutions available to them (Kreutzwiser et al. 2011).

Despite all of this potential, however, existing research on source water protection highlights several limitations concerning scope, capacity and watershed authority. Many source water protection programs are voluntary and/or limit consideration to only the area immediate adjacent to the well-head or intake (McFarlane and Harris 2018). Many also target municipal service providers largely excluding rural areas (Minnes 2018). Because source water protection is often the responsibility of individual water systems, limited technical, managerial and financial capacity, overlapping and fragmented institutional responsibilities along with an absence of watershed authority also all pose significant bottlenecks to successful implementation (De Loë and Kreutzwiser 2005; Ivey et al. 2006; Minnes 2018; Minnes and Vodden 2017; Patrick, Kreutzwiser, and De Loë 2008). To address these limitations scholars have called for a transition towards more regional approaches (Ivey et al. 2006; Minnes and Vodden 2017). Research at this scale has thus far been very limited, however the widespread adoption of collaborative water governance provides ample opportunities, and incentive, to study planning and management approaches for addressing drinking water disparities at the watershed level.

A direct response the high-cost and adversarialism of top-down regulation, collaborative governance leverages local knowledge and capacity to foster multi-partner, cross-jurisdictional governance characterized by principled engagement, shared motivation, and capacity for joint action (Ansell and Gash 2008; Emerson, Nabatchi, and Balogh 2012; Foster 2002). Intended to carry out a public purpose not otherwise attainable, the collaborative governance revolution has been particularly

prevalent in water given the mis-alignment of political and ecological boundaries and multiplicity of stakeholders (Foster 2002). So much so, in fact, that "collaborative strategies of governance are often seen as modern necessities for sustainably managing water resources" (Harrington 2017, 254).

This begs the question: Can collaborative governance processes be leveraged for rural drinking water source protection? On one hand, collaborative governance seems uniquely designed for this. The approach explicitly seeks to engage diverse stakeholders and cross jurisdictional boundaries to develop multi-benefit solutions tailored to local problems (Bodin 2017). In doing so, collaborative governance is said to reduce conflict, enhance capacity, increase public acceptability/compliance, build trust and empower local stakeholders (Ansell and Gash 2008; Emerson, Nabatchi, and Balogh 2012; Foster 2002). Key to fostering many of these benefits is the promotion of broad representation in the decision-making process (García and Bodin 2019; Johnston et al. 2010; Morrison et al. 2019).

On the other hand, collaborative governance has a clear potential to perpetuate the status quo and even exacerbate disparate outcomes (García-López and Arizpe 2010; Harrington 2017; Morrison et al. 2017; Swyngedouw 2005). Although collaborative governance's strengths lie in its expansion of the decision-making table, the table is still very much a contested one (Brisbois, Morris, and de Loë 2019; Cook 2015; Lukasiewicz and Baldwin 2017). Exclusion, lack of access and elite capture continue to be vexing concerns (Brisbois, Morris, and de Loë 2019; Lukasiewicz and Baldwin 2017; Purdy 2012). In water basin councils in Peru and Brazil, for example, Garcia and Bodin (2019) show how the expert discourses in these spaces can operate as a vehicle of exclusion for rural communities and in California's famed CALFED program, Shilling et al (2009) detail the "marginalization by collaboration" of environmental justice actors.

What work that has been done on watershed source water protection raises similar challenges. Patrick et al. (2008) find that local water purveyors in British Columbia were frustrated by their relative lack of power in land use decision-making compared to provincial actors and recreational interests. Given these uneven power relations and overlapping institutional authorities, the authors posit that a single agency for coordinating source water protection would be preferable. Ivey et al. (2006), agree, however,

they caution that such an approach needs to consider how institutional arrangements may help maintain and reproduce power disparities.

In California, collaborative groundwater reform passed in 2014 known as the Sustainable Groundwater Management Act, or SGMA, provides an excellent testcase for developing our understanding of these alternatives. Focusing on the San Joaquin Valley, the heart of California's drinking water crisis, this paper interrogates the nexus of rural drinking water access and collaborative groundwater governance to ask and answer the following research questions: How and why (or why not) are small, rural low-income communities participating in SGMA implementation? What are the challenges for integrating rural drinking water priorities into collaborative groundwater planning? And what are the potential implications for promoting sustainable drinking water access under these ubiquitous management regimes? The results indicate that in keeping with the importance of stakeholder participation for shaping outcomes (Bodin 2017; Brisbois, Morris, and de Loë 2019), the inability of rural drinking water stakeholders to meaningfully participate in collaborative governance has important consequences for leveraging SGMA for source water protection. Interviews with rural drinking water stakeholders show how power and resource disparities limit the equity potential of scaling up source water protection in this way, even when comprehensive watershed authority is granted. They also hint at potential contradictions between devolved management and enhanced drinking water access that need to be addressed.

Case Context: Rural Drinking Water Disparities and the Sustainable Groundwater Management Act in California

In 2017 alone, nearly 600,000 Californians were impacted by primary health violations issued to public water systems under the Safe Drinking Water Act (State Water Resources Control Board 2018). Up to another two million rely on unregulated private wells whose water quality is unknown but are at high risk for contamination (Harter et al. 2012; State Water Resources Control Board 2015). These impacts fall most heavily on low-income rural communities of color, especially those in the San Joaquin

Valley, the state's largest agricultural producing region, making California's drinking water crisis a pressing environmental justice issue (Francis and Firestone 2010; Pannu 2012).

These disparities are directly tied to longstanding groundwater management challenges in the state. Because of their heavy reliance on shallow groundwater and one or a few supply wells ("Disadvantaged Community Water Study for the Tulare Lake Basin" 2014), small low-income communities are disproportionately affected by California's water management woes such as groundwater pollution (Balazs et al. 2011; 2012). For example, 68% of the 505 small water systems in the state with recent primary drinking water violations rely on groundwater as their primary or only supply source (California State Water Resources Control Board n.d.). During the state's recent historic drought yet another problem reared its head: ensuring adequate supply. Thousands of Californians ran out of water completely and millions of dollars of emergency funding was dispensed to support nearly 150 small water systems left scrambling as groundwater levels receded to record lows (Feinstein et al. 2017; LaFond 2015).

Such widespread and headline grabbing impacts disrupted the political inertia on groundwater management in the state. Much like previous droughts which had forced progress towards comprehensive management by initiating monitoring and voluntary management plans, 2014 brought about an unprecedented coalition, compromise and, ultimately, victory, introducing statewide groundwater regulation to the last state in the nation without it (Leahy 2015). The resulting three-bill package known as the Sustainable Groundwater Management Act or SGMA initiated a period of monumental reform for groundwater users around the state. Under SGMA, 127 high- and medium-priority groundwater basins were required to form Groundwater Sustainability Agencies (GSAs) by June 30th, 2017. Because SGMA allowed for more than one GSA to be formed per groundwater basin, so long as the entire territory of the basin was covered, rather than forming 127 new groundwater agencies, more than 260 proliferated.[2]

[2] For more about the GSA formation process under SGMA see Milman et al. (2018).

Now, these GSAs have until January 2020 or 2022, depending on their basin condition, to develop Groundwater Sustainability Plans (GSPs). Upon submitting their plans, GSAs will have twenty years to implement them and achieve sustainability (as defined below), updating their plans every five years as their knowledge of their basin and water conditions change. The Department of Water Resources will monitor their progress through the submittal annual reports. At any time if a GSA fails to comply with its legal responsibilities under the act, the State Water Resources Control Board may step in and assume temporary management until such time as locals are able to re-assume local control.

In keeping with the emphasis on local control, under SGMA sustainability is defined locally. GSAs are charged with avoiding "significant and unreasonable" impacts within six categories of "undesirable results": chronic lowering of groundwater levels, reduction of groundwater storage, seawater intrusion, degraded water quality, land subsidence, and depletions of interconnected surface water. What constitutes significant and unreasonable impacts for each of these six is up to the GSA but must take into account the interests all of the beneficial uses and users of groundwater in the region. The statute lists eleven categories of users that must be involved including specifically low-income communities (called Disadvantaged Communities or DACs) as well as public water systems and domestic well owners more generally.[3]

Thus, in defining "sustainable management criteria" GSPs could represent an opportunity for proactive source water protection but leveraging it will depend on local implementation. The participation of the eleven identified user groups will be critical for shaping the outcomes (Ansell and Gash 2008; Johnston et al. 2010). The prospects of this for small, low-income communities in particular, however, are uncertain. Other watershed management programs in California have struggled to involve this oftentimes marginalized stakeholder group (Balazs and Lubell 2014; "Recommendations" 2015). Further, recent

[3] The other eight beneficial uses and users listed in the legislation are agricultural users, municipal well operators, local land use planning agencies, environmental users, surface water users (where there is a hydrologic connection), the federal government, California Native American Tribes, and entities monitoring and reporting groundwater elevations in the boundaries.

research shows that very few are represented as decision-makers in GSAs and only half were recognized as interested parties as required by statute (Dobbin and Lubell 2019).

Methods

Interviews

The author conducted 27 semi-structured interviews with 35 individuals in California's San Joaquin Valley between October 2018 and May 2019. Per the Institutional Review Board reviewed protocol for the project, interviewees could participate with or without recording. All interviews except three were recorded and then transcribed. For the three non-recorded interviews, detailed hand-written notes were transcribed for data analysis instead. On average, interviews lasted 43 minutes. Interviews took place at locations chosen by the interviewees including in private homes, water district/municipal offices, community meeting spaces and local coffee shops/restaurants.

The interview guide consisted of 11 questions that covered past and present involvement with SGMA, the role of community and drinking water stakeholders, expectations and future impacts as well as recommendations for improvement (see Appendix A). Depending on the type, duration and level of involvement of the interviewee(s) in SGMA, some questions were less applicable and were skipped. The interview guide for non-profit and community group interviews (see below) mirrored those for the community representatives but the language was generalized to facilitate discussion across a broader geographic area. The questions were developed by the author after exploratory fieldwork and a primary literature review. Input on the questions was also sought from key informants working on SGMA implementation and with rural residents in the region to make them as relevant and informative as possible.

Participant selection and recruitment

Recruitment started with a list of all U.S. Census Bureau Places in California (including both incorporated cities and unincorporated Census Designated Places) with populations less than 10,000 that

fall within high- and medium- priority groundwater basins.[4] This list was then filtered to include only Disadvantaged Communities, defined by the state as communities with an annual Median Household Income (MHI) less than 80 percent of the statewide MHI, in the two hydrologic regions (Tulare Lake and San Joaquin) that make up the San Joaquin Valley. A place of stark social and environmental inequality (London 2016), the San Joaquin Valley accounts for 50% (120 of 241) of all small low-income communities subject to SGMA. Further, the vast majority of this area is considered to be critically over-drafted, placing local GSAs on the expedited timeline for plan submittal by January 2020.

A purposive sample of 17 of these communities was selected for initial outreach based on key variables including GSA type, MHI, population, incorporation and GSA eligibility (Dobbin and Lubell 2019). For each of these cases, participation was requested from a representative of the local water system, either a staff member or an elected official on the board or city council in charge of that system. Where someone of that description was participating in SGMA, that specific person was asked to participate in the interview. Where nobody was actively involved, anyone in that demographic was accepted. For communities with domestic wells instead of a centralized public water system or where the water system was operated by an outside provider (typically the County Board of Supervisors), outreach was more challenging, leading to their under representation in the sample (13% of interviews versus 17.5% of the full list). In these cases, the author relied on GSA records and personal contacts to find someone who was either participating in SGMA or involved in other local water management efforts/issues. It was not possible to recruit participants from all 17 selected communities. Thus after attempting all 17, the initial list was used as a basis for subsequent snowball sampling, pursuing interviews in similar communities (by geography and other key variables) from the list of 120 with constant attention to the representativeness and diversity of the sample (Seawright and Gerring 2008).

[4] As opposed to census tracts or blocks, census places are the most appropriate geographic boundary to use here because they correspond to socially and geographically identifiable residential locations, typically associated with a specific place name. They are also more aligned with public water system boundaries, where applicable, which is the primary form of representation for rural communities in the SGMA process.

Ultimately 23 interviews were conducted with residents of unique communities. An additional four interviews were conducted with non-profit or community-based organizations working with residents on SGMA implementation in one or more GSA. Table 1 summarizes the various roles of the interviewees. While Spanish language interviews were offered, ultimately all 27 interviews were conducted primarily in English.

The focus on small low-income communities necessary constrains the generalizability of the results. This paper does not make any claims about general trends or barriers to participation in the collaborative governance process, comparisons between this and other stakeholder groups, nor speculate on the implications of collaborative governance for source water protection generally. Rather the contribution of this focus is its ability to offer a deep understanding of the experiences of small low-income communities in SGMA and the ability to probe the equity prospects of source water protection at the regional scale by intersecting two distinct bodies of literature: small and rural drinking water governance and collaborative water governance.

Analysis

All of the transcripts and transcribed notes from the non-recorded interviews were analyzed using the qualitative research analysis software platform Dedoose. Throughout fieldwork, post-interview memos were prepared in the constant comparative method style to identify and integrate key properties and themes (Glaser 1965). These memos were used to refine and update the interview protocol and became the basis for developing a codebook and coding protocol. A draft code book was piloted on a small sub-set of transcripts and then refined and finalized. The final code book, which included codes related to both content/topic (structural coding) and themes (thematic coding), was used to code all 27 transcripts.

The resulting 1,066 coded excerpts are the basis of analysis here. Throughout the results section, findings are primarily summarized at the interviewee level (n=35). In a few specific cases, the community level (n=23) is used to describe the formal relationships of individual communities with overlying GSAs, which primarily took the form of governing board or advisory committee seats allocated to the

community at-large and was often a rotated responsibility among various residents. Included quotes have been edited for clarity and anonymity.

Results and Discussion

Community participation in SGMA implementation

> *"We care about water. I care about water. I care about drinking water. I care about surface water. I care about groundwater. We want to be at the table… I know we are little but we don't want to be left behind. We want to know what's going on." (Interview 18)*

Half (12 of 23) of the communities represented in the interview pool had one or more representatives who were very involved in SGMA implementation, serving on the governing board of their GSA, GSA committees and/or attending meetings regularly. Another seven communities had representatives attending meetings more sporadically, including two communities who had been allocated positions on GSA advisory committees but where representatives were unable to attend consistently. The remaining five either had no representative attending SGMA proceedings or representatives had attended only one or a few related events, usually large public hearings or information sessions. The formal relationship between each community and their overlying GSA is described in Table 2. Interestingly, multiple of the communities with no formal relationship to their GSA had representatives actively attending meetings while some with more formal relationships attended less. In keeping with past findings on institutional barriers to representation (Dobbin and Lubell 2019), in no case did a privately-owned community water system or domestic well community have formal representation in a GSA. Yet all types of local drinking water providers, including cities, lacked formal representation in at least one case.

Regardless of meeting attendance or formal representation, however, interviewees were overwhelmingly interested in the SGMA process and its potential outcomes. A major reason for this is their critical reliance on groundwater for their drinking water supply, creating a direct link between groundwater management and the future of their community. As one put it: "We can't assume that water is going to be available to us. Just experiencing the drought we've had. If nothing comes down that means

people are using the groundwater. There are few of us and more of the [cows], who do you think is going to get the water?" (Interview 6). Two interviewees were less directly concerned about their own water supplies, one based on a perception that they were not hydrologically vulnerable due to their location and the other because they had access to surface water, offering some redundancy in supply. Both of these interviewees, however, noted the importance of SGMA for other rural communities in their region and one of the two was actively attending GSA meetings out of concern for the potential financial impacts of the regulatory process. Notably, as the earlier quote demonstrates, those who lived or worked in communities that were either currently dealing with or had dealt with quality or supply challenges, especially during the recent drought, expressed the most interest in, and concern for, SGMA.

Another key driver of interest and participation was concern for community autonomy and self-determination. GSAs are making, and will continue to make, decisions that will affect rural communities and interviewees wanted to be sure that those decisions adequately accounted for community needs. "My priority is to be part of it" (Interview 16) and "it's important to have someone there to make sure we are counted into the final decisions" (Interview 9) both represent common assertions in this regard.

Particularly concerns about self-determination led a few interviewees to challenge the formation of a GSA in their area in which they were not represented. In some cases this involved working to join another, neighboring GSA. In others, leveraging their status as public water systems to obtain legal agreements with the GSA that offered some level of protection against pumping restrictions and fees. "We wanted to make sure that [we were] there in an agreement to where it could be challenged in court. To make sure we're counted, you know, because otherwise we were just going to have to assume that they were going to keep us in the loop and we didn't have any way of knowing that that would be the case." (Interview 6). Relatedly, several interviewees reported trying to or successfully linking up with other small communities to build power with numbers and/or pursuing GSAs that included larger cities, believing they would help promote or protect drinking water interests.

Challenges

> *"What is your biggest problem? Farming. Who got all the control? Farmers. So good luck fixing the problem." (Interview 8)*

Despite their keen interest to participate in the process, most interviewees were frustrated by the inability to do so to the degree, or in the ways, that they would like. These barriers to community participation can be summarized by two broad issues: Lack of access to, and influence in, the collaborative process.

Lack of access

For many communities with their own independent water system, financial consideration directly shaped the way they chose to get involved with SGMA. Several interviewees reported that forming their own GSA was not financially viable, leading them to either join up with a collaborative regional effort or cede authority to one or more other local agencies. Most, but not all, of the communities with formal governing representation financially contributed to the GSA to gain that authority leading local water leaders to make difficult choices between greater self-determination and the ability to finance other, more immediate, local water priorities. In one instance, the choice to take a non-voting role in their GSA rather than a voting one saved the local drinking-water district a much needed $8,000.

Their decision to take a non-voting role was also informed by a concern that they had neither staff nor a board member that would be able to consistently attend GSA meetings. While many board and council members were regularly participating, all were doing so as volunteers, many while also balancing full-time jobs and family obligations. As a result, community drinking water systems with paid staff participate more actively than those without. But staff participation is also highly constrained. Many staff reported that day-to-day operations or managing large capital projects left little or no time to engage with longer-term regional planning efforts. For a few, attending meetings meant having to temporarily close their office. As a result, several interviewees reported that they or someone they knew had to resign or had been threatened to be removed from a GSA board or committee for lack of attendance.

Such challenges were magnified for those without a centralized water system such as private well communities and communities with water systems operated by an external agency such as the county

Board of Supervisors. In these cases, not only was there no dedicated staff or even volunteer electeds to participate, but the lack of institutional recognition was often related to later (or no) engagement by their GSA. These institutional arrangements also tended to prevent formal voting representation although some such communities did have dedicated stakeholder or advisory committee seats. Similar challenges were faced by privately owned community water systems. While legally barred from acting as a GSA independently, non-public entities technically do have various pathways to formally join GSAs. Yet none represented in the interviews had such an arrangement nor did their community have any other form of representation.

Language barriers, transportation, obtaining time off work, the timing of meetings (which are typically are held during the workday) and an inability to tap in-house expertise or hire consultants all were also raised as significant challenges. This was true in nearly every interview but particularly so for those who were not participating or were participating less than they would like to be. Having several monthly SGMA meetings, and in one extreme case, seven, compounds the problem. Multiple interviewees felt that not being able to attend all of the monthly board and committee meetings put them at a distinct disadvantage.

Even when they could get to the meetings several interviewees reported feeling less prepared than their counterparts: “Farmers have time to read up on issues, get into the technical language and so they dominant the conversation… everyday people from community have jobs, they don’t have time to do that.” (Interview 5). Relatedly, the highly technical nature of SGMA was often cited as a reason why community stakeholders struggled to get and stay involved. At best, the complexity of GSA meetings was a challenging learning opportunity for residents, at worst it was a frustrating and disempowering. Several either had stopped participating because they felt like they had nothing to offer or knew someone who had.

Many interviewees also had concerns about transparency. Reports of last minute canceling and rescheduling of meetings, non-Brown Act (California’s public meeting law) compliant meetings and the use of closed sessions were common. Many also reported that meetings felt less like forums for open-

discussion and collaboration and more like overly formal spaces for standardized GSA business like bill-paying. This caused several interviewees to speculate on where the actual water management decision-making might be happening instead. “It's just that this cloak of non-transparency. In all those SGMA meetings there was always a meeting after the meeting where [the big districts] sort things out” (Interview 27). These concerns also extended to the data and information being used to develop GSPs, which for many was unclear, unavailable or even suspect. Data and models, some pointed out, can be made to say anything.

Issues with transparency were often related to a more general lack of communication and information about the SGMA process. While many interviewees had eventually been reached out to about SGMA by other local water agencies, their county or local technical assistance providers, most were informed about SGMA only after GSAs had already been formed. One received their first notice about the process in 2018, three years after SGMA took effect. Several appealed for more communication from GSAs. When asked how SGMA could work better for small communities one interviewee responded “we get treated equally to the big companies. Granted we don’t have the money like them, but we should have the information they do and when they get it” (Interview 14).

Lack of influence

An inability to influence, directly or indirectly, GSA decisions constitutes the second overarching issue. Many of those participating without voting authority were quick to point out that they lacked a meaningful say in final decisions. This included those with dedicated advisory or stakeholder positions who often noted that they have “voice but not vote”. Indeed, this theme and phrase came up so frequently that it became its own code in analysis. Several interviewees involved with stakeholder or advisory committees discussed concerns that the governing board of their GSA did not care about, and perhaps would not even hear, their opinions.

Interestingly, those with formal representation were not necessarily more likely to feel influential in the process. Many were uncertain, or pessimistic, about how much of a difference one vote would make. As one interviewee put it: “majority rules”. In one such case, despite having a voting seat dedicated

to their community on the governing board of their GSA, an interviewee reported feeling invisible: “it’s kind of weird because like we’re a part of it but whoever’s attending, the board doesn’t really ask you know, so it’s kind of… we’re a part of it but were not a part of it per se” (Interview 17). Interviewees also worried they were unable to leverage their formal positions in the GSA effectively given their limited technical expertise. “Knowledge is problem because when we go to the meeting I don’t quite understand what’s going on. I don’t understand what the GSA is trying to do. So we are not taking full advantage of it” (Interview 16).

There was, however, a clear sense that others were taking advantage of the opportunity. Many had concerns about special interests driving GSA decisions:

> *I see certain boards and it’s like, okay, he’s interested because he’s a developer and he’s the big farmer and he’s the other big farmer so I see why these guys are in it because they have a concern, that’s going to be priority. Who’s representing the small people or the city or what not? (Interview 4)*

Relatedly, many also believed that their needs and priorities were not compatible with these dominating actors. This is well illustrated by an interviewee who remarked “what’s best for them probably is not going to be best for everybody” (Interview 17).

These asymmetries often translated into inhospitable meeting experiences, with serious implications for participation. Several reported feeling uncomfortable at meetings. Even more mentioned feeling intimidated. At least three explicitly mentioned self-censoring their comments while attending GSA meetings. One interviewee reported feeling talked down to, like “we aren’t smart enough to figure things out for ourselves” (Interview 27). Another remarked on the differential treatment of farmers, who were treated with respect, and low-income Latino residents, who were treated as if they were “whining and complaining” (Interview 10). Importantly, one interviewee remarked, “[these] social problems are not really caused by SGMA. SGMA didn't create this at all, you know, it just created a container for a lot of it to be funneled in a very tight timeline” (Interview 25).

Certainly not all interviewees reported feeling entirely uninfluential in their local SGMA process. Two interviewees, both of whom had voting seats representing their communities on their GSA board,

reported that they were able to fully participate in GSA decision making and that their contributions were listened to and respected. A few more felt that they regularly or occasionally were able to add useful information in SGMA discussions, typically drinking-water considerations that other representatives were unfamiliar with.

All interviewees, however, including these exceptions, remarked at least once (and often regularly and at great length) about the relative lack of power that community stakeholders exerted on the process. The sentiment that "the farmers are really the ones deciding all this" was nearly universal. Such feelings led some to question the utility of participating at all. When asked to explain why they don't go regularly to their local GSA meetings one interviewee responded "they're the ones with the most power. I mean, let's face it, they are the motor that's driving this thing. And you know, maybe in other places where they have bigger communities but out here… all these small communities, we really don't have a big impact on it" (Interview 4). For many, this was neither unexpected, nor an accident. Repeated interviewees asserted that SGMA was not created by, nor for, rural communities. Rather, they insisted, agricultural interests were behind the crafting of the local control design of SGMA in the first place.

> *I'm thinking why would the state require us to pull all this together? And I've asked that question and I was told because farmers went and said we want local control and so the state gave them local control first under SGMA… We weren't at the table for that, you know, the little guys weren't. We weren't at the table because we didn't even know about it. We didn't know about it until it was already adopted. (Interview 18)*

Implications for rural drinking water provision and source water protection

> *"I thought [SGMA] was intended to help residents and communities make sure they had water. Communities had dry wells for years. SGMA came along as a solution, if it's not, what is the point?" (Interview 24)*

Particularly for those who were more included in SGMA implementation, a handful of positive implications and benefits arose in the interviews. One highlighted how SGMA increased the visibility of their community in their region. For example, "it's put [our community] on the map. It's just brought [us] to the attention of these larger water agencies, 'hey, there really is a place out there and they make drinking water and they care about water'" (Interview 18). A few developed new relationships with other

regional stakeholders, learned things about groundwater management or were pursuing new projects because of SGMA.

Despite these positive examples, the widespread pattern of exclusion and marginalization detailed in the previous section had a clear, overarching negative effect regarding rural drinking water interests in SGMA, namely the failure to account for them at all. All interviewees including those with more positive SGMA experiences expressed that drinking water considerations, particularly water quality and domestic wells, were either absent from GSA deliberations or a minimal part of the conversation. Many felt that their GSA did not know, or understand, their groundwater interests and/or that their GSA felt no obligation to address drinking water considerations. Most had not been asked to provide water quality or pumping data to their GSA and many felt that public data sources related to drinking water from the State Water Resources Control board were being underutilized or ignored. Even in cases where an interviewee felt that their GSA was considerate of their needs, it clearly wasn't the priority: "We're not invisible. They mention us and [other small communities] in the area... I know they don't spend a lot of time on it. I'm sure they don't, you know, they don't lay asleep at night or lose sleep at night thinking about it, but I do believe they're trying to be considerate of [us]" (Interview 2).

Given this reality, the vast majority of interviewees did not view SGMA as an avenue for addressing current or future drinking water challenges. Most interviewees were either uncertain about how the process would ultimately affect them or believed that it would have no effect. Instead, they continued to emphasize the importance of capital improvement projects and other local measures.

Fears, concerns and potential threats were coded twice as often as hopes and potential benefits in association with SGMA. Twenty-five percent of the interviewees were worried about the current and future impacts of SGMA, believing they would be net negative. Interestingly, these interviewees as well as their more uncertain and even optimistic counterparts all expressed similar concerns about their ability to ensure a safe, and especially affordable, drinking water supply in the future under SGMA. The potential for new fees and taxes and their implications for small systems and low-income residents who were already paying unaffordable rates was a major concern. Several remarked on the high cost of the

fancy consultants and technology that their GSAs were employing and speculated how and when they would be footing the bill. Anticipating moratoriums on new pumping and even potentially mandatory reductions, another concern for many was their ability keep up with planned and inevitable growth in their communities. Some were worried they might not even be able to meet existing demand depending on the policies adopted in their GSP. The potential for possible groundwater markets to harm residential users was also raised repeatedly. Given their vulnerability, lack of representation and general neglect in the process, many felt that is was very real possibility that domestic wells would go dry despite the move to comprehensive management.

Local control was generally seen as a burden and something locals, including themselves, had no idea how to do. While many accepted the need for groundwater regulation, some welcomed it, and a few rejected it as state overreach, across all of these perspectives, given the reality of SGMA, interviewees advocated for a stronger role for the state. Interviewees were overwhelmingly frustrated with the lack of state leadership in the process and many wanted more requirements, guidance, support and especially resources.

Given that local control had the effect of disadvantaging community water interests in the implementation process, many also thought that the SGMA regulations could have or should have better addressed drinking water needs. For example, by prioritizing or adding special protections for drinking water or establishing clearer requirements and enforcement for representation and inclusion. State review of submitted GSPs was seen by several as a potential future opportunity to protect vulnerable drinking water stakeholders and advance drinking water benefits but most doubted anything would come of it, painting the state as either too under resourced or just disinclined, to intervene in that way. A few were skeptical any of SGMA's requirements would be enforced at all. Complete state intervention, however, was, like SGMA, seen as a threat to community self-determination. Many were also quick to note the role of the state in creating the challenges they faced, in SGMA and beyond.

Thus for several, SGMA was a wakeup call for the need to assert more self-determination in order to reverse the long-standing trends of neglect and disinvestment of which SGMA was only a new

chapter. As one interviewee remarked, need to think beyond “when a new law passes or when a plan needs to be updated” and work towards a long-term sustainable process by which small and rural drinking water providers can be involved, rather than saying “figure out how you participate and we'll just like create a process where you can come to meetings if you're available and maybe what you say will, will be included or not" (Interview 19). “We can’t keep relying on other people to take care of us” said one interviewee (Interview 10), “we have to do what we have to do to get in there to help ourselves. And until we do that we’re going to be stepped on”.

Conclusion

Overall interviewees representing small low-income communities in the San Joaquin Valley were extremely keen to participate in groundwater management. Many, however, have been unable to actually do so, at least meaningfully, for a number of important reasons. Community representatives faced numerous barriers to accessing the collaborative governance process including a lack of financial resources, technical expertise and staff and volunteer capacity. Thus many of the limiting factors to previous iterations of source water protection at the local level (De Loë and Kreutzwiser 2005; Ivey et al. 2006; Minnes 2018; Minnes and Vodden 2017; Patrick, Kreutzwiser, and De Loë 2008) also arise when scaling up source water protection into collaborative watershed planning.

Additionally, the findings demonstrate further challenges that arise when working towards source water protection regionally. Even when communities surmounted the barriers and managed to participate in SGMA, they typically lacked the influence and power necessary to meaningfully shape policy making, or even discourse, in these spaces. So much so, in fact, that several questioned the utility of participating at all. Despite being clearly positioned as beneficial users that must be involved in SGMA implementation, nearly across the board small water purveyors and domestic well owners reported limited consideration of rural drinking water needs in GSP development. In their eyes, SGMA seems largely unlikely to leverage groundwater planning for source water protection. These findings emphasize the fact that institutional arrangements, power dynamics and participation continue to shape source water

protection efforts even at these new scales (Ivey et al. 2006; Minnes 2018; Patrick, Kreutzwiser, and De Loë 2008). And that removing multi-agency overlap and siloing through the establishment of a single process with watershed authority, as has previously been recommended, is unlikely to fix the problem. Instead, the process risks simply re-embedding the very same historic patterns of resource use and degradation that programs such as SGMA were implemented to address.

More than just painting SGMA as a missed opportunity for rural drinking water source protection, however, the interviews highlight a disturbing counter proposition: SGMA as a yet another rural drinking water challenge. Rather than a potential benefit or help, SGMA was more often considered a threat to the provision of safe and affordable drinking water. Echoing findings from Ontario, Canada from Minnes and Vodden (2017), SGMA clearly further strained the limited technical, financial and staff capacity of small water systems, many of whom expressed direct tradeoffs between investing time and resources into local projects versus regional planning. While source water protection should in theory be cost effective for small systemsit clearly has costs, and if those investments don't result in tangible benefits, the net effect could be making rural water provision yet more expensive than it already is. Similarly, staff and volunteer capacity directed towards the SGMA process directly takes away from time spent pursing alternative solutions such as local capital improvement projects, potentially putting safe, sustainable drinking water access even more out of reach. Even where such compounding effects are avoided, the institutionalization of the status quo in GSAs and GSPs risks cementing the historic inequitable distribution of the costs and benefits of water planning and management in the region, lending "renewed legitimacy to racial and class distributional inequities" (Foster 2002, 463).

Thus the tendency of collaborative governance towards co-option by elites and the perpetuation of entrenched inequalities (Brisbois, Morris, and de Loë 2019; Cook 2015) is a significant hurdle for those looking to leverage source water protection to advance rural drinking water access. Addressing the underlying inequalities is likely the only way forward for leveraging source water protection for rural drinking water access, at least to any meaningful scale (Dobbin and Lubell 2019). There is a clear need

for source water protection to go back to not just the literal, but also the metaphorical source of rural drinking water disparities.

The interviews hint at some of the ways SGMA may be contributing to this end long-term by increasing attention and contestation of water governance and motivating participation and collaboration among more marginalized users, all of which would benefit from more investigation. Shorter-term, the interviews highlight several opportunities, some already missed but some still possible, to leverage the signature power of the state to support small and rural drinking water systems in SGMA including through increased resources/support, stricter regulations and thorough enforcement. In this way the findings support an important role for state intervention in polycentric governance (Bednar, Henstra, and McBean 2019), particularly for protecting equity and public good goals (Lukasiewicz and Baldwin 2017; Patrick 2009). From the perspective of rural community stakeholders participating in SGMA at least, such a positive application of power in the form state "steering" could be highly desirable (Morrison et al. 2019). Such changes, however, raise potential contradictions with the underlying logic of the collaborative governance approach itself which hinges on power decentralization and local control. Future research should consider how the results of source water protection in collaborative, multi-use settings might vary based on specific policy/program designs and the ways by which equity goals and devolved management can be balanced and the tradeoffs inherent in this act (Foster 2002; Shilling, London, and Liévanos 2009). The findings from this study support the idea that it may be far harder than many may want to admit (Foster 2002; Patrick 2009; Swyngedouw 2005).

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Supplemental Information

Appendix A: Small Low-Income Community Stakeholder Interview Questions

1. First, can you tell me how you are involved with water management in your community? (Probes: What is your role? How long have you been involved? Why are you involved?)
2. How did you first learn about SGMA? How/from who did you hear about it?
3. What did you think about it initially? Has that changed over the last few years? If so, how?
4. Can you tell me about the GSA formation process and how you participated? (Probes: Why or why not did you participate? Were you as involved as you would have liked to be? Why or why not? What kept you from participating? What motivated you to participate? Did other community representatives participate? Why do you think that is? Did you provide input? How? Why was this particular GSA structure chosen? What do you think about it?)
5. What is happening now with GSP development in this area? (Probes: How are you participating? Why or why not are you participating? What could help make participation more feasible? What is going well? What are the challenges? Can you tell me about the meetings? How do you feel when you are at them? Why do you think that is? How is the board? Are other community representatives attending meetings too? Why or why not do you think? What do you think will be reflected in the final GSP?)
6. How did you know or work with these other actors prior to SGMA? (Probes: What was your relationships like before? Have your relationships with them changed? How so?)
7. Long-term, is SGMA important for your community? If so, why? (Probes: How could your GSP address your community's needs? What would a good GSP look for your community? Do you think your community will benefit from SGMA and your GSP? Why or why not?)
8. Has your community participated in other regional water management programs like IRWM, TLB etc.? (Probes: Why or why not? What was the experience like? How does that compare to SGMA?)

9. Overall, do you think your communities' experience with SGMA is similar or different from other small rural communities in the state? How? Why?
10. What solutions or opportunities do you see for SGMA, your GSA or your GSP to better address small community needs?
11. Is there anything else I haven't asked you about yet that you think I should know?

CHAPTER 3 - ENVIRONMENTAL JUSTICE ORGANIZING AS COMMONING PRACTICE IN GROUNDWATER REFORM: LINKING MOVEMENT AND MANAGEMENT IN THE QUEST FOR MORE JUST AND SUSTAINABLE RURAL FUTURE[1]

Introduction

> *Groundwater Sustainability Plans must include a sustainability goal which is the vision for groundwater for the region. We want to hear from you all about what the sustainability goal should entail. What is the vision we want for the future?*

This question is posed by an employee of Self-Help Enterprises, a non-profit technical assistance organization standing in front of a room of more than twenty residents in the unincorporated community of Planada, Merced County, California. It doesn't take long before a chorus of responses starts up: All private well owners are aware and involved; Clean drinking water; Sustainability; Conservation; Sharing. Two months later in October 2019 a similar conversation is being had in the City of Lindsay, Tulare County 110 miles south. "*En un mundo ideal, ¿cómo sería su agua?*" asks the founder of El Quinto Sol de America, a grassroots environmental justice organization. In an ideal world, what would your water be like? *De la llave; Limpia; Purificada; Todos tiene acceso por un base económico sin tener comprar un filtro o botellas; Que el agua esté al alcance de todos.* From the tap, clean, purified, everyone has access at an affordable base rate without having to buy filters or bottles, everyone has water.

Both groups have been gathered to discuss and respond to draft Groundwater Sustainability Plans recently released for public comment by newly formed Groundwater Sustainability Agencies in their areas. While these local agencies have been meeting for years to prepare their plans (which are thousands of pages long), many local residents are hearing about the law that mandated them, known as the Sustainable Groundwater Management Act or SGMA, for the first time. The workshops are a crash course in the legislation, the local self-appointed agencies that formed in response, and how they propose to define and implement "sustainability" all at once. Organizers are also simultaneously collecting community input on sustainability and groundwater priorities to share back to the agencies, most of which

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are barely, if at all, mentioned in the draft texts as written. The enclosure of the process, as much as access and use of the groundwater itself, is extensive, more than a century in the making, but it is not uncontested and certainly not guaranteed. These workshops and dozens of similar ones hosted throughout the San Joaquin Valley (SJV) by a coalition of community-based organizations clearly demonstrate the unwavering commitment of the region's environmental justice movement to the pursuit of a more just and sustainable future.

Such community groundwater workshops are just one of many diverse tactics being employed by environmental justice organizers to challenge the exclusion of low-income and farmworker communities, contest narrow technical framings that exclude considerations of community and environmental wellbeing and defy ongoing enclosure in the state's massive groundwater reform process. In this paper I detail the region's environmental justice movement's engagement in the development of Groundwater Sustainability Plans (GSPs) and demonstrate how this organizing can be understood as commoning, or "processes/relations enacted to challenge capitalist hegemony and build more just/sustainable societies" and the contributions of doing so (García López et al., 2017: 1). [2]

I argue that through three principal strategies of challenging participation, scope and authority, the region's environmental justice movement has played a formative role in SGMA's implementation as insistent commoners in a landscape of intensive enclosure. While the immediate, material impacts of their challenges have been limited, there is indication of the broader impacts reshaping not just groundwater management but the region as a whole, slowly but surely advancing more common socio-natural relations through the "performance of counter hegemony" (García López et al., 2017). In this way we see how in taking a commoning perspective that foregrounds contingent and contested relations in lieu of institutions and attends to confrontations between resource users as power-ladden struggles over access (scholtens, 2016), the critical role of social movements in common pool resource management is highlighted.

[2] In this paper I conceptualize the region's environmental justice movement to include both formal social movement organizations and other community development and community-based organizations as well as the residents and community water managers that organize and participate with these groups.

Further, the resource management process itself is shown to be a key venue for renegotiating and fostering new relations. The commoning practices employed in trying to do so, then, offer empirical lessons for the pursuit of "transitions that are truly transformative" (Nikolaeva et al., 2019: 348).

Social movements, commons and commoning

Generations of scholars have made enormous advances in understanding common pool resources and their sustainable management, or lack thereof. However the dominant institutionalist approach focused on understanding the rules, norms and strategies employed in management (Ostrom, 2009; Crawford and Ostrom, 1995) has led to a relatively static perspective on these issues (Villamayor-Tomas and García-López, 2018). Generally this literature has focused on the conditions under which sustainable resource management is possible with significantly less attention paid to how such conditions can or do change (Scholtens, 2016; Varvarousis, 2020) including a heavy focus on diagnosing collaborative dynamics and comparative institutional design to the neglect of feedbacks, interdependencies and the continual evolution of these management regimes at all levels (Emerson et al., 2012; Berardo and Lubell, 2019). Relatedly, the institutionalist approach has been critiqued for a lack of attention to the historical, political and embedded nature of resource governance (Johnson, 2004; Clement, 2010; Scholtens, 2016; Morrison et al., 2019).

Perhaps it is not surprising, therefore, that efforts to understand the ways by which social movements organize to promote or defend commons, let alone the implications of these efforts, have been sparse with a few notable exceptions (Scholtens, 2016; Villamayor-Tomas and García-López, 2018; Villamayor-Tomás and García-López, 2021). This gap is curious for several reasons. In addition to their common interest in collective action (Villamayor-Tomas and García-López, personal communication, 2021), social movements around the globe have long been using the language of the commons in their struggles. Prominent examples related to water access include Cochabamba, Bolivia and Stockton, California (Olivera and Lewis, 2004; Robinson, 2013). Moreover, the global commons have long been a site of social movements with a long history of resource users mobilizing to contest their exclusion in

natural resource management (Scholtens, 2016). Indeed, as De Angelis (2012) reminds us, the commons, in practice has always been a story of dynamic struggles over enclosure and access and that of movements to defend and reconstitute commons. As sites of capitalist accumulation and dispossession (García López et al., 2017), commons are prime sites for struggle globally (Kashwan, 2017).

This gap is also consequential. The focus on institutions misses the embedded and political nature of commons thereby limiting our understanding of variable outcomes (Johnson, 2004; Emerson et al., 2012; Scholtens, 2016; Morrison et al., 2019). For example, social movement actors can play a key role in diffusing innovation (Stern et al., 2002). Moreover, movement engagement can have both positive and negative effects on management regimes (Villamayor-Tomas et al., 2020). Villamayor-Tomas and García-López (2021) find that social movements contribute to commonisation through five principal pathways: defense of communal use and management rights, promotion of economic autonomy, promotion of community capital, improvement of community decision making, enhancement of litigation capabilities and promotion of community organization. As some of these pathways indicate, social movements can produce effects that transcend management itself with long-term implications such as reinvigorating identity ties and inaugurating nested user organizations among others (Villamayor-Tomas and García-López, 2018).

Second, the omission of social movement actors obscures the important role common pool resource management can play as a terrain for the re-articulation of existing socio-natural relations (Veuthey and Gerber, 2012; García López et al., 2017; Singh, 2017). Institutions are as much about norms, behavior and values as they are about rules, law and governance (Morrison, 2006). They do not exist soley in the environment, independent from individuals, but rather in combination, producing both old and new subjectivities. Keen attention to why some groups benefit over others and, particularly, how this changes through time underscores the processual and fluid nature of the commons (Bresnihan and Byrne, 2015; Scholtens, 2016).

A central argument of this paper is that by framing social movement engagement in common pool resource management as commoning, these dimensions are productively clarified. Broadly defined as “a

process of making and remaking of the commons" (Clement et al., 2019, p. 2), commoning is an action ("doing in common") that promotes commonisation, an alternative to commodification and capitalization guided by emancipation, social justice and ecological sustainability (Centemeri, 2018). Emerging from the convergence of a diverse array of literatures from geography to feminist theory to political ecology among others, a commoning perspective expands and diversifies our understanding of common pool resources (and even more broadly, common goods), foregrounding the social relations that facilitate the production and perpetuation of commons (Turner, 2017). The active and collective nature brings the processual, spatial and relational dimensions of commons management to the forefront (Nikolaeva et al., 2019). In doing so, commoning focuses on practices for fostering new relations and the ongoing renegotiation and ambivalence of these relations over time (Nightingale, 2019), including strategies for advancing more just, inclusive and sustainable spaces (Nikolaeva et al., 2019).

Scholtens (2016: 931) explains the scholarly study of commoning, as compared to commons, as constituting a switch in focus from collective action as "fostering institutions" to collection action as "contesting power structures". In doing so, a commoning perspective is more explicitly inclusive of social movement actors even though they often lack formal roles in management. Commoning also helps focus us on the key role common pool resource management as venues of socio-natural renegotiation and critically, the practices of fostering new relations (Nightingale, 2019) occurring in these spaces. Whereas institutional common pool resource theory has concerned itself with common pool resource management almost exclusively, in taking a commoning approach in this paper I am explicitly concerned with the commons as "a vehicle for broader societal transformations" (Villamayor-Tomas and García-López, personal communication, 2021) and what we can learn from movements already doing this work.

The generative nature of this switch is well demonstrated in the case of California groundwater reform. While there is much written about California environmental justice movements (e.g. Pulido, 1996; Harrison, 2011; Perkins, 2012; Perkins, 2021), and groundwater management (e.g. Blomquist, 1992; Leahy, 2015; Owen et al., 2019) individually, in keeping with the aforementioned trends, much less scholarly attention has been paid to the relationship between the two. Given the long-term intensive

enclosure of the resource in the SJV and the resulting displacement and movement response of rural drinking water users as will be detailed shortly, the case provides a fertile context for demonstrating and learning from these intersections that compliments existing (and growing) institutional analyses.

Methods, positioning and paper organization

This paper benefits from the engaged scholarship model (Balazs and Morello-Frosch, 2013; Derickson and Routledge, 2015; Morello-Frosch et al., 2005; Fine, 2008) through which the research was conducted. In elaborating my argument, I draw on diverse primary documents ranging from comment letters and technical reports to op-eds and media articles as well as transcripts from 27 previously conducted semi-structured interviews (see Dobbin, 2020). I also draw directly on my participation in meetings and workshops over the course of three years (2017-2019) and ongoing communication and participation with several of the organizations discussed. These relationships stem, in part, from my employment by one of these organizations, Community Water Center, working on SGMA implementation from 2015 to 2017, an experience which further informs my analysis. Thus, my positioning in writing this paper is undeniably one from "within" although not "of" the organizers and organizations discussed, as they are my own as both an advocate and scholar in this space. This positioning is intentional with the goal of providing a unique viewpoint into the unfolding of the groundwater reform process in the San Joaquin Valley capable of rendering not just a deep understanding of environmental justice organizing in the case, but also the complex dialectics between organizing and groundwater management at play and their implications for each.

The paper is organized as follows: The next section situates the narrative by detailing pervasive enclosure and inequity in groundwater access in the San Joaquin Valley and SGMA as the case context. This is followed by a detailed exploration of the three commoning strategies employed by the environmental justice movement to advance their commons agenda through the implementation of the policy reform. Subsequently the discussion explores the contributions of the commoning framing to this case followed by a brief conclusion.

Background and Case Context

Inequity and enclosure in water access in the San Joaquin Valley and environmental justice resistance

Sometimes called "the other California" (Haslam, 1993) or the "Appalachia of the west" (The Economist, 2010), the San Joaquin Valley (SJV) is a place of contradictions and extremes. The SJV is the world's most productive agricultural region and produces 75% of California's crude oil. Not unrelatedly, it is home to some of the worst air quality in the nation (Huang and London, 2012), an overconcentration of prisons (Gilmore, 2007) and 25% of the nation's pesticide applications (Harrison, 2014). Taken together, this means that the region produces tens of billions of dollars through its extractive industries while remaining one of the poorest regions in the United States where one in four children have asthma and are food insecure.

These conditions aptly characterize the SJV as a slow violence landscape (Sze, 2020, personal communication).[1] This violence is borne out on residents in a handful of cities (37, many small) and over 500 unincorporated communities spread across a region larger than the state of West Virginia (Flegal et al., 2013). Unincorporated communities are populated settlements outside of municipal boundaries. Shaped by de jure and de facto segregation (Eissinger, 2008; Eissinger, 2017), unincorporated communities, have, in effect, been "mapped out" of local democracy via their explicit exclusion from local governance (Anderson 2012). This shocking level of informality has subsequently been maintained through a century of county underinvestment and neglect evidenced by the lack of rudimentary services and interspersed toxic land-uses (Anderson, 2009; Flegal et al., 2013). Such "creative extraction" as Seamster and Purifoy (2020) refer to it, has led to white overdevelopment of not just a few select cities, but also industry, principally agriculture, via Black/Brown underdevelopment.

[1] Nixon (2011: 2) defines slow violence as "violence that occurs gradually and out of sight, a violence of delayed destruction that is dispersed across time and space, an attritional violence that is typically not viewed as violence at all".

This uneven development and representation has directly shaped both water infrastructure and water access in the region thereby leading to another central mechanism of slow violence in the SJV: drinking water injustice (Pannu, 2012; London et al., 2018). Shut out of rights to the subsidized imported surface water afforded to farming and a few large cities, the rural residents of the SJV's unincorporated communities and small cities are almost entirely reliant on groundwater as their drinking water supply. They access this water through shallow and often single groundwater wells, leaving them at the mercy of changing conditions. While always somewhat tenuous (Eissinger, 2008; Eissinger, 2017), the ever-growing footprint and intensification and industrialization of agriculture in the region (Arax, 2019) has increasingly squeezed out community drinking water access through both excessive pumping (appropriation) and unbridled contamination of remaining groundwater reserves.

The socio-natural consequences of these trends are stark, constituting a marked enclosure of the regions shared groundwater resources. Accelerated pumping has led to widespread lowering of the SJV groundwater table causing the land surface to subside by as much as 28 feet since the 1920s as water pockets amidst the sediments are drained of water and collapse, permanently reducing the aquifers ability to store groundwater reserves (Galloway and Riley, 1999). As climate change exasperated drought compounded the human-made over pumping drought from 2012 to 2016, the previous gradual drying out of drinking water wells accelerated to unprecedented levels: more than ten thousand residents found themselves without running water, the majority of them low-income residents in unincorporated communities (Feinstein et al., 2017). Five years later some continue to rely on hauled water from county emergency services. Far more of these same communities are impacted each year by primary (health-based) violations of the Safe Drinking Water Act, some resulting from long-standing naturally occurring contaminants such as Arsenic but most from agricultural byproducts such as nitrates, 1,2,3-TCP and DBCP (Burow et al., 2008; Balazs et al., 2011; London et al., 2018). Nitrogen fertilizer applications alone increased by 554% (in the region from 1950 to 1980 to say nothing of confined-animal feedlots, another prominent source) corresponding to a marked increase in groundwater nitrates levels which continue to rise and are expected to do so for decades even if all input sources ceased immediately due to gradual

leaching from existing deposits (Dubrovsky et al., 1998; Harter et al., 2012). In the pest-vulnerable eastern SJV citrus belt, one study shows agricultural pesticides to be detectable in nearly 70% of domestic wells sampled (Dubrovsky et al., 1998). The culmination of these impacts means that for those wells that remain operable, the water they produce more than likely to represents a threat to human health.

To be clear, what proceeded this long-term enclosure let alone the recent intensification did not constitute a commons in that it lacked any management, let alone democratic or community norms and processes. Prior to the passage of the Sustainable Groundwater Management Act (SGMA) in 2014 as will be discussed next, California had no systematic required groundwater monitoring or management enabling open access and exploitation (Leahy, 2015). But due to ample groundwater reserves initially this regime did facilitate, and even encourage, community water access. As such these changes by which large agricultural groundwater users grew still larger through use accumulation was experienced as an enclosure by SJV communities as defined not just by the displacement of drinking water uses but also the "appropriation of wealth produced" (Jeffrey et al., 2012: 3).

Further, not dissimilarly to other enclosures around the globe, this displacement of drinking water users for private gain has spurred a movement response to resist enclosure and envision and enact a water commons in its place (Scholtens, 2016; Villamayor-Tomas and García-López, 2018). With roots in the United Farm Workers (Pulido, 1996; Perkins, 2021) and famous David-and-Goliath struggles in communities like Kettleman City (Cole and Foster, 2001; Richter, 2018), the SJV's environmental justice movement is expansive and multi-faceted. Yet given the region's conditions of water inequity and enclosure, water justice has always been central to the movements' work and vision.

How this work is conducted, however, has changed over time. Mirroring the broader movement's trends towards increasing institutionalization and professionalization (Perkins, 2015). Organizing has gradually expanded from being highly localized, focused on individual communities, towards increasingly regional and state-wide efforts (although not to the exclusion of local organizing), including the development of coalitions, both among communities, such as AGUA (*la Asociación de Gente Unida por el Agua* or the association of people united for water) and the organizations that work in them, such as

the Environmental Justice Coalition for Water. This transition has corresponded with increased involvement in Sacramento policy making (London et al., 2008; Perkins, 2015) leading to the passage of California's human right to water law, AB 685, in 2012. Organizers have also spent years working on the state's Integrated Regional Watershed Management (IRWM) program initiated in 2002 and played a key role in regional nitrates and salts management programs through political and legal advocacy at all levels. During the recent drought the movement's leaders were on the front lines at all levels -- arguing for, designing, and implementing emergency solutions including hauled water replacement and leveraging the crisis to develop mandatory programs for drought resilience planning in rural areas.

Groundwater reform under the Sustainable Groundwater Management Act (SGMA)

The passage and implementation of the Sustainable Groundwater Management Act (SGMA) in 2014 highlights the movements' role as a key actor in present day water policy making at the state and local levels. Several of the SJV's prominent environmental justice organizations played an important role in negotiating the three-bill package and were present for its signing by Governor Brown on September 14, 2014. Among the artifacts of this advocacy were several provisions for the consideration and involvement of low-income, small water system and domestic well stakeholders specifically. Critically, advocates also worked in parallel to the legislative process to secure public water bond funding for sustainable groundwater planning in low-income communities. Ultimately $16.2 million was awarded, split between technical assistance funding provided to environmental justice and community assistance organizations for SGMA (which several of the organizations subsequently applied for and received), and more traditional planning activities for capital improvement projects in these areas.

SGMA set into motion a complete reorganization of groundwater management in the state (Leahy, 2015). Whereas previously management efforts had been voluntary, resulting in spotty coverage and little to no capacity to address the root causes of groundwater overdraft, under SGMA groundwater management is now mandatory and comes with a whole host of new institutional powers for monitoring and regulation. These new powers were granted to Groundwater Sustainability Agencies (GSAs), which formed in an opt-in manner by local water and land-use agencies covering each high- and medium-

priority groundwater basin by June 2017. SGMA sets up a state framework for sustainable management that is to be implemented locally by these GSAs with significant flexibility. In writing their plans, GSAs must define a locally determined sustainability goal as well as define what constitutes "undesirable results" for six groundwater indicators. These definitions then must be used to set Minimum Thresholds and Measurable Objectives that bound a sustainable operating range that ensures the avoidance of "significant and unreasonable" impacts to beneficial uses and users of groundwater. Per the design of SGMA, state agencies will only intervene if locals decide not to assume the responsibility of groundwater management, or if they fail to comply with state guidelines. This "state backstop" alternative as it is referred to, however, is not permanent. Rather, even in the case of non-compliance, GSAs are expected to revise their plans and resume local management as soon as possible.

This collaborative, stakeholder driven, local control design of SGMA is a double-edged sword. While potentially opening the door for direct participation by SJV communities in resource governance (as opposed to a top-down state controlled program) (Harrington, 2015), it also cedes decision-making to local jurisdictions (cities and counties) along with special districts, all of which are highly unrepresentative of the hundreds of low-income rural unincorporated communities who have continually been excluded from the material benefits of local government since colonization (Pannu, 2012). In this way, enclosure it not just the reason for groundwater reform via SGMA but also the context in which it would be performed. Alternatives, however, were not on the table. Not only would any other approach be a significant break from more than a century of California water management precedent (Leahy, 2015), but anything less than local control was considered non-viable in the state legislature given the power of the agricultural lobby. Several years into a historic drought tens of thousands were living without running water, residents and advocates lacked a venue to challenge these impacts let alone build the water commons they desired. Regional groundwater planning very clearly provided new opportunities to alter regional drivers of local inequity (London, 2016). As such, they were ready to fight for the passage of SGMA, and its full and equitable implementation, despite challenges with the specific method.

Based on SGMA's design, any progress to advance a more secure water future for the hundreds of communities reliant on single and shallow water sources in the SJV within the program hinged on local implementation in fragmented, parallel efforts. Such regional governance and local control-oriented state policy directives were not new in California or the SJV. Reflecting a general move towards regional institutional integration for achieving rural sustainability (Morrison, 2006), environmental justice advocates were already accustomed to fighting for land use, air quality and greenhouse gas reduction mandates on multiple regional fronts, often through coordinated coalitions (London, 2016). Similar tactics were immediately pursued for SGMA although the fragmentation far surpassed what had been seen before: By June 2017, SGMA's first statutory deadline for the formation of Agencies, more than 260 had formed, over one hundred of which were found in the SJV.[2] Groundwater basins, the socio-ecological unit around which SGMA was written, were split into as many as six to 12 agencies, bifurcating or even trifurcating unincorporated communities and public water systems. Existing research shows that these agencies are highly unrepresentative of the SJV's environmental justice communities (Dobbin and Lubell, 2019) and have been heavily influenced by the region's large-scale agricultural interests, which have dominated not just the agencies (Dobbin, 2020; Méndez-Barrientos et al., 2020) but also the public narrative of the process (Bernacchi et al., 2020).

Upon their formation, these GSAs were tasked with developing Groundwater Sustainability Plans (GSPs), which for most SJV areas, were due January 2020 due to their critically overdrafted status. Thus, environmental justice organizations, in partnership with environmental allies from around the state, found themselves engaged in the parallel development of 37 unique GSPs across the SJV (some written by individual GSAs and some collaboratively written by several). Even with coordinating their involvement and leveraging the public technical assistance funding they had fought for, the sheer magnitude of agencies and plans resulted in far more work than any had staffing for. An individual GSA could have as many as seven meetings per month, stretching thin not just organizations working across agencies but

[2] For comparison, the region formed eight Council of Governments for transportation planning at the county level (London, 2016).

also residents trying to keep pace with just one process. Thus, not just the formal governance of the process has been one of continued exclusion but also the supposedly public participation mechanisms. Organizers and residents alike have critiqued the representativeness, inclusivity and transparency of the process noting significant barriers to accessing, let alone influencing, decision-making (Dobbin, 2020). In consequence, SGMA has in many ways, grown, rather than reversed, the enclosure of groundwater in the SJV. This enclosure, however, has not gone uncontested by the region's environmental justice movement who, despite these challenges, have continued to leverage SGMA as an opportunity to articulate and pursue their vision of groundwater commons in which groundwater is not just a common good, accessible and sustainable as a life source, but also actively commoned by commoners through shared, democratic management (Centemeri, 2018). In a region where water rules (Arax, 2019), there could be no clearer challenge to capitalist hegemony (García López et al., 2017: 1).

SGMA's Contested Fronts: Challenging participation, scope and authority as environmental justice commoning strategies

The commons are inherently contested (Harvey, 2011; Nightingale, 2019) and SJV groundwater is not an exception. Despite the ongoing, and sometimes seemingly increasing threat of enclosure through SGMA implementation, environmental justice organizing efforts in the process have continued through and past the submission of GSPs to the Department of Water Resources for review in January 2020. Their ongoing efforts can be summarized by three principal strategies identified inductively through my research: Challenging participation, scope and authority. Through each, organizers have worked to defy status quo powers that sought to constrain and limit, seeking instead to connect and amplify in pursuit of a more just and sustainable SJV. Together, I argue, these strategies constitute an environmental justice commoning practice dedicated to advancing a SJV water commons that does not yet exist. How these strategies were employed, and what we can learn from them with respect to the role of both movements and resource management in advancing just and sustainable transitions are the subject of this and the following sections respectively.

Participation

Reflecting the environmental justice movement's long-standing attention to process encapsulated by the motivating refrain "we speak for ourselves" (Cole and Foster, 2001), ensuring broad and inclusive participation has been a focal point of environmental justice advocacy around SGMA since the beginning. In direct defiance of local water managers efforts to play off SGMA as a niche undertaking, environmental justice organizers have promoted a clear and consistent message: SGMA is about all of us, therefore we all need to be involved. They have done so by underscoring the relevance of groundwater to every facet of life in the SJV. Meeting flyers proclaimed "your comments on this Plan are vital to helping address water quality and water supply challenges in your community" and presentations and workshops often started by linking community specific water challenges to regional groundwater management. In one SGMA training Self-Help Enterprises started with a community visioning worksheet where residents described or drew what they wanted their community to look like in twenty years (the deadline for achieving sustainability under SGMA) and then linked that vision to specific water management priorities that would facilitate it.

Using this messaging, community-based organizations heavily prioritized outreach, holding community meetings and providing updates at local water board meetings and other community venues regularly. Often this was in areas where organizations had existing ties but some of the outreach was "cold" often leading to new relationships. Several organizations created "get to know your GSA" factsheets and videos encouraging community involvement in the process.

In support of this outreach, a critical role that non-profits and community organizations have played to support broader participation was providing training to make both the complicated policy process, and the technical groundwater subject matter, more accessible. In partnership with the Union of Concerned Scientists, several SJV organizations provided a series of bilingual community workshops on SGMA and GSPs with hands-on activities such as calculating water budgets for their own groundwater basins and role-playing negotiations for setting management criteria and selecting projects and

management actions for hypothetical basins. Building off of these efforts, the Union of Concerned Scientists also published a bilingual layperson "Getting involved in groundwater guide".

Based on previous experiences with attrition in leadership positions, particularly in hostile environments, supporting community leaders to stay involved was of the utmost importance. To sustain involvement organizers provided one-on-one support to dozens of community representatives, sending meeting reminders, collaboratively reviewing agendas, and providing ongoing training to help participants feel confident in SGMA meetings. To support residents in person, and to fill gaps to maintain an ongoing presence, organizers also attended hundreds, if not thousands, of GSA meetings themselves, coordinating their involvement to maximize coverage with attention to leveraging key strategic, pre-existing relationships with local communities, water managers and local electeds alike.

New relationships also evolved through this work. Community-based organizations convened communities in the same GSA to work together in SGMA. In one such case five unincorporated communities worked together to negotiate a legal agreement with their overlying GSA for GSP development and implementation. They did so based on their shared priorities but also advocated collectively for individual community needs: one of the five communities lacked a sewer system (a common challenge for unincorporated communities in the SJV stemming from withheld county investment). Without one, this community had no means to quantify and claim credits for recharging the aquifer to help offset potential pumping quotas or fees. Despite this challenge being unique to only one community, all five communities worked together to insist the GSA include a mechanism for estimating that communities recharge credits for their household septic tanks.

Importantly, efforts to broaden participation targeted not just environmental justice community residents but also GSAs themselves. Starting immediately with the passage of SGMA, an environmental justice priority was securing decision-making representation in GSAs. Wary of the limited benefits low-income communities continued to reap from the similar IRWM program, organizers were determined that environmental justice representatives would not just participate in SGMA, but have a meaningful say. Advocates engaged in negotiations establishing dozens of GSAs in the South SJV with the goal of

securing community representation on board of directors and advisory boards as well as in some cases to establish rural community and drinking water committees. Learning from their engagement across many GSAs, they used wins in one agency as leverage in others and often replicated proposals for committee and board structures from one to another. For example, the establishment of a "rural communities committee" with an assigned board seat/vote in one Tulare County GSA known as Greater Kaweah GSA was replicated in neighboring Fresno County in the North Fork Kings GSA where environmental justice organizers were also deeply engaged. North Fork Kings GSA was formed via special act district legislation after local agricultural water districts appealed to legislators in Sacramento for assistance in setting up an agency with more flexibility than the more popular routes of establishing Memorandums of Understanding of Joint Powers Agreements.[3] In both cases, environmental justice advocates were able to flex their power in the state capitol to ensure voting seats for local communities.

Organizers have been the first to say that progress in securing meaningful representation in decision-making has fallen far short of what is needed. They were successful in obtaining voting seats in just a handful of GSAs and advisory roles in another handful. On more than one occasion organizers fought tirelessly for these roles and then struggled to find residents that were willing and able to hold them as they balanced work and other responsibilities. Notably, however, the environmental justice community's focus on representation in decision-making roles has not faded with time. For the past several years, an ongoing coalition of environmental justice, community development, and traditional environmental NGOs working on groundwater have convened annually to reflect and strategize on SGMA. At each convening enhancing representation, specifically voting representation, has arisen as a key shared priority moving forward. Further, organizers have been busy making sure they are ready to leverage representation opportunities when they arise: Since the passage of SGMA Community Water Center launched their Community Water Leaders Network, a leadership cohort for local electeds, and Self-Help Enterprises revamped a Rural Community Water Managers Leadership Institute. Both included

[3] For more information about the formation of GSAs and different avenues pursued see Dobbin and Lubell (2019) and Milman et al. (2018)

a significant focus on SGMA and have already seen new residents move into decision-making positions. One such win came in 2018 when a local organizer and participant Daniel Peñaloza, 25 at the time, was elected to the Porterville City Council and promptly volunteered for every water related committee assignment including to represent the city on the East Tule Groundwater Sustainability Agency for which he became an alternate voting member.

In stark contrast to the dominant policy narrative focused on low-income communities needing capacity building to participate, advocates also spent significant time engaging GSAs and state agencies on the skills they needed to develop to make the process more inclusive. Especially in the first few years of GSP development, advocates spent significant time working with GSA staff for improved outreach and meetings, sometimes partnering with the agencies to implement their suggestions. Environmental justice organizations also consistently watchdogged agencies for compliance with California's public meeting law, the Brown Act.

To expand these efforts statewide Community Water Center along with Union of Concerned Scientists and Clean Water Action published a report entitled "Collaborating for Success" highlighting best practices and examples for broad stakeholder engagement in water management. Significant effort was also dedicated to pushing the Department of Water Resources, which was charged with technical assistance for GSAs, to publish a similar document. When the Department finally began working on one, the same advocates worked diligently to improve its contents. The result, which was published in January 2018, more than a year after the Departments other supporting materials had come out, was considered far too little too late. Yet advocates' sense of the importance of these documents was borne out in time. The state backstop design of SGMA incentivizes local agencies to adhere to state guidelines and recommendations as a means of preventing state intervention. The stakeholder communication and engagement plan template suggested in the document, created with substantial environmental justice input, appeared in more than 80% of the GSPs submitted in January 2020 despite it only being a suggested example.

Scope

In addition to fighting for an inclusive democratic process, a second major environmental justice priority has been fighting for an inclusive scope for groundwater planning. Generally, GSAs have sought to limit what is considered relevant to GSP development, and ultimately, what a GSP can accomplish. In doing so, they have unabashedly pursued a "one-world world". In contrast, environmental justice stakeholders have fought to make SGMA accommodate multiple forms of knowledge and expertise in pursuit of a "pluriverse" (Singh, 2017: 762, 766).

In day-to-day SGMA meetings, engineers, and occasionally lawyers, were the primary voices in the room. Similarly to other cases (Yates et al., 2017; García and Bodin, 2019), these expert discourses limited environmental justice participation and influence in decision-making. SJV residents and organizers knew the impact of poor water management and had important expertise to offer, but ontological differences made it challenging to do so. For example, the official declaration of the end of the recent drought in 2017 based on average regional and state precipitation was inconsistent with the lived reality of ongoing drought by residents who remain without running water in their homes and wanted planning to reflect this by discussing drought in the present tense rather than the past.

The topical coverage of SGMA meetings was also heavily policed. For environmental justice stakeholders, SGMA was, and had always been, a visionary law about the future of the SJV, implicating everything from land use and labor to safe drinking water and public infrastructure. In contrast GSAs typically focused on and claimed a very limited scope. As GSPs were developed it was not uncommon to hear leaders describe their purpose as simply "to balance water inputs and outputs" often adding "without impacting surface water rights". In other words, their vision was to calculate all of their groundwater inflows, assign proprietary rights to every drop of those that could be claimed, and then divide up the remainder among users per some allocation system (often acreage or crop based). In direct defiance of the nature of the shared resource itself, any potential impacts from these actions were portrayed as simply out of their hands, the consequences of the legislation rather than their implementation. This approach intentionally excluded two primary environmental justice priorities: drinking water quality and mitigation,

particularly for domestic wells, the shallowest and therefore most vulnerable groundwater users. Incessantly contesting these exclusions became a primary practice for residents and organizers at meetings, one of whom reported feeling like a broken record. In addition to meeting participation, extensive comment letters to local GSAs became another important tool for pushing a more expansive approach. Informed by community meetings and their own, often contracted, technical analyses, comment letters increasingly became the place in which advocates could develop and support their own vision. Community organizations submitted dozens of comment letters on draft GSPs, often dozens of pages long and accompanied by exhibits and appendices.

To facilitate GSA's consideration of these important topics, Community Water Center, Leadership Counsel for Justice and Accountability, Self-Help Enterprises and other ally organizations also developed new support tools and resources, essentially leading by example. Much as they had done in developing best practices and guidance documents for stakeholder engagement, the organizations turned towards developing model projects and policies that could be adopted by GSAs. They also developed support tools with the explicit intention of making it easier for GSAs to integrate drinking water into their plans such as the Community Water Center drinking water tool (Community Water Center, n.d.). Working together the three organizations also developed guidance for designing a drinking water well impact mitigation program. Although the idea wasn't adopted as widely as they hoped, there was some effect: Four GSAs in the SJV included the development of a mitigation program in their GSP and another five stated their intent to consider such a program.

Environmental justice was not alone in being shut out from this overly narrow approach to GSPs, environmental interests also found their priorities missing from the conversation and draft plans. Working together as part of a newly developed Groundwater Leadership Forum funded by the California Water Foundation they developed a GSP review tool which they then pitched as an additional support tool to GSAs. A chief goal of this tool was highlight, and encourage remedying, common deficiencies relevant to the coalition's groundwater priorities namely the failure to discuss, let alone proactively address domestic drinking water wells, drought/climate change, and interconnected groundwater-surface water habitats.

But it was not just the scope of GSPs where organizers and traditional water managers had different visions, but also the goal of, and possibilities under, SGMA itself. Whereas advocates read SGMA, which requires local stakeholders to define sustainability based on the avoidance of "undesirable results" and assumed that GSAs would define sustainability metrics and then design management actions to meet them, many GSAs did exactly the opposite. In nearly a third of GSPs, local definitions of sustainability were set by extending the pre-SGMA rate of groundwater level decline into the future, in some cases all the way to 2040, creating what is essentially "business as usual" or "no management" scenario (Bostic, 2020). Such was the approach in the Kings basin where the North Kings GSA established minimum criteria of groundwater levels to accommodate more than forty feet of additional groundwater level decline in some areas, the result of which would be the dewatering of at least 65% of the domestic wells that remained functioning in the area (Bostic, 2020). Meeting after meeting organizers tried to refocus conversations away from minutia of calculating groundwater inflows and outflows towards bigger picture questions of what sustainability might look like in the SJV with limited success. Many of those interviewed reported there was little to no opportunity to explicitly discuss the end goal of the management process, effectively making implementation about procedural rather than substantive compliance.

Where organizers had more success with this strategy was in their own meetings, which they leveraged to create dedicated community spaces that made room for residents to be experts and world-builders as described in the opening vignettes. Similarly, the possibility of a very different future became a primary talking point as organizers transitioned their strategies to other forums (see next section). Water-intensive large scale industrial agriculture did not have to be a foregone conclusion of GSPs as everyone seemed to be acting they argued. In a letter to the Secretary of California Natural Resources Agency Groundwater Leadership Forum members wrote:

> *[i]t is unfair and unreasonable to assume that the only path to economic prosperity is water. While we support a healthy and thriving agricultural economy, the state should also use this moment to invest in additional pathways of economic development and prosperity through workforce development and job training, investments in broadband, transportation and other*

> *infrastructure, as well as providing economic incentives that attract less water-intensive businesses to our state.*

This argumentation clearly demonstrates the expansive scope of the commoning agenda motivating environmental justice engagement in SGMA. Broadening the scope of GSPs, like broadening participation, is about far more than equitable groundwater access, it is about challenging the socio-economic context that fosters those inequitable and unsustainable socio-natural relations.

Authority

A third principal strategy wielded by the environmental justice movement in the SJV was contesting the definition of "local" in SGMA's local control design and the authority of those who coopted this label. The farse and inequity of local control was clearly evident to residents and organizers who felt no control of the process (Dobbin, 2020). While this challenge was anticipated based both on past experience and the legislative design, the legitimacy that this concept bestowed on the process also made it an important locus of contestation. Questions of who was included and excluded form GSAs and GSPs and the material implications were powerful tools that effectively served to expose the enclosure SGMA was legitimizing under the guise of a commons with the language. Organizers pursued this message on two parallel stages, with the state and with the public, but towards one goal: the continued renegotiation of groundwater planning in such a way that allows from more collective, or common, authority over a shared future.

A central component of this work was dissecting these plans in order to message both their contents and potential impacts. Working with Union of Concerned Scientists and American Rivers, Community Water Center, Self-Help Enterprises and Leadership Counsel for Justice and Accountability developed a Human Right to Water Scorecard for reviewing GSPs. Unlike the SGMA regulations which only considered whether agencies have "adequately responded to comments that raise credible technical or policy issues" (CA Water Code § 355.4(b)(10)) the scorecard explicitly integrated community expertise on drinking water issues as a review criteria and was extensively cited to California code sections including SGMA requirements but also state non-discrimination and civil rights law. The

Groundwater Leadership Forum group then used their review tool to write comments on 31 draft and final plans. In addition to leveraging their own expertise to review the plans, a key tool used in their comments and meetings with agency officials were contracted technical analyses and hydrologic assessments quantifying the potential drinking water impacts of GSPs. The results showed nearly 130,000 people at risk for losing their water supply statewide (Water Foundation, 2020) and more than 350,000 people reliant on water supplies where contaminant concentrations would continue to increase (EKI, 2020).

With these assessments in hand, appealing directly to the state, advocates framed GSPs as a giant step backward for California's progress on the human right to water (AB 685). This approach was seen as particularly persuasive to new Governor Newsom who had just signed the monumental Safe and Affordable Drinking Water Fund (SB 200) that would provide a sustainable funding source to "help water systems provide an adequate and affordable supply of safe drinking water in both the near and long terms". For advocates this was a huge victory that they had been envisioning for decades and actively working on for years. For the governor, too, SB 200 was important, as an early and challenging legislative win. Thus, the movement began immediately connecting successful implementation with SGMA. In a large coalition letter spanning many of the state's most prominent environmental justice, environmental, public health, faith and civic organizations addressed to key governor appointees (Fig. 1, Clary et. al 2019, personal communication, 18 December), advocates argued that "poor implementation of SGMA now threatens the success of the Fund, as it is being implemented in a manner that ignores safe drinking water needs of our most vulnerable communities and threatens Governor Newsom's vision of providing safe water to all." Tombstone Territory in Fresno County, the signing location of SB 200, quickly became a face of SGMA's challenges as well. The private well community had experienced household outages in 2015 and 2016. They so happened to also sit squarely in the middle of what advocates saw as one of the more egregious GSAs. These appeals as to what was at stake for the human right to water were complimented by appeals as to what was at stake for the state financially if the continued siphoning of public water for private profit was allowed. The sheer number of potentially impacted drinking water

wells would be an expensive proposition for the state that had just spent hundreds of millions on emergency aid and drought solutions.

Figure 1. Coalition sign-on letter to governor appointees

Simultaneously, coalition members also pursued news and social media campaigns intended to increase public awareness of the potential impacts and force increased scrutiny on agencies and plans alike. To do so they once again leveraged the immediate relevance of groundwater to the lives of residents, both urban and rural. Social media posts highlighted the potential for negative impacts using

their contracted technical analyses (Fig. 2). Countless media and other news pieces emphasized rural community dependence on groundwater. Opinion pieces in the Bakersfield Californian (Clary and Renteria, 2019) and Fresno Bee (Monaco, 2019) among others emphasized the importance of groundwater management for the human right to water and the future of the region. One such op-ed read:

> *As a region and a state we're going to have to think creatively about how we transition to an ethical and sustainable economy. We have precedent. The New Deal of the 1930s put millions of people to work doing the jobs that America needed to transform our economy. Our water crisis in California demands equally bold action. We can knit together labor and environmental concerns, and create a movement toward a common vision, but we cannot have business as usual, where agricultural water usage runs amok and wrecks communities and our environment* (Monaco, 2019).

In this example we once again see how these forums were not just used to expose/critique but also to amplify the movement's comprehensive vision of what sustainable management could and should mean for the SJV, encouraging new shared imaginaries.

Figure 2. Outreach Twitter placard

Discussion

From the proceeding narrative it is clear that environmental justice organizers and residents have fought diligently in the SGMA process to assert their right to not just participate but shape groundwater management. Further, they have applied their expansive environmental justice lens to assert a broader,

more holistic and more inclusive vision for the future than GSAs presented to them. In seeking to renegotiate the contested political relationships governing groundwater, these efforts are well conceptualized as commoning, or a "collective rethinking" of the ways groundwater management is performed and the resource is governed guided by objectives of emancipation, social justice and ecological sustainability (Centemeri, 2018; Nikolaeva et al., 2019: 354).

The label of commoning, however, is not just apt, but also productive in that it highlights several oft-overlooked elements of the case ripe for discussion and learning. Not only does this case lend further support to the assertion that social movements are key actors in common pool resource management (Villamayor-Tomas and García-López, 2018) but contextualization of groundwater management in time and space as a contingent and relational process emphasizes the stakes and potential of the process. Environmental justice movement investment in SGMA and the broad ranging effects detailed herein position SGMA itself as a key venue for contesting the longstanding enclosure of groundwater in the SJV that is intricately tied up with regional inequality and oppression. The commoning strategies, collectively constituting a commoning practice, they use to do so is informative, then, for understanding the emergence and growth of commoning communities towards these ends. This section explores these three contributions in further detail.

Social movements as key actors in common pool resource management

SGMA, like other California water management programs before it, have been shaped by environmental justice organizing. SGMA's legislative design itself is a tangible example, with unprecedented language in the water code explicitly calling for the integration of low-income communities and rural drinking water stakeholders. While the language was frustratingly (and anticipatedly) unenforceable, it was symbolically important in tone and placed environmental justice stakeholders as key actors in the events to follow.

Just because SGMA was not passed with the intent of enacting a groundwater commons does not mean that residents and organizers cannot leverage it towards that purpose, even when the same process is simultaneously posing new and expanded threats of enclosure. Spanning the entire region and engaging in

almost every GSP, environmental justice actors have played a critical role as diffusers and innovators as they worked diligently to make groundwater management in the region inclusive, participatory and equitable: The environmental justice informed communications and engagement plan recommended by the state appeared in most GSPs; governing board and committee structures for representing environmental justice and drinking water stakeholders were replicated between GSAs; and community-based organizations packaged and marketed their own policies and management actions which surfaced in countless plans.

In individual GSP development processes, many participants also cited important instances where formal positions and even public comment allowed them to raise concerns and ideas that shifted conversations and even made it into GSPs. Contracted reports, technical analyses, support tools, comment letters and guidance documents helped drive conversations even in their absence and helped protect communal use and management rights (Villamayor-Tomás and García-López, 2021). As one organizer put it: “We forced ourselves into those tables”. Similar watchdogging tactics and applying pressure via state level advocacy led to some important, particularly procedural, improvements incentivizing increased efforts related to outreach, translation, water quality and more. Additional and future impacts are almost certainly unknown.

It is for precisely these reasons why attending to the bottom-up power of social movements is so important. While admittedly far short of the change they seek, we cannot understand groundwater management without understanding the role and impact of commoners like environmental justice organizers. However, to only consider these proximal impacts risks painting SGMA as wholly reformist in nature and misses much of the significance of this movement-management interface and the broader relevance of the commoning practices detailed herein. As the next section explains, not only has the impact of environmental justice organizing transcended SGMA as a policy reform, but the intent of this organizing has squarely kept the broader goal of regional change in view.

Common pool resource management as key venue for fostering new socio-natural relations

While the direct impacts of environmental justice organizing in this case are largely reformist in nature and somewhat limited in nature as detailed above. The broader perspective afforded by a commoning framing clarifies that this is not the whole story of this case. Participation in the SGMA process has had a multitude of wide ranging, indirect effects that also contribute to commonisation beyond defending community groundwater use and management rights such as through the promotion of community organization (Villamayor-Tomás and García-López, 2021). SGMA provides a place for new practices, relations, identities and discourses to emerge (Villamayor-Tomas and García-López, personal communication, 2021).

One such example is increased relationship building between adjacent SJV communities and between environmental justice organizations and other community-based nonprofits. While the movement has a long history of broad regional organizing, a challenge and benefit of SGMA was to focus on coordination between communities in immediate proximity. This included working towards coordinated community participation which had long been a vision of organizers but prior to SGMA had seen little implementation. In several cases, residents who participated in the SGMA process for years found themselves looking to these relationships as one of the most tangible outcomes of their efforts. Similarly, regional relationships were developed and strengthened among nonprofit and community-based organizations which already had a long history of coalition work but were challenged to coordinate in new ways as they worked and shared updates and strategies across dozens of GSAs. Whereas past organizing had been strongest in communities with existing water challenges, the proactive nature of SGMA brought additional communities to the table including larger unincorporated communities and small cities that benefited more from economies of scale. Many of these relationships were later leveraged to build support for the passage of SB 200.

Highlighting the importance of these relationships, given the encountered limits of procedural reform and state engagement (Holifield, 2004; London et al., 2008; Liévanos, 2012), SGMA has also refocused many organizers on the importance building and maintaining local/regional relationships and

leadership. That environmental justice participants and GSA leaders have a fundamentally different vision is not something that can or should be worked around. Instead, both changing local leader's minds, and changing local leaders will be necessary to move SGMA, and the SJV at large, forward. This reminder has spurred new leadership development and civic engagement programs that continue to grow.

After clearly situating themselves as key actors in the law's passage, advocates took up space in GSAs up and down the SJV. Throughout GSA formation and GSP development, environmental justice and technical assistance organizations held countless events. Local electeds and GSA leaders continued to show up, some to learn and collaborate, and some from a more defensive posture. While some GSAs still bucked environmental justice involvement, others were keen to include advocates on their advisory committees or partner with them on outreach. Working across more GSAs than just about any other stakeholder, advocates assumed a position of authority on many SGMA topics beyond equity and drinking water. Long-time organizers noted a sense of influence they had not experienced before. While not always "game changing" especially as the process wore on, many did report positive impacts of this growing influence at both the state and local levels as well as spillover effects in other areas of their work including ongoing drought relief efforts. Even when they felt uninfluential, however, for many residents their consistent presence at GSA meetings was a defiant taking of space in a realm they had long been excluded from. That act, and even the pushback it received, often had an empowering effect in itself (Dobbin, 2020) which coupled with the strengthening of collective and identity ties (Villamayor-Tomas and García-López, personal communication, 2021) resulted in the growth in the size and influence of the environmental justice movement in SJV water management and statewide policy.

A related outcome of five years of ongoing engagement in SGMA has been to increase the visibility of SJV environmental justice communities. While their differing use and relationship with groundwater posed ontological challenges, so too did it provide an avenue to involvement, with their status as users ultimately making more legible their status as residents. As one water system operator put it: "SGMA has put us on the map". We can see this progress comparing the interested parties lists GSAs submitted to the state in 2015 with the plans they submitted in 2020. Per SGMA, the interested parties list

were required to include a list of "Disadvantaged Communities" (low-income) in the boundaries of the new agency yet only 55% of them appeared. Whereas in final GSPs the number, names and locations of these communities was adequately described in 76%. For communities that have quite literally been intentionally written out of planning for decades (Balazs and Ray, 2014), being written into Groundwater Sustainability Plans is a tangible sign of progress made possible only by overwhelming environmental justice investment in these efforts long-term. These dynamic social and ecological relations (Singh, 2017) also undergirded the growth of the movement and regional networking. Communities identified and advocated for shared vulnerabilities as well as learned from, and advocated for, their differences.

Lastly, among the most salient contributions of the movement's engagement has been the contribution of the expansive environmental justice lens itself. When asked about the progress that has been made since 2015, changing public discourse and increased attention to groundwater management is often among the first items to be cited by those involved. Environmental justice organizing over the last five years has undeniably, and potentially irreversibly, connected drinking water, and by extension public health and safety, with groundwater in a way that has never been achieved before. Previously groundwater in California had existed as an essential but mostly invisible resource, securely the domain of industry not the public lacking both management and discussion. While SGMA introduced management, it has been environmental justice organizers that have achieved discussion. In amplifying the discussion to a broader public and tying it to a shared future, organizers have made significant headway in reshaping local narratives about groundwater and increasing attention and involvement.

These changes highlight SGMA as an important venue for advancing broader structural change to the socio-natural organization of the region. Critically these broader impacts are neither accidental, nor peripheral. Rather such transformations are central to the vision and intent of organizers. Embedded as they are in the socio-natural and historical context, the three strategies of challenging participation, scope and authority are not just strategies for amplifying the shared use of groundwater resources but also transforming the region through the "performance of counter hegemony" (García López et al., 2017). It is true that SGMA has been a tangible and extremely motivating organizing platform for very practical

reasons. The recent had drought demonstrated in a very clear way that groundwater management (or mis-management or non-management), has real implications for residents, impacts they are still living with today and by extension, demonstrated the value of planning. But for organizers and residents alike, SGMA has always been as much about the forces that produce regional groundwater conditions as it has been about the conditions themselves (Read, 2011). SGMA is a tool rather than a means which is exactly how organizers discuss it.

GSAs play not just an ecological but also key social and political roles (García-López, 2013). And in the rural SJV, which has been fundamentally shaped by the absence of such venues in which to seek the "renegotiation of the (contested) political relationships through which everyday community affairs, production and exchange are organised and governed" (Nightingale, 2019: 17), this potential was rare and not to be overlooked. As Morrison (2006) points out, institutions are as much about norms, behavior and values as they are about rules, law and governance. These changes cannot be orchestrated from the top down. Bringing along local leadership from city councils to community services districts to irrigation districts, or replacing them, is a critical component of advancing a more just and sustainable region which is exactly the opportunity afforded by SGMA. As we can see, this is a difficult and contested process. Ongoing challenges highlight how much work is needed in this regard, but they have also focused and reinvigorated efforts towards that goal. The intersection of commons and movements provides a necessary generative space for deconstruction, learning and collective resistance (Hardt and Negri, 2009; Barron, 2017; De Angelis, 2017). Precisely based on its regional design, long-term nature and the salience of the resource, SGMA provides the foundation to build for a new future. In organizers strategic deployment of imaginaries, we see very clearly the "world-making possibilities" baked intentionally and explicitly into their commoning practice (Singh, 2017).

Learning from the SJV's environmental justice commoning practice

Given these findings, what can we learn from the strategies employed in this case? After starting with a brief exploration of the deeply contextual nature of commoning efforts this section extracts three generalizable lessons from this case useful for understanding others.

Among the most clear empirical contributions of this case study is the deeply contextual nature of commoning strategies employed by the movement. All three strategies are clearly informed by past organizing efforts and, in turn, informative of future efforts. For example, the focus on governing representation is a clear consequence of the lack of progress attributed to lack of representation in the precursor IRWM Program. Similarly, the very language of SGMA was only possible after decades of grassroots power building. Failures or challenges encountered throughout the SGMA process have been critical for promoting further learning and adaptions. For example, the transition to more community-oriented spaces and the production of comments through community groundwater workshops in lieu of direct meeting participation.

Similarly, the environmental justice movement as a commoning community is also clearly constrained by the socio-natural context in which they work. Organizers are not free actors in these events (Perkins, 2015). The tough choices they have made in implementing their strategies reflect not just their preferences and priorities but also the conditions under which they are working. In contracting and publishing technical analyses to push GSPs towards greater consideration of drinking water, climate vulnerability etc., they risk reenforcing the dominant technocratic discourses they are simultaneously challenging in meetings. In creating their community-centered spaces for fostering community involvement, they are challenged to balance fostering a safe and productive conversation that values community input and expertise, and the need for decision-makers to hear and interface with residents directly. Similarly, the extreme fragmentation of GSAs stretched community and organizational resources leading to tough choices about where and how much to invest in SGMA at the expense of other campaigns/projects and subsequently encouraged more engagement with state agencies as did SGMA's design through the establishment of the state backstop.

Despite this co-constitution of commoning with common pool resources and commoners (Centemeri, 2018), however, this case, I argue, offers generalizable insights for understanding other commoning communities and their practice. First, the three commoning strategies, together as a commoning practice, help us identify key constraints to the environmental justice vision and strategies

that can transcend them (Villamayor-Tomas and García-López, 2018). Throughout the SGMA process state, regional and local decision-makers have focused heavily on broadening participation in SGMA as a goal. The environmental justice movement has similarly emphasized this goal. But addressing participation without addressing scope or authority is clearly insufficient for achieving the vision of a more just and sustainable groundwater commons. Applying this lesson to other cases then, systematically analyzing the various components of a commoning movement can help clarify a grounded pathway towards change and all of the various components that will be needed to achieve it.

Relatedly, the strategies of participation, scope and authority are connected and interdependent. As such they need to be considered together as a commoning practice to be fully understood. Participation itself serves normative goals by proactively taking space and asserting a role in decision-making, but it is also a key means to expanding scope and authority. The three strategies build off each other to assert the connection between racial and social injustice with ecological problems (Sze et al., 2009). Taken together, then, the strategies represent an environmental justice vision of connection and expansion posed as an alternative to reductionism and dualism. Individually, however, they are prone to being misunderstood. By scaling up their organizing and directly engaging with the state on SGMA implementation, rather than falling into what might be seen as a liberal state trap (Pulido et al., 2016; Ranganathan, 2016), organizers are leveraging the unique design of SGMA to build power at multiple levels in a targeted effort to challenge and redefine local control to be inclusive of residents and their priorities and vision. In understanding these strategies collectively, not only is their intent clarified, but the multi-scalar nature of the commons they seek is highlighted.

Third and perhaps most importantly, these findings underscore the critical role of affect and performance as argued for by Nightingale (2019), García López et al. (2017) and others in commoning, not just as a tool (challenging scope), but also the goal. It is true that final GSPs have been overwhelmingly disappointing and their potential approval by the state would, in many ways, constitute a formalization of the existing status quo, enshrining inequitable groundwater access and management with newfound legitimacy. But that does not mean commoning objectives have not been, or will not be, made

as part of the process too. Ultimately the fight for the commons is a fight for control of the production of subjectivities (Singh, 2017). In taking the commons as a terrain for re-articulation (García López et al., 2017), we see not just the outcomes but also the process as essential. Here we see that the individual/collective empowerment and relationships built directly and indirectly as a result of SGMA is tangible and potentially long-lasting also. So too is the changing public discourse about groundwater, increased attention and community engagement in its management. "Commons are nurtured through commoning practices that, in turn, enable us to think, feel, and act as a commoner" (Singh, 2017: 767). By leveraging the commons as a site of socio-nature encounters to create commoners, the environmental justice movement has undeniably done the later, showing just how critical of a role in advancing commons that both social movement actors and common pool resource management play. This is true despite the overarching disappointment of submitted GSPs, clearly demonstrating the importance of focusing on "the work commons do" rather than produce (Singh, 2017: 754). Social movement organization to imagine and build commons under capitalism is often, if not always, a both/and proposition.

Conclusion

That the environmental justice movement in the SJV has evolved through and with SGMA implementation is an important but not revelatory finding as to the dynamism of progressive social movements. Indeed the organizing strategies detailed in this case clearly align with existing literature on the California environmental justice movement and social movements more broadly including the movements' prefigurative politics (Yates, 2020), scale shifting (Kurtz, 2003; Sze et al., 2009; Perkins, 2015; Mendez, 2020; London, 2016), focus on participation (London, 2016; London et al., 2008), use of public comment (Cole & Foster, 2001; London, 2016) and use of coalitions (Mendez, 2020; London, 2016) among others. That the environmental justice movement plays an important role in shaping common pool resource management, on the other hand, has received far too little attention in the literature (Villamayor-Tomas and García-López, 2018). The fact that environmental justice organizers are natural

commoners should perhaps not be surprising. Afterall, environmental justice has always been about expansion. The frame is an inherently connecting one, premised on making visible the links between social and environment (Sze et al., 2018). But that as insistent commoners in a landscape of intensive enclosure, environmental justice organizers have fundamentally shaped, and been shaped by, groundwater reform in California through a set of three, well defined and interrelated commoning strategies of contesting participation, scope and authority is important for three reasons.

First, if we fail to consider natural resource management regimes within their broader social, political and economic context we risk missing the important ways these processes are mutually shaped and subsequently limit our understanding of them (Clement, 2010; Emerson et al., 2012; Villamayor-Tomas and García-López, 2018). As is clearly evidenced in this case, social movements can be an important part of this context and have significant implications for resource management and vice versa. These formative interactions also have potentially positive and negative reinforcing effects that will inevitably shape both moving forward and continue to inform their mutual development (Villamayor-Tomas and García-López, 2018). As such, understanding the implementation and outcomes of SGMA and other common pool resource management programs requires keen attention to these dynamics. Much the same can be said for understanding the emergence and growth of commoning communities themselves (Nightingale, 2019), which is intricately intertwined with the socio-natural landscape they are working to reshape.

This movement-management connection is also critical for understanding the role that common pool resource management, with the help of social movements, can play in advancing just and sustainable transitions. The history of the commons has always been one of struggle and enclosure (Villamayor-Tomas and García-López, 2018). Yet often these governance tales, especially in polycentric systems, are focused on top-down and repressive exercises of power, neglecting more enabling forms of power and bottom-up processes of empowerment that are also operating in these spaces (Morrison et al., 2019). GSAs are sites where power relationships are reinforced (Dobbin, 2020), but they are also where power asymmetries can be changed. The commons is a critical site of not just resistance but also world-building.

This perspective is too often neglected in political ecology and environmental governance literatures more broadly (Clement, 2010; Morrison et al., 2019; Martin et al., 2019). Focusing on relationality, rather than just institutions, underscores the inherent potential of the commons as a venue for advancing structural change even in a case such as SGMA where the legitimization of enclosure appears to be the most material result. It is this potential that animates social movement commoning as a practice.

Lastly, the case of environmental justice organizing in SGMA implementation provides an important illustration of how collective action is mobilized for the promotion of commons rather than just their administration (Villamayor-Tomas and García-López, 2018). The three fronts of contestation detailed here are strategies for commoning intentionally crafted as a pathway to more sustainable and equitable future commons and as such provide several empirical lessons for understanding commoning movements. Given the co-constitution of commons, commoners and commoning demonstrated in this case, as well as the interdependence and cumulative nature of the individual commoning strategies themselves, there is a clear need to understand any commoning practice holistically, situated in place and time. Yet mapping individual commoning strategies can help us understand this context by identifying principal constraints. Analyzing the broader impacts of these events also demonstrates the folly of focusing on the commons at the expense of the work commons do. The production of commoners and the development and articulation of shared imaginaries is highly germane for understanding the impact and future of these efforts. Understanding commoning as a re-articulation in which both social movements and resource management play a key role is an essential perspective afforded by the commoning perspective with valuable lessons for advancing just and sustainable transitions.

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CHAPTER 4 - DRIVERS OF (IN)EQUITY IN COLLABORATIVE GROUNDWATER PLANNING[1]

Introduction

In recent decades, the search for more appropriate scales and effective methods to tackle complex environmental problems has reshaped the discourse and practice of environmental policy, leading to the widespread adoption of collaborative governance (Ansell and Gash 2008; Brisbois and de Loë 2016; Harrington 2017). In contrast to the command-and-control, top-down policies of the past, in collaborative governance multiple decision-makers and stakeholders engage with one another in a more horizontal fashion to develop and implement policy or management objectives that are mutually beneficial. Collaborative governance has been promoted for its policy benefits including reducing conflict, leveraging local knowledge, and increasing public acceptability and compliance (Bodin 2017; Pahl-Wostl et al. 2007). But collaborative governance's popularity and widespread adoption also reflect strongly normative democratic ideals (Brisbois and de Loë 2016). Collaborative governance purports to be a consensus-oriented process where the involvement of diverse stakeholders promotes representation in decision-making, builds trust and empowers local stakeholders (Emerson, Nabatchi, and Balogh 2012; Morrison et al. 2019).

Thus, in collaborative governance, the relationship between process and outcomes is a critical one that speaks to the underlying logic of the approach itself. But there has been surprisingly limited empirical assessment of the outcomes of collaborative governance regimes (Emerson and Nabatchi 2015). What little evidence we do have suggests that equity goals are among the least realized (Emerson and Nabatchi 2015; Koehler and Koontz 2008; Leach 2006). We know even less about the "broader social, political, and economic contexts that shape [collaborative] processes and outcomes" (Brisbois and de Loë 2016:788). Clearly participation can affect outcomes (Bodin 2017; Newig and Fritsch 2009), but collaboration does not always produce the expected results, especially when powerful special interest

[1] Collaboration between Kristin Babson Dobbin, Michael Kuo, Jessica Mendoza, Darcy Bostic, Ernest Echeveste and Mark Lubell

actors are able to dominate the process (Cook 2015; García-López and Arizpe 2010; Morrison et al. 2019).

This paper seeks to fill this gap, exploring the extent to which collaborative planning advances equity goals, and under what conditions, using the critical case of California's landmark groundwater reform program known as the Sustainable Groundwater Management Act or SGMA. SGMA mandated the development of Groundwater Sustainability Plans (GSPs) for all of the state's high and medium priority groundwater basins that detail current groundwater conditions, set sustainable management criteria and outline the management actions and projects necessary to achieve those criteria. We assess the first 45 of these plans submitted to the state Department of Water Resources (DWR) for review using a human right to water scorecard to develop two dependent variables: the extent to which each plan discusses the needs, priorities and interests of impacted/vulnerable small and rural drinking water users and the correspondence between the water quality management criteria set in the plans and state drinking water standards. Next, we employ Boosted Regression Trees to explore the relative influence of various factors pertaining to collaborative governance regimes, representation, elite power and problem severity on these outputs.

While submitted GSPs will need to be implemented and their outcomes and impacts assessed to determine the nature of distributive equity under SGMA, the integration of vulnerable drinking water users into GSPs is necessary (but not sufficient) for advancing equitable water access in the state. Currently more than one million Californians are impacted by unsafe water and many more are impacted by unaffordable drinking water. Most of these residents rely on groundwater as their primary or only water supply. Further, household and even community-level water shortages have become increasingly widespread as climate change induced droughts have accelerated groundwater depletion particularly in the interiors of the state. Thus, groundwater management under SGMA has significant implications for present and future access to safe and affordable drinking water with the starkest implications for small and rural drinking water users. Our analysis provides an important early indication of alignment between SGMA implementation and the state's human right to water declaration passed in 2012 (AB 685).

Understanding the realized and potential equity impact of collaborative governance reforms, in turn, is critical for advancing sustainable and equitable natural resource management in California and beyond.

Our results suggest that certain elements of collaborative dogma may indeed be more performative than substantive, at least when it comes to advancing equity. Nonetheless that collaborative regimes, stakeholder engagement, representation and elite power all impacted both management outputs highlights some, albeit limited, potential for progress if equity can be integrated holistically into design and implementation. Among these factors, representation was by far the most influential and the only factor to influence management thresholds more than overall plan content. Differences between the influence of different factors depending on the dependent variable considered as well as non-linear and threshold effects in these associations highlights the complexity and nuance essential to understanding the outputs of collaborative governance processes, reinforcing the need to employ multiple measures and multiple methods as we seek to advance our understanding of the approach in practice rather than just in theory.

Theoretical background and hypotheses: Potential factors influencing equity in collaborative environmental governance

Contributing to the widespread adoption of collaborative governance is the wide array of benefits purported to be associated with the approach ranging from reduced conflict and increased compliance to enhanced democratic legitimacy and more equitable outcomes. Notably most evaluations of collaborative governance thus far have focused on process rather than performance (Emerson and Nabatchi 2015). Thus, all of these purported benefits merit skepticism and require more empirical assessment (Emerson et al. 2012). This is particularly true, however, of equity claims given the mounting body of evidence to the contrary. For example, considering a case of transnational collaboration at the Mexico-US border, the only metric across nine performance dimensions that Emerson and Nabatchi (2015) do not find evidence of is equity. Similarly, in their assessment of informal collaborative water governance in Southwestern Tanzania, Franks and Cleaver (2007) find uneven water access and livelihood outcomes for different

water users. Looking at two watersheds in Australia, Lukasiewicz and Baldwin (2017) identify distributive injustice in the outcomes as being linked to procedural and interactive injustice in the management processes.

Given these findings it seems clear that collaborative governance does not inherently, or even necessarily regularly, advance social equity. Why not? Under what conditions might it? Certainly, that equity in collaboration has not always been forthcoming does not mean it can't be (Dolan and Middleton 2015). To our knowledge the drivers of these differences have not been systematically investigated. Nonetheless, these and other studies provide some insight into potential factors mediating process and outputs including collaborative regimes, elite power, representation, stakeholder engagement which we adopt as a framework for our investigation (see Table 1). Notably we do not see these categories as mutually exclusive, rather we start from the assumption, based on the literature explored below, that all four influence the integration of equity considerations into Groundwater Sustainability Plans (GSPs) and seek to confirm/disprove and compare their relative importance. Next, we review these potential factors in turn before turning to two relevant null hypotheses drawn from the collaborative governance and environmental justice literatures: Collaboration as symbolic and collaboration as performative.

Collaborative regimes

Collaborative governance seeks to "transform the way that the state interacts with citizens and non-governmental organizations" and "restore trust in government and expand democratic consent by deepening participation and deliberation in public affairs" (Ansell 2012:1). Fine-tuning the institutional arrangements that best accomplish this goal has been a critical consideration in collaborative governance research and particularly for findings such as those previously discussed that equity is not always a forthcoming result of these re-configurations (Dobbin and Lubell 2019). More formalized and large-scale (both geographically and pertaining to the complexity in number of participants) collaborations have been linked to more full realization of collaborative governance benefits. Nonetheless collaboration is not without potential drawbacks. The consensus orientation of collaborative governance can perversely disincentivize incorporating a diverse set of perspectives or priorities because it tends to make agreement

even more challenging (Foster 2002). Depending on the institutional structure established, collaboration may also formalize and/or legitimize inequitable status quo (Franks and Cleaver 2007; Morrison et al. 2017; Purdy 2012). Thus, while we expect that formal, larger scale collaborations will positively affect equity in collaborative planning, an alternative hypothesis could be that these same factors inhibit rather than encourage the integration of vulnerable drinking water users into planning.

Elite power

The key to understanding both the promise and peril of collaboration may lie with power asymmetries. Although collaborative governance's strengths lie in its expansion of the decision-making table, it is abundantly clear that the table is still a contested one (Brisbois, Morris, and de Loë 2019; Cook 2015; Lukasiewicz and Baldwin 2017). Swyngedouw (2005:2001) notes that re-scaling "is not socially neutral as new actors emerge and consolidate their position in the process, while others are excluded or become more marginal". This is well demonstrated by California's famed CALFED program, where Shilling et al. (2009) detail the "marginalization by collaboration" of environmental justice actors. The potential to perpetuate or even exacerbate inequalities seems particularly likely in cases where powerful actors (e.g., industry, governors etc.) are able to exert undue influence on the collaborative process (Gerlak, Heikkila, and Lubell 2013; Moe 2005; Purdy 2012). For example, Cook (2015) documents how both the governor and the oil and gas industry in Colorado exerted agenda control to influence the outcome of a fracking rule making process in the state. Similarly, considering two collaborative processes in Canada, Brisbois et al. (2019) find that industry interests were able to stifle progressive outcomes by restricting the collaborative agenda. To this end we expect a larger presence of industry interests to be associated with less equity integration.

Representation

Relatedly, a lack of representation, particularly of more marginalized and less powerful stakeholders, may hinder the integration of equity into collaborative management processes (Lukasiewicz and Baldwin 2017; Newig et al. 2018). Collaborative governance regimes are neither uniformly accessible nor even known to all relevant actors (Ansell and Gash 2008; Purdy 2012; Swyngedouw

2005). Inclusive and balanced representation is widely considered important for leveraging the promise of collaborative decision-making (Ansell and Gash 2008; Newig et al. 2018). Yet assessing 76 western watershed partnerships, Leach (2006) found representativeness to be the weakest criteria noting that while generally balanced across stakeholder types, critical stakeholder groups were missing from many. Precisely because much of collaborative governance's purported benefits, particularly equity benefits, hinge on enhanced democratic legitimacy, we expect that limited representation of marginalized stakeholders will limit the extent to which any collaborative governance endeavor meaningfully addresses their interests.

Stakeholder engagement

Finally, the importance of such sustained stakeholder engagement is also well established in the collaborative governance literature (Gerlak et al. 2013). Much like representation, public workshops, and targeted outreach to and engagement of stakeholder groups supports the comprehensive collection of stakeholder needs and values and can help build dialogue and shared understanding across diverse stakeholder groups leading to more win-win or mutually acceptable management objectives/actions. In this way we expect meaningful stakeholder engagement, where input is not only solicited but meaningfully addressed, to increase equity in planning.

Importantly, outreach on the part of the collaborative body to relevant stakeholders is not the only form of stakeholder engagement that can or does occur in these processes. Missing from the existing literature on collaborative governance which has tended to focus on impediments to progress/cooperation, is focused attention on potentially enabling forms of power and mobilizations operating in these spaces (Brisbois and de Loë 2016; Morrison et al. 2019). A small but growing body of literature highlights the important role of social movements in natural resource management (Dobbin 2021; Villamayor-Tomas and García-López 2018). Thus, in addition to institutionally initiated engagement we expect the relative level of stakeholder engagement with collaborative institutions to also positively influence equity in a planning or management process.

Null hypotheses: Collaboration as symbolic and/or performative

Investigating the role of these factors provides an important opportunity to test two additional propositions about collaborative governance, both of which are highly relevant to the potential of advancing equity in these spaces. First, some studies have found collaborative governance to have limited or no effect, leading some scholars to assert that collaborative environmental institutions may be largely symbolic, or "all talk and no action" (Lubell 2004). For example, Lubell (2004) did not find evidence that the EPA's National Estuary Program increased cooperation (although it was associated with increased consensus and potentially important indirect effects). Similarly, in the case of Integrated Regional Water Management in the Bay Area of California, Lubell and Lippert (2011) documented little change from the conflictual status quo. Such studies suggest that local factors beyond the collaborative process have more bearing on results. Here we operationalize this possibility by incorporating a measure of problem severity, specifically the magnitude of drinking water challenges in each plan area. Intuitively, environmental management is necessarily informed by local conditions but is typically insufficient for understanding management outputs (Scott and Carter 2019). Thus, while when considering any of the above factors we would expect problem severity to play a role in shaping outputs (in other words, where drinking water is more of a problem more attention will be paid to it), but from a symbolic policy perspective we would expect problem severity in any given local context to play an outsized role in shaping outputs compared to other factors. Should that be the case, the potential to leverage collaborative approaches to advance equity may be moot, but so too should be the potentially detrimental effect of impediments such as elite power.

Relatedly, collaboration has been critiqued by some as performative. This perspective is well characterized by the refrain "talk is cheap" and informed by concerns that more horizontal, participatory approaches can be used to placate constituencies while pursuing pre-determined or otherwise biased outcomes (Cook 2015). In such a scenario, factors influencing the integration of equity considerations may have a noticeable effect on more visible management outputs or management rhetoric while the effect on more substantive management decisions, particularly those most tied to implementation and

outcomes. Such scenarios are a frequent feature of the environmental justice literature where the relative importance of, and relationship between, procedural justice (equity in the decision-making process) and distributive justice (equity in the distribution of costs, impacts and benefits of decisions themselves) has been a longstanding topic of discussion (Hunold and Young 1998; Lake 1996; Schlosberg 2004). There is a critical difference between presence, voice, and being heard (Cornwall 2008; Franks and Cleaver 2007; Shilling et al. 2009). This difference can be particularly pronounced when it comes to non-decision-making advisory roles (Hunold and Young 1998; London, Sze, and Lievanos 2008; Shilling et al. 2009). Thus in addition to reduced influence on more substantive outputs, we may also observe performativity if there is an observed difference in relative influence between decision-making board roles and non-decision making advisory roles for those involved in collaborative planning.

Case Context

In 2012, California made the human right to water part of California law, affirming that every resident has "the right to safe and clean drinking water and sanitation that is essential for the full enjoyment of life and all other human rights" (London et al. 2021). Nine years later, however, California has yet to live up to this promise. An estimated one million people still lack access to safe water and as many as a third of residents face unaffordable rates. Like most environmental burdens, these impacts are not distributed evenly across the population. Rather unsafe, unaffordable, and inaccessible drinking water most impacts low-income Californians of color, particularly in the Central Valley, the state's agricultural heartland (Balazs et al. 2011, 2012; Balazs and Ray 2014; London et al. 2021; Pannu 2012).

Chronic groundwater management challenges lie at the heart of many of these inequities (Dobbin 2020), particularly in the San Joaquin Valley which constitutes ground zero for the state's drinking water crisis (Francis and Firestone 2010; Pannu 2012). Groundwater is the primary source of water for 90% of the region's communities (Vanderwarker 2009), both accessed through shared community water systems and individual private domestic wells, both of which are highly prone to contamination. While some prominent contaminants are naturally occurring, such as Arsenic which is found in California bedrock

(Balazs et al. 2012), many are linked to large scale agriculture and other industrial/commercial sources with significant detrimental impacts to public health (Pannu 2012). In addition to point and nonpoint source pollution, groundwater pumping has been entirely unmanaged for all of the state's history prior to in 2015 with the exception of select adjudicated groundwater basins (primarily in the Southern parts of the state) leading to compounding challenges with unpredictable and diminishing supply.

The disparate impacts to low-income rural communities of these statewide challenges is socially constructed. Long legacies of what Seamster and Purifoy (2020) refer to as "creative extraction" from discriminatory housing and labor practices (Eissinger 2008, 2017) to regional planning (Francis and Firestone 2010; London et al. 2021; Pannu 2012) has led to a astonishing level of "informality" and inequality in residential settlement (London et al. 2021), particularly in the hardest hit region of the San Joaquin Valley where there are well over 400 unincorporated low-income rural and urban fringe communities across eight counties (London et al. 2021). These communities lack a delineated tax base to generate needed revenue for investment and repairs and representation in state and regional water decision-making resulting in continued underinvestment in infrastructure and solutions (Balazs and Lubell 2014; Disadvantaged Communities Visioning Workshop 2015; Francis and Firestone 2010). Thus these conditions persist even as they live next to the large canals funneling water to Southern California, products of large state and federal funding (Vanderwarker 2009).

As California faced a severe drought from 2012-2016 these constructed inequalities were further exposed and exacerbated. From 2013 to 2016, California spent $66 million on addressing drought-related water shortages (Feinstein et al. 2017). Meanwhile, agricultural users accelerated their longstanding practice of groundwater overdraft, increasing pumping to replace curtailed surface water allocations, leading to plummeting groundwater levels and resulting water shortages as shallower water supply wells ran dry (Sugg 2018). More than ten thousand Californians, again primarily low-income people of color, found themselves without running water. Five years later, as the state returns to extreme drought conditions and new outages are recorded, some are still relying on hauled water as they wait for permanent solutions.

Squarely in the international spotlight, the state was finally moved towards action (Leahy 2015). On September 26, 2014, Governor Brown signed the three-bill package known as the Sustainable Groundwater Management Act (SGMA) into law, initiating mandatory groundwater management in high and medium priority groundwater basins for the first time in the state's history.[2] Notably, the law only vaguely defines "sustainable management" as "management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results", leaving new, locally formed Groundwater Sustainability Agencies (GSAs) to define and implement this concept.[3] Local water and land use agencies were given two and a half years to form GSAs, which could be collaborative multi-agency partnerships or consist of a single pre-existing agency wherein that agency assumed the additional responsibilities and authorities to manage groundwater. These new management agencies then must define sustainability locally by writing Groundwater Sustainability Plans (GSPs) that include measurable Sustainable Management Criteria for six statutorily defined "undesirable results": Chronic lowering of groundwater levels, reduction of groundwater storage, seawater intrusion, degraded water quality, land subsidence, and depletions of interconnected surface water. Sustainable Management Criteria for each must include a Minimum Thresholds (MT) and Measurable Objective (MO) that together bound the bottom and top of a stakeholder derived acceptable operating range for the aquifer. In designing their criteria GSAs must consider all beneficial users and uses of groundwater including specifically drinking water users. GSAs also have the responsibility to prevent significant and unreasonable impacts to beneficial users. These plans, which can be collaboratively written by multiple GSAs together or authored by a single GSA, must then be implemented within twenty years with regular updates and revisions as needed to accomplish their goals.

[2] High and medium priority groundwater basins are established under Bulletin 118, the state's official groundwater report updated every five years and determined both by groundwater conditions and the nature of current and projected groundwater use. Basins designated as low and very low priority under this report are not subject to SGMA.

[3] For more about the formation of local Groundwater Sustainability Agencies see Dobbin & Lubell (2019) and Milman et al. (2018)

The law establishes two different deadlines for GSAs to submit GSPs based on local groundwater conditions. For the most critically overdrafted basins in the state, plans were due in January 2020. These 45 plans are the subset analyzed in this study. The remainder of plans will be submitted in January 2022. In both cases, following a 60-day public comment period, DWR will evaluate the GSPs over a two-year period "to ensure they are in conformance with SGMA, regulations, and are likely to achieve the sustainability goal of the basin." Following evaluation, DWR will mark a plan as approved, incomplete, or inadequate. If a plan is marked as inadequate, the State Water Resources Control Board will intervene and take corrective action. If marked as incomplete, the GSAs must address the problems identified in their GSPs within 180 days. During plan review and after plan approval GSAs are expected to be working towards implementation.

Data and Methods

The data employed in this paper are derived from four years of mixed-method research on SGMA implementation and include both primary and secondary data collected over this period. The following two subsections provide an overview of data collection methods for dependent and independent variables respectively.

Dependent variables

Given that we remain in the early stages of SGMA implementation, for our analysis we are constrained to looking at the integration of equity into processual outputs (actions and other administrative endpoints), rather than outcomes, the link between the two being implementation. While this necessarily limits our ability to assess distributive outcomes, as mentioned previously the integration of vulnerable users into the plan is a necessary but not sufficient for advancing distributive equity making these outputs an important early indication of how implementation will proceed. Further, GSPs as processual outputs are less subject to exogenous variables (e.g. extreme drought) than measures of plan implementation making GSPs a robust initial test case for exploring and comparing drivers of equity in collaborative planning.

Emerson and Nabatchi (2015) suggest two general indicators of equity as a target goal of collaborative governance regimes: measures of stakeholder perceptions about the equity and measures of the distribution of costs/benefits. Here we attempt this, albeit imperfectly due to the adaptation to outputs rather than outcomes, to develop two distinct dependent variables. In the first, the GSP assessment score, we use a human right to water scorecard developed by several environmental justice organizations highly involved in SGMA implementation to quantify the extent to which plans address key drinking water and environmental justice concerns. In the second, we compare the sustainable management criteria for water quality set in each plan to state drinking water standards as a proxy measure of the distribution of impacts. The logic behind this comparison is that where a plan sets no water quality thresholds, that denotes a management decision to prioritize unrestrained agricultural practices without concern for the impacts to drinking water users. On the other end of the spectrum, where a plan sets water quality thresholds below or at state drinking water standards, that denotes a willingness to restrain some agricultural activity to protect drinking water users.

GSP assessment score: We assessed the 45 GSPs using an adapted version of the human right to water scorecard developed by three environmental justice organizations that were involved in SGMA's passage in 2014 and have been heavily involved with implementation at all levels since (Dobbin 2021). While the overall assessment was broad in scope and included both quantitative and qualitative portions, just the quantitative metrics unrelated to stakeholder engagement/outreach were used to develop a final assessment score for use as our first dependent variable.[4] Thus 17 questions were used to calculate plan scores. These questions spanned six principal topics of concern for environmental justice stakeholders: water quality, water access, drinking water as a beneficial use of groundwater, affordability, projects/management actions and mitigation. Generally, questions within these categories considered whether drinking water users and uses of groundwater were fully acknowledged in the plan, whether the

[4] Stakeholder engagement and outreach considerations were excluded so that they could be included as independent variables instead based on the theoretical proposition that such efforts could advance more equitable outcomes.

potential for impacts to these users for management thresholds was considered/discussed, whether drinking water users were named as beneficiaries for any priority projects or management actions and whether the plan considered or developed mitigation plans to remedy negative impacts to vulnerable drinking water users. Because the scorecard was designed to focus on elements environmental justice stakeholders thought critically to be included in any GSP, a plan's assessment score can be understood as an indirect measure of stakeholder perceptions of drinking water equity based on plan content. The full GSP review tool is reproduced in Appendix C with questions included in the calculated assessment score displayed in bold text. Each item was scored zero/one/two (corresponding to no, somewhat or yes ratings) or zero/two (no/yes). A GSP's total summed score was then normalized to a 100-point scale representing the total percent of points possible received. Notably some items were not universally applicable to all GSPs, these items were marked NA and their total points possible was reduced by two to ensure comparability across plans.

Quality Minimum Thresholds (MTs): As part of our GSP review information concerning each plan's Minimum Thresholds (enforceable management criteria dictating the lowest acceptable conditions) for water quality was collected and combined to create a second dependent variable (see the "constituents of concern" section of the review tool in Appendix C). The assessment recorded which contaminants (e.g., arsenic, nitrates) a plan set sustainable management criteria for (Minimum Thresholds and Measurable Objectives) out of a list of seven common drinking water contaminants found in groundwater and what thresholds were set. After comparing these results to state drinking water standards known as Maximum Contaminant Levels or MCLSs, this information was then combined to classify each plan into one of four ordinal categories for use in our analysis: plan set no MTs, MTs set above (out of compliance with) MCLs; MTs set at or below MCLs with exceptions; MTs set at or below MCLs without exceptions. The setting of MTs in compliance with MCLs but with expectations was an unexpected trend (initially we anticipated having only three categories). Expectations enumerated in GSPs typically were exemptions to the established thresholds applied to plan areas where water quality was near or above MCLs already. In

other words, these plans committed to maintaining safe drinking water quality in areas with good conditions but not in more vulnerable areas.

Independent variables

To explore potential factors associated with the above two dependent variables we compiled 14 independent variables across the categories of collaborative regimes, elite power, representation, stakeholder engagement and problem severity. These categories and their associated indicator variables are displayed in Table 1 along with their expected relationship to equity in the final GSPs (as measured by the two dependent variables). Data sources and basic descriptive statistics for these variables can be found in Appendices A and B.

Table 1: Independent variables by category

Variable (shorthand name for figures)	**Description**	**Anticipated effect direction (categories) /Type of indicator (variables)**
Collaborative regimes		Positive
Number of GSPs in basin (# GSPs)	Count of submitted GSPs in groundwater basin where having more than one plan indicates the degree of fragmentation[5]	Negative
Percent of GSAs with more than one entity (collaborative GSAs)	Percent of GSAs authoring plan that are collaborative endeavors as opposed to single-entitle GSAs[4,6]	Positive
Number of agencies involved (# agencies)	Total count of local water and land use agencies involved in authoring each GSP	Positive
Representation		Positive
Use of stakeholder committee(s) (committee)	Percent of GSAs authoring plan that employed a stakeholder committee or advisory board for plan development[5]	Positive

[5] Because SGMA allowed for extensive flexibility for how, when and if local agencies collaborated in implementation, two measures of the extent of collaboration are used here, one measuring collaboration in the formation of GSAs and one measuring collaboration in the development of GSPs (negative indicator of collaboration)..

[6] Percent used to normalize across plans with different numbers of GSA authors

Percent of board seats representing drinking water users (% board DW)	Percent of board of director seats (across all plan-authoring GSAs) representing drinking water users	Positive
Percent of board seats occupied by people of color (% board POC)	Percent of board of director seats (across all plan-authoring GSAs) that are assessed to be non-white people of color using surname analysis	Positive
Stakeholder engagement		Positive
Level of outreach and stakeholder engagement (outreach)	Degree of outreach and stakeholder engagement efforts detailed in GSP pertaining to plan development (e.g. stakeholder workshops, mailed flyers, distribution of surveys)	Positive
Incorporating comments on draft plan (comments)	Degree to which GSP demonstrated evidence of addressing public comments received on draft plan in the final plan submitted	Positive
EJ engagement (EJ)	Extent of involvement of environmental justice organizations in plan development	Positive
Elite Power		Negative
Percent irrigated agriculture (% irrigated)	Percent of plan area that is irrigated agricultural lands	Negative
Annual agricultural profits (ag profits)	Annual agricultural profits for primary county overlapping the plan area	Negative
Problem severity		Positive
Reported household well outages (well outages)	Reported household water outages in plan area since 2013	Positive
Aquifer water quality risk percentile (quality risk)	Average percentile rating for the plan area from the State water Resources Control Board Aquifer Risk map	Positive
Number of Disadvantaged Communities (# DACs)	Count of Disadvantaged (low-income) census designated places in plan area	Positive

Analysis

In this paper we employ Boosted Regression Trees (BRT) to identify potential factors ("drivers") associated with more or less equitable GSPs for vulnerable drinking water users as measured by the above two output variables: GSP assessment score and Quality MTs. BRT is a machine learning approach that serially (additively) fits and combines Classification or Regression Trees (CART models) using the residuals from the previous model to continually improve predictions. Doing so leverages the unique flexibility of CART models, which can accommodate different types of predictor variables, nonlinear relationships and missing data, while avoiding the tendency for overfitting (Elith, Leathwick, and Hastie 2008). The use of a randomly selected subset of data in fitting each new tree introduces stochasticity further reducing the risk of overfitting and influence of outliers (Yang et al. 2016).

Notably BRT methods cannot address standard issues with observational data such as simultaneity, selection bias or omitted variables, and because a minimum number of observations per terminal node is set *a priori*, it can also limit learning from more exceptional cases. For these reasons BRT is best suited to general prediction and inquiry as compared to causal inference (Epstein et al. 2021). Nonetheless, the flexibility of the approach makes it well suited to research questions where theory is lacking, ambiguous and/or fragmented as it is in this case (Epstein et al. 2021).

Prior to running the models, we assessed the bi-variate correlations between all included terms to identify any potentially confounding multicollinearity between included model terms (see Appendix F). Just two pairs exhibit a correlation greater than 0.55 and neither by much: agricultural profits and the number of GSPs have a correlation coefficient of 0.62 and number of DACs and number of total agencies a coefficient of 0.61. Based on these findings we chose to retain all terms for modeling.

As Epstein et al. (2021) do, we tuned both model parameters (one for each dependent variable) using the caret package (Kuhn et al. 2020) creating a search grid of possible parameters for number of trees, interaction depth, learning rate (aka shrinkage), and minimal observations per terminal node with a fixed bagging fraction (See Appendix E for grid dimensions and tuning notes). Using tenfold cross validation the following optimal parameters were selected for Model A (GSP assessment score model):

number of trees=2000, interaction depth=2, shrinkage=0.0025, minimum observations=6 resulting in a Root Mean Squared Error (RMSE) of 14.78. Using the same procedures, the following optimal parameters were selected for Model B (ordinal water quality Minimum Thresholds dependent variable): number of trees=1800, interaction depth=2, shrinkage=0.001, minimum observations=4 resulting in a predictive accuracy of approximately 70.3%.[7]

Using these parameters, both models were then executed in the gmb package (Greenwell et al. 2019) to estimate the relative influence of the driver variables. Relative influence is a measure of how frequently each variable is employed in the trees fit weighted using the improvement in model error or how much of the total explained variance is accounted for by each term. Thus, we can interpret these scores as a relative measure of how important each variable is in determining the outcome variable in question in comparison to other included variables (explicitly excluding omitted variables from consideration) (Epstein et al. 2021). To visually display results for select variables we use the pdp package (Greenwell 2017) to create partial dependence plots.

Results

First, while the focus of this paper is comparing the degree to which collaborative regimes, elite power, representation, stakeholder engagement and problem severity are associated with greater accounting for vulnerable drinking water users in GSPs, the extent to which equity was integrated in the 45 GSPs merits some prior discussion: The average assessment score was a mere 37.63% with a low of 3.85% and a high of 79.41%. The extent to which these same plans set minimum thresholds for important drinking water quality constituents and how they did so follow a similar trend: most GSPs (53%) did not set management criteria for any of the seven constituents and those that did most set their threshold for acceptable water quality above what is allowed for drinking water under state safety standards, often well

[7] Model performance is assessed differently for the two models due to the difference in dependent variable type. Whereas the GSP assessment score variable for Model A is continuous, the quality Minimum Thresholds variable for Model B is an ordinal categorical variable.

above. Just four GSPs (8.9%) set their Minimum Thresholds in a way that supported water providers meeting drinking water standards without exceptions.

Table 2 shows the cumulative relative influence of the driver variables by category for the GSP assessment score (Model A) and Quality MT (Model B) models respectively. The relative influence of each of the 14 potential driver variables individually is provided in Figure 1 with the nature of the association (positive or negative) displayed in parentheses.

Table 2. Cumulative relative influence by independent driver variable category for Model A (GSP assessment score) and Model B (Water quality Minimum Thresholds)

	Cumulative relative influence	
IV Category	*Model A*	*Model B*
Collaborative regimes	12.76%	7.19%
Elite power	16.45%	10.50%
Problem severity	32.19%	37.94%
Representation	22.47%	38.91%
Stakeholder engagement	16.13%	5.46%

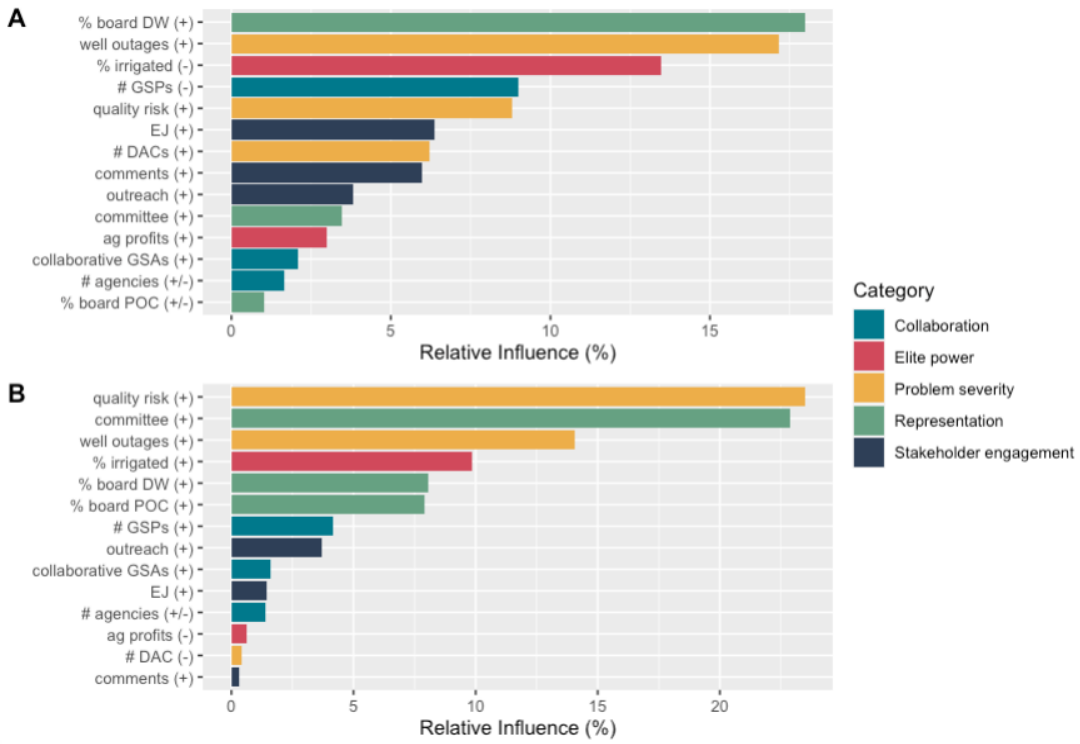

Figure 1. Relative influence of driver variables for A) GSP assessment score model and B) Quality MT model with variable category. Direction of each displayed in parentheses.

Of the collaborative regime variables, across both models, only the number of GSPs per basin in the assessment score model (Model A) demonstrates more than 5% influence (8.91%). In the quality MT model (Model B), the number of GSPs is still the most influential variable of the three but moves from the fourth most influential variable overall to the seventh most influential. Notably the anticipated negative effect on equity of increasing numbers of GSPs per basin is not observed in results for Model B where more GSPs actually corresponds to more/more drinking water aligned water quality Minimum Thresholds. The percent of GSAs that are multi-party collaborations and the total number of involved agencies have similar effect sizes in both. Collectively then the collaborative regimes variable category has a combined relative influence of 12.76% in Model A and slightly more than half that, 7.19%, in Model B.

The cumulative influence of the elite power variables is also reduced moving from Model A to Model B (16.31% to 10.50%), although to a lesser degree. In both cases, the percent of irrigated acreage exhibits a much larger influence (more than four times greater) than annual agricultural profits, which not

only is limitedly influential, but also exhibits the opposite effect as hypothesized (positive rather than negative) in Model A. The expected negative influence is, however, observed on the quality Minimum Thresholds dependent variable in Model B.

The smaller than expected effect of elite power in the form of irrigated agriculture is surprising and potentially enlightening. The unexpected positive association between county agricultural profits and the two dependent variables could be explained by those GSAs having more funding to develop their GSAs, and/or more at stake in ensuring their GSP is approved by the state. That percent irrigated area is far more influential overall could indicate that influence of agriculture in these areas transcends mere profits, a view supported by the importance placed on minimizing any potential reduction in agricultural acreage in many local GSP development processes. This finding may also indicate a need to experiment with different measures to capture elite influence in collaborative decision making.

The percentage of board seats dedicated to drinking water representatives is the most influential variable in Model A, representing 18% of all the influence exerted by the 14 independent variables. Interestingly, in the water quality MT model (Model B), the use of stakeholder committees overtakes board drinking water representation as the most influential representation variable accounting for nearly 23% of the influence explained in the model while drinking water representation moves to the 5th most influential variable accounting for 8% of the total influence. The percentage of board seats held by people of color is the least influential variable in Model A, with a relative influence score of just over 1% but in the second model the same variable accounts for nearly 8% of the cumulative variable influence rising all the way to 6th place in the ranking of most influential variables with a similar degree of influence to board drinking water representation. Overall, the influence of representation on equity in GSPs is larger than both collaboration and elite power, and increases between Model A (22.30%) to Model B (38.91%).

Among the stakeholder engagement variables, in Model A, environmental justice advocacy (6.38%) has the largest impact, followed closely by incorporating comments (6.00%) followed by outreach efforts (3.82%). In Model B outreach is the most influential of the three variables constituting more than double the influence of environmental justice engagement which in turn exerts more than

double the influence of demonstrated evidence of incorporating comments. In Model A stakeholder engagement variables account for a total of 16.20% of the relative influence amongst all predictor variables. In Model B stakeholder engagement variables in turn account for just 5.46% representing the largest magnitude change amongst categories between the two models.

Problem severity, characterized by ambient water quality (aquifer risk percentile), reported well outages and the number of Disadvantaged (low-income) Communities (DACs) in a plan area, has a large, estimated influence in both models, 31.91% in Model A and 37.94% in Model B. Of note, while well outages are the most influential GSP assessment scores (second most influential variable overall), increased aquifer quality risk (worse water quality) most drove setting water quality thresholds, and, in fact, is the most influential variable overall in the later model (Model B) although well outages remain influential as well. Increasing number of DACs, in contrast, had a much stronger effect on GSP assessment scores than setting water quality criteria. Moreover, more DACs has a negative, rather than the expected positive impact on water quality thresholds. This is interesting given that more DACs generally corresponds to increased drinking water use of the underlying aquifer.

Partial dependence plots for the three most influential variables from both models are displayed in Figure 2, plots for the remainder of the variables are displayed in Appendix G. In several cases, thresholds or “tipping points” of potential importance emerge. For example, when it comes to drinking water representation on GSA governing boards, when less than 20% of board seats are so occupied the effect is negligible, at 20% an increasing trend of GSP assessment scores is observable and after approximately 40% the association levels off. In Model B the effect of drinking water representation is more linear until approximately the 50% threshold after which point the association also levels off. Several of the problem severity indicators exhibit similar tendencies. The presence of one or two low-income communities in the plan area has a large effect on GSP assessment scores but starting around two and certainly after reaching five communities no additional changes are noted. After a small initial increase, increasing numbers of communities have as mentioned a negative impact on water quality thresholds but again above five communities this effect levels off. Surpassing a 60th percentile risk score for aquifer water quality is

associated with a marked increase in likelihood that given GSP sets water quality minimum thresholds and does so with consideration of drinking water standards as well as in GSP assessment scores. Lastly, the first few well outages recorded in a plan area are associated with positive increases in both dependent variables with more minimal positive increases occurring between approximately five and forty dry well reports after which the impact is negligible.

In a few other cases, the relationship between independent variables and attention to vulnerable drinking water users is unexpectedly non-linear. The number of local water and land use agencies involved in authoring each GSP initially shows the anticipated positive effect in both models. This changes however after reaching approximately five involved parties, after which the effect of increasingly larger cooperative efforts is negative. Finally, while generally there is no observable association between increased representation for people of color on GSA boards and GSP assessment scores, there is a notable decrease in scores for plans with boards comprised of between 15% and 20% people of color.

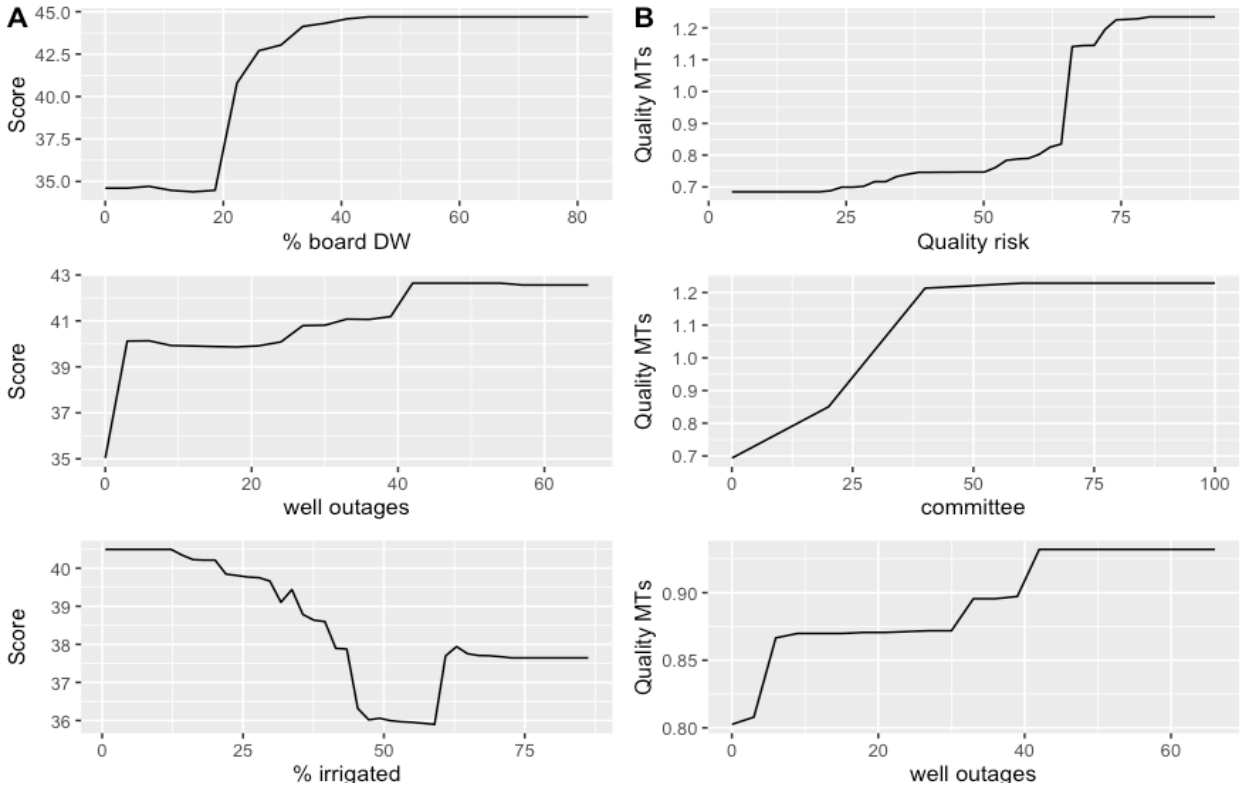

Figure 2. Partial Dependence Plots for top three most influential variables from each model. Left panel: Model A, GSP assessment scores Right panel: Model B, Quality MTs.

Discussion

The disappointing distribution in both dependent variables highlights both the challenge of collaborative governance for environmental justice and the importance of understanding the factors that promote or hinder equity outcomes in these efforts. Our results provide a first inroad to doing so raising some potential explanations, and a whole host of additional questions for further investigation. After first discussing the two proposed null hypotheses in light of these results we consider four salient findings regarding the drivers of equity in collaborative governance in turn: 1) improved equity outcomes derive from many overlapping factors; 2) the critical importance of not just representation but also of the degree and form of representation; 3) that effects vary depending on the outcome considered; and 4) the potential for non-linear associations and threshold effects. Lastly, we consider the need for future research to advance our understanding of the potential of advancing equity goals in collaborative environmental governance.

The reasonably high-performance level of both models combined with the fact each independent variable was established to have at least a minimal influence on GSP assessment scores and water quality thresholds indicates that collaborative governance is not entirely symbolic, at least when it comes to equity. Nonetheless, the relatively large influence exerted by contextual problem severity variables in comparison with several of the key tenants of collaborative governance such as stakeholder engagement and collaborative institutions is far from a strong endorsement of a collaborative governance's equity potential, especially given the small estimated effects. For example, even the most influential factor from Model A, board representation for drinking water users, is estimated to increase GSP scores by a maximum of ten percentage points. This supports previous research findings that collaborative governance is insufficient for producing fundamental changes to water governance including for advancing equitable water access (Dobbin and Lubell 2019; Pahl-Wostl et al. 2007). Interestingly, notwithstanding this seemingly limited direct effect on management outcomes, there is some indication that collaborative governance reforms may work towards such goals in other more long-term ways including by building the size and strength of social movements, strengthening community ties, and

creating new organizations (Dobbin 2021; Villamayor-Tomas and García-López 2018; Villamayor-Tomas, García-López, and Scholtens 2020).

We do, however, find evidence that specific drivers influence more performative, potentially stakeholder placating outcomes to a greater degree than substantive policy actions. The overall effect of stakeholder engagement is much larger on plan contents (Model A) than management decisions (Model B), indicating potentially more reluctance on the part of GSPs to listen and adjust more impactful management decisions. The influence of collaborative regimes on enforceable quality minimum thresholds is nearly half of what it is on GSP assessment scores. The influence of stakeholder engagement, in turn, is reduced by nearly two-thirds in the threshold model compared to Model A. The performative nature of these changes is further supported by the steep drop in influence of incorporating comments from Model A to Model B, highlighting an important environmental justice stakeholder complaint that few substantive changes were made to sustainable management criteria while finalizing draft plans (Dobbin 2021).

Similarly, the effect of environmental justice advocate engagement in GSP development illustrates this challenge well. In the GSP assessment score model, Model A, environmental justice engagement is the sixth most influential variable. In comparison, in Model B, their influence ranks tenth with a relative influence score reduced to almost a quarter of what it was. While this finding is not surprising given that such a phenomenon has been a growing concern for scholars studying environmental justice movements (Pellow 2016b, 2016a; Pulido, Kohl, and Cotton 2016) and has been cited by organizers specifically in SGMA (Dobbin 2021), it is concerning prospect generally given how pervasive collaborative approaches are becoming in environmental policy development and implementation. This is particularly true if collaborative governance is more prone to "equity performance" than other forms of environmental decision-making, a question which is ripe for future research. Nonetheless, environmental justice advocacy was shown to have a positive influence on both measures emphasizing the need for further attention to social movements on collaborative governance, and common pool resource governance more broadly (Morrison et al. 2019; Villamayor-Tomas and García-López 2018).

Notably the pattern of more performative outcomes also holds for the influence of agricultural power, an unexpected finding given the documented ability of such powerful industry interests to impede progressive outcomes (Brisbois et al. 2019; Cook 2015). The lack of progressive minimum thresholds outcomes across all 45 plans combined with the presence of a strong agricultural sector across the majority of plan areas may present one explanation for this if a lower threshold of elite influence is simply unobserved in our sample. In contrast, the pattern does not hold when it comes to representation which exerts a far greater influence on minimum thresholds than GSP assessment scores as we will explore below.

Given these significant constraints on the degree and type of effect, what do these results say about specific factors that facilitate or impede more equitable outcomes in collaborative governance? Although not transformative in any respect, we do document an associated influence on the part of all four proposed drivers: collaborative regimes, elite power, stakeholder engagement and representation. This indicates that any prospect of advancing equity in collaborative planning will likely result from several (or even many), rather than a few or single factors. Importantly, as demonstrated by the correlation matrix, these drivers are all also clearly interrelated. This highlights the importance of integrating an equity perspective into all aspects of collaborative governance design and implementation.

While all five categories included in the analysis do demonstrate influence on the dependent variables in both models, and indeed all individual independent variables do as well,
The most influential of the four proposed factors influencing the integration of equity is representation by a relatively large margin. In the GSP assessment score model, Model A, representation accounts for more than 22% of the cumulative influence of the independent variables, the majority of which is derived from just one representation indicator: board representation for drinking water users. In the water quality thresholds model, Model B, representation is the most influential category overall constituting nearly 39% of the cumulative influence. In the latter case, however, the majority of this influence is derived from use of stakeholder committees to develop a GSP with board representation for drinking water users and people of color playing a smaller but also influential role (interestingly, people of color representation on

the board has a negligible effect on GSP assessment scores with a relative influence score of just 1% and relatively flat predicted effect holding other factors constant (see additional partial dependence plots in Appendix G)). This finding indicates that not just the extent of representation matters but that the type of representation does as well, potentially varying depending on the output or outcome assessed. Anecdotally, our experience with SGMA implementation indicates that where they were used, stakeholder committees were often leveraged for discussing Sustainable Management Criteria, which includes Minimum Thresholds. GSPs, on the other hand, which are often thousands of pages long, were often more the domain of consultants under the direction of GSA governing boards. This may explain the difference in relative influence observed for stakeholder committees between the two models. Why representation, in the form of racial and ethnic diversity has a similar effect to drinking water user representation on water quality thresholds but a negligible effect on GSP assessment scores is not immediately clear but could relate to the disproportionate impact of poor water quality on communities of color in the state (Balazs et al. 2011, 2012). All these potential explanations require further investigation to confirm, but the results do highlight the importance of delving further into the different roles and mechanisms by which representation may influence outcomes. To the extent that division of labor occurs in such large collaborative planning processes, the relative effects of representation in different roles may vary.

A third key finding relates to the already discussed propensity for more performative than substantive impacts from these four categories. The significant differences between the two models provide a clear demonstration of the fact that when it comes to collaborative governance, the measure matters. If a goal is to develop a management plan that reflects vulnerable stakeholders, our findings indicate that stakeholder engagement may well be an effective tool to accomplish that. But if the goal is to establish management criteria that protect those users, representation is far more promising. Precisely because there is ongoing debate as to the realized effect of collaborative governance (Koontz 2005; Lubell 2004; Lubell and Lippert 2011; Newig et al. 2018) as well as the difficulty of measuring collaborative outputs/outcomes (Lubell 2004), such differences underscore the importance of clarity and

diversity in measuring collaborative outputs. Such distinctions have the potential to advance more critical interrogations of claims of collaborative governance as symbolic policy (Lubell 2004). For the time being at least, findings should only be generalized with extreme care. This is perhaps even more important when it comes to social equity, which is not just challenging to measure (as is clearly illustrated herein), but also poses enhanced risk for performative symbolic policy making as already discussed. Taking care to attend to nuance in cause and effect will go a long way to advancing our heretofore limited understanding of the empirical effects of collaborative governance in practice (Emerson and Nabatchi 2015).

Lastly, an unexpected important contribution of this study is raising the prospect of non-linear and threshold effects relating process/context with management outputs. In our results we see this most prominently among representation and problem severity independent variables. The necessity of having not just a single representative of a marginalized stakeholder group, but rather a meaningful proportion of representatives to impact results corresponds with qualitative research into the potential limits of minority participation in environmental decision-making (Dobbin 2020; Méndez-Barrientos et al. 2020) and provides a potential explanation for the seeming lack of effect in other cases (García and Bodin 2019; Scott 2015). Further that the effect of ambient water quality risk is significantly delayed compared to domestic well outages highlights how problem visibility influences local perceptions of the challenges they face.

Similarly, some of the documented associations between independent and dependent variables were not unidirectional. For example, the number of agencies involved in authoring each GSP. While more inclusive and extensive collaborations with more members embody the ethos of collaborative governance most fully, indicating potentially greater prospects for integrating vulnerable drinking water users and their needs, we find that the effect of collaboration is positive, but only to a certain extent. After approximately 5 partner agencies join the fray, the costs of collaboration appear to outweigh the benefits, at least as far as vulnerable drinking water users go. Much more research is needed to address this and other potential costs to collaboration as a necessary complement to additional research into potential benefits. While we are cognizant of the limits of our sample size and thus wish to refrain from too much

interpretation of these patterns, the prevalence of such associations in our results presents a possible explanation for the ongoing contradictions and ambiguity in collaborative governance research.

In addition to the items already discussed, a key direction for future research that arises from this initial attempt to identify drivers of outcomes in collaborative governance is the role of path dependence. While each of the fourteen variables investigated here were found to influence GSP assessment scores and water quality minimum thresholds in GSPs, we also know that associations exist among these variables themselves. Thus, while we attempt to quantify direct impacts on equity integration in this paper, what remains entirely unaddressed in this study is the potential for indirect effects. Considering the correlation matrix in Appendix F, that collaborative regimes are positively associated with several other influential drivers such as drinking water representation, outreach and incorporating comments highlights some limits to the analysis approach and the importance of considering path dependence. For example, to the extent that collaboration facilitates representation and stakeholder engagement, the influence of collaborative regimes could be significantly higher than we document here. As another example, environmental justice organizations have dedicated years to the SGMA implementation process with a significant focus on securing representation for small and rural drinking water users (Dobbin 2021). By documenting the outcome of these efforts it would then be possible to potentially attribute additional influence to environmental justice engagement on our dependent variables, enacted indirectly through the representation variables. The (variable) impact of representation is yet another case where such research could be illuminating. We highlight these possibilities both as important context for understanding our findings and their limitations, but also to advocate for the need for mixed method and qualitative research linking collaborative environmental governance with specific outcomes. As we have noted, empirical assessment of outcomes is limited across the board but of what does exist, this paper included, most are either quantitative or single case studies. To the extent that this trend continues, our understanding of these processes and their impacts will likely continue to be partial.

Conclusion

The limited integration of equity goals into all the plans, even under favorable conditions, highlights the ongoing equity gap in collaborative governance and the urgent need for skepticism and investigation of potential and realized outcomes of these management processes. Comparing factors that influence the content of groundwater management plan to those that influence the setting of enforceable water quality criteria, our initial foray into these efforts suggest that particularly certain elements of collaborative dogma may indeed be more performative than substantive, at least when it comes to advancing equity. Nonetheless collaborative regimes, stakeholder engagement, representation and elite power all impacted both management outputs highlights some, albeit limited, potential for progress if equity can be integrated holistically into design and implementation. Among these factors, representation was by far the most influential and the only factor to influence management thresholds more than overall plan content. Notably, between the two models, the relative influence of different forms of stakeholder representation varied, indicating that the degree and form of representation matters. Relatedly, changes between the two models underscores that results are sensitive to the specific measure of performance assessed. Thus, we caution researchers and practitioners alike to not generalize between measures and suggest employing multiple measures when considering any given performance criteria such as equity. Based on the prevalence in our results, researchers should expect to observe non-linear and threshold effects and account for these in designing their approaches. The complexity of relating such factors with management outputs and the nuance in these relationships themselves is, in many ways, the antithesis of the many broad claims that have been made of collaborative governance for well over a decade, serving as yet another cautionary tale to be mindful of governance panaceas (Ingram 2011).

A sample size of 45 provides admittedly limited observational power to derive even "rough rules of thumbs" (Elith et al. 2008:804) regarding the drivers of integrating equity into collaborative governance. Nonetheless the critical nature of the SGMA case, the tangible environmental justice implications, and the relative lack of systematic empirical investigation into the topics across the field merit undertaking, and learning from, this initial attempt. The submittal of another 65 GSPs in January

2022 provides an opportunity to expand this scope of the analysis and test the robustness of these findings with a larger sample. Further, additional research in other cases is needed to confirm the applicability of any of these findings beyond SGMA implementation. Based on our findings we suspect that variability and nuance will only continue to grow, necessitating not just more studies but also different types of studies including qualitative studies to both assess equity in management outputs/outcomes and link these to specific potential drivers/impediments as we do here. Such efforts have the potential to finally bring us closer to an answer as to whether collaborative governance offers the potential to enhance equity, even if the answer is: it depends. Afterall, what matters is likely precisely those details.

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Supplemental Information

Appendix A: Variable sources

Variable	Data source
GSP assessment score	Authors - Human right to water rubric assessment (see appendix C)
Water quality Minimum Thresholds set	Authors - Human right to water rubric assessment (see appendix C)
Number of GSPs in basin/subbasin	Department of Water Resources GSP portal (https://sgma.water.ca.gov/portal/gsp/status)
Extent of collaborative GSAs	Department of Water Resources GSP portal (https://sgma.water.ca.gov/portal/gsp/status)
Facilitation Support Services	Department of Water Resources Public Records Act (PRA) request
Stakeholder committee or advisory board	Authors - Human right to water rubric assessment (see appendix C)
Percent of board representing drinking water users	Authors - Human right to water rubric assessment (see appendix C)
Percent of board of directors that is people of color	Authors - Board of directors assessment (see appendix D)
Level of outreach and stakeholder engagement	Authors - Human right to water rubric assessment (see appendix C)
Incorporating comments	Authors - Human right to water rubric assessment (see appendix C)
EJ engagement	Authors - Self-reported by three named organizations using author provided form
Reported outages	California Department of Water Resources Household Water Shortages Reporting System (https://mydrywatersupply.water.ca.gov/report/)
Aquifer quality risk percentile	State Water Resource Control Board 2021 aquifer risk map (https://gispublic.waterboards.ca.gov/portal/apps/webappviewer/index.html?id=17825b2b791d4004b547d316af7ac5cb)
Number of Disadvantaged Communities	Department of Water Resources DAC mapping tool (2016 data year). Missing data from the DAC mapping tool was filled in using internet and

	record searches.
Percent irrigated agriculture	California Natural Resource Agency 2018 Statewide Crop Mapping GIS geodatabase (https://data.cnra.ca.gov/dataset/statewide-crop-mapping/resource/898a116e-53ae-4d71-b17e-2d8b0146f143)
Annual agricultural profits	California Department of Food and Agriculture Agricultural Statistics Review 2019-2020

Appendix B: Variable descriptive statistics

Variable	**Mean (st. dev)**	**Min**	**Max**
GSP assessment score	37.63% (18.32)	3.85%	79.41%
Water quality Minimum Thresholds set	0.89 (1.07)	0	3
Number of GSPs in basin/subbasin	4.11 (2.36)	1	7
Proportion of collaborative GSAs	48.35 (47.02)	0	100
Facilitation Support Services	0.2 (0.40)	0	1
Proportion of GSAs using Stakeholder committee or advisory board	33.61 (45.73)	0	100
Percent of board representing drinking water users	20.30 (25.35)	0	100
Percent of board of directors that is people of color	17.27 (16.53)	0	60
Level of outreach and stakeholder engagement	1.29 (0.76)	0	2
Incorporating comments	1.31 (0.85)	0	2
Environmental justice engagement	1.49 (2.26)	0	8
Reported outages	49.34 (115.41)	0	641
Aquifer quality risk percentile	49.70 (24.66)	4.22	92.05
Number of Disadvantaged Communities	3.64 (4.39)	0	20

Percent irrigated agriculture	45.95 (23.46)	0.55	86.27
Annual agricultural profits	$5,215,767,556	$231,990,000	$7,714,540,000

Appendix C: Human right to water scorecard GSP assessment tool

GENERAL GSP INFORMATION				
Descriptives				
GSP name:				
GSP website link:				
Groundwater basin/subbasin name:				
Groundwater basin number:				
Number of associated GSA(s):				
Names of associated GSA(s):				
WATER QUALITY				
Questions	Yes/Somewhat/ No	Summary/evidence		Page numbers for reference
Does the plan discuss current water quality conditions in terms of drinking water needs/standards (eg PWS MCL violations, public health concerns for domestic wells etc.)?				
Does the plan explain how drinking water stakeholders were involved in defining URs, MOs or MTs for degraded groundwater quality?				
Does the plan discuss the potential impacts of MTs for water quality on drinking water users (domestic wells and public water systems/cities)?				
Constituents of concern (CA drinking water MCL)	Minimum Threshold (include units, use "none" for none)	Measurable Objective (include units, use "none" for none)	Explanation/rationale provided for MT or for not setting MT	Page numbers for reference
Nitrates (10 mg/L as N, as NO3 45)				
Arsenic (10 µg/L)				
Uranium (20 pCi/L)				
DBCP (0.2 µg/L)				
1,2,3-TCP (0.005 µg/L)				
Chromium-6 (None currently, former and in process standard is 10 µg/L)				

Perchlorate (6 µg/L)				
WATER ACCESS				
Questions	Yes/Somewhat/ No	Summary/evidence		Page numbers for reference
Does the plan discuss current water levels/depth to groundwater conditions in terms of drinking water needs/access?				
Does the plan explain how drinking water stakeholders were involved in defining URs, MOs or MTs for chronic lowering of groundwater levels?				
Does the plan discuss the potential impacts of MTs on drinking water users (domestic wells and public water systems/cities)?				
Does the plan include a technical analysis/discussion of potential for domestic wells to go dry given management decisions? (beyond simply noting the possibility which would be included in the above question)				
Is there an overview of the drinking water impacts experienced during the 2012-2016 drought?				
DRINKING WATER AS A BENEFICIAL USE				
Questions regarding types of drinking water beneficial users	Adequately identified as beneficial user? (Yes/Somewhat /No)	Description provided in GSP (e.g. names, #, summary stats like spatial distribution and well depths etc.) and comparison to reference data (tab 2) where appropriate		Page numbers for reference
DACs/SDACs				
Public Water Systems (including cities)				
Domestic Wells				
Questions	Yes/Somewhat/ No	Summary/evidence		Page numbers for reference
Does GSP account for increased municipal/domestic water demand due				

to future population growth/development?			
Does the sustainability goal mention the importance or protection of groundwater for domestic/municipal uses?			
Does the GSP provide a description of how drinking water users input was considered when defining the sustainability goal?			
Does GSP discuss and/or affirm the human right to water (AB 685)			
PARTICIPATION AND ENGAGEMENT IN GSP DEVELOPMENT AND IMPLEMENTATION			
Descriptives			Page numbers for reference
Draft GSP comment period start date			
Draft GSP comment period end date			
Draft GSP comment period length (days)			
Date that final GSP was adopted			
Is there a Stakeholder Communication and Engagement Plan included in the GSP? (Y/N)			
Questions	Yes/Somewhat/ No	Summary/evidence	Page numbers for reference
Were significant and meaningful attempts at outreach and community involvement in GSP development made? (public workshops, community meetings, targeted outreach, various/creative communication methods, material development etc. Don't count full draft plan public comment period required by law but can consider prior comment periods on parts of preliminary drafts if applicable)			
Is there evidence of the GSA(s) incorporating public comments into GSP?			

Translation/interpretation efforts made? (notices, meetings, materials, GSP)			
Is there a plan for inclusive public engagement during GSP implementation?			
DRINKING WATER AFFORDABILITY			
Questions	Yes/Somewhat/ No	Summary/evidence	Page numbers for reference
Is drinking water affordability discussed in the plan and/or are accommodations for affordability made (e.g. exemptions/reductions /rebates for fees or penalties for low-income users)?			
PROJECTS AND MANAGEMENT ACTIONS			
Descriptives	Yes/No	Summary/description	Page numbers for reference
Does the plan propose or consider employing a groundwater market?			
Questions	Yes/No	Summary/evidence	Page numbers for reference
Does the plan include projects/actions that specifically address drinking water needs? (generally reducing pumping or increasing supply not counted whereas targeted recharge to improve water quality while increasing supply or targeted recharge to protect domestic or otherwise vulnerable wells from dewatering would count)			
Does the plan include projects/actions that directly benefit a DAC/SDAC? (same stipulations as above)			
MITIGATION			
Questions	Yes/Somewhat/ No	Summary/evidence	Page numbers for reference

Does the GSA propose any actions/projects to mitigate for impacts to drinking water wells caused by the actions (or lack of actions) of the GSA? Impacts may include dry wells, contamination plume etc. Programs may include mitigation funds, drinking water wells technical assistance, protection zones near DACs and SDACs and other options.			
Does the plan go beyond aiming to prevent further degradation and strive to remediate groundwater conditions and advance the human right to water?			
GSP GOVERNANCE (Plan level only, LEAVE BLANK for single GSA plans and see below)			
Descriptives	Summary/description		Page numbers for reference
Description of plan-wide governance/decision-making system for GSP development if applicable			
Description of plan-wide advisory or stakeholder committee for GSP development if applicable			
Questions	Y/N/NA	Summary/evidence	Page numbers for reference
Drinking water stakeholders represented on stakeholder/advisory committee? (NA for those without committee)			
DAC stakeholders represented on stakeholder/advisory committee? (NA for those without committee)			
GSA GOVERNANCE (duplicate section for each authoring GSA)			
GSA name:			
Descriptives	Summary/description		Page numbers for reference or other source
Description of GSA governing board			
Description of GSA advisory/stakeholder committee			

Questions	Y/N	Summary/evidence	Page numbers for reference or other source
Is this GSA a drinking-water provider, or if the GSA is an MOU/JPA or special district, is one or more drinking-water representatives on the board?			
Does this GSA directly represent a DAC? Or if the GSA is an MOU/JPA or special district, is one or more DAC representatives on the board?			
Are there specific drinking water stakeholders represented on stakeholder/advisory committee? (NA for those without committee)			
Are there specific DAC stakeholders represented on stakeholder/advisory committee? (NA for those without committee)			

Appendix D: Surname analysis methods, limitations and rationale

One representation variable included in the analysis is the percent of board seats occupied by non-white board members. This variable was developed using board rosters collected between January and April 2021. To collect these rosters we first checked if a GSA had a website, and if so, if this information was provided. Where this method was unsuccessful, for those single entity GSAs where the GSA was the same entity as a previously existing water or land use agency, we collected directors names from county election records. As a last resort, individual GSAs were emailed and asked for this information directly. If they did not respond to our request in a few weeks, we then submitted a Public Records Act request. In this manner names were collected for all GSAs in the analysis (authors on submitted GSPs).

After organizing and cleaning the resulting data we loaded the data into R and used the wru package (Khanna and Imai 2017) to predict race/ethnicity using surnames. Wru predicts the probability that an individual is white, black, hispanic, asian or other for every individual. We then assigned that individual based on the most probable assignment. In almost all cases the most probable assignment has a probability of over 50%, in many cases well over. In 44 of the 558 cases, no surname match for prediction could be made. In these cases we used internet searches to make our best guess at assigning these individuals.

Notably, surname analysis of this type is not perfect and self-identification data, if it were available, would certainly be better. Given that it is not, however, these procedures provide an important avenue for investigating critical questions about the effect of representation with a reasonable level of classification accuracy (Mateos 2007; Wais 2016; Williams et al. 2018).

Appendix E: Model tuning parameters

A search grid of possible parameters for number of trees, interaction depth, learning rate (aka shrinkage), and minimal observations per terminal node was employed to select the optimal parameters for each model. In both cases the parameter grid consisted of the following: interaction depths between two and four, number of trees between 800 and 5,000 by 100 tree increments, learning rates of 0.001, 0.0025, 0.05, 0.01 and a minimum of between three and six observations per terminal node.

The bagging fraction for each model was then selected through experimentation starting with an estimate of 0.6. We opt for the lower end of the typical range of 0.5-0.75 for Boosted Regression Tree Models given the relatively large number of relevant predictors included (Boehmke and Greenwell 2019; Elith et al. 2008). For Model A, a bagging fraction of 0.65 was ultimately selected after testing 0.5, 0.6 and 0.7 as well. Using 0.5 provided slightly improved predictions but required more than double the number trees/processing time and 0.7 providing reduced accuracy and almost no efficiency gains. For Model B, a bagging fraction of 0.7 was selected which improved predictive accuracy over 0.6 with no noticeable efficiency losses.

Appendix F: Correlation matrix

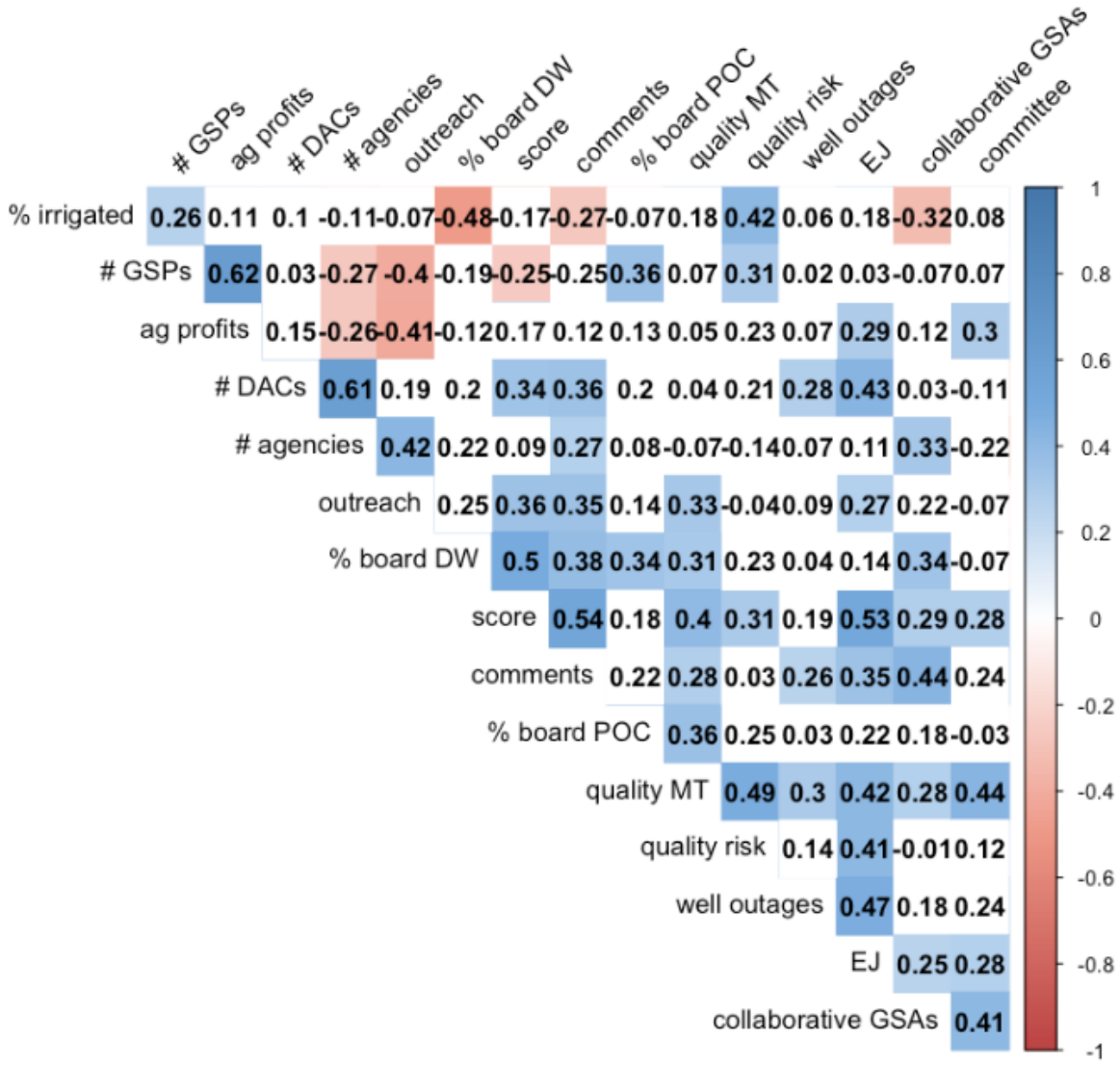
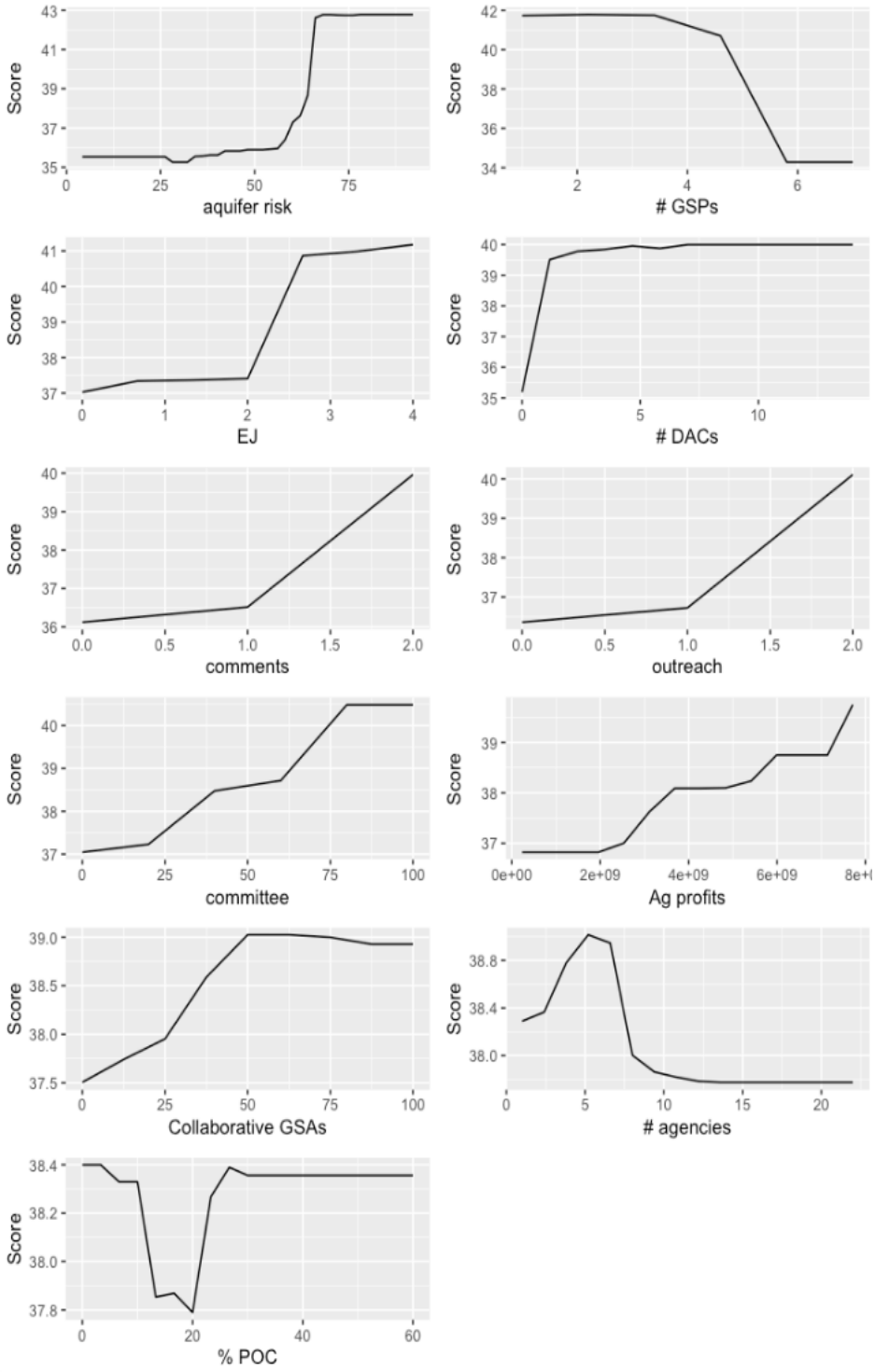


Figure S1. Correlation matrix with both dependent variables and all independent driver variables. Shaded cells are significant at the p<0.1 level. Correlation coefficients are displayed in all cells. Made with corrplot package in R.

Appendix G: Partial dependence plots for other independent variables

Plots for three most influential variables from both models are found in the main article body Figure 2.

Model A: GSP assessment score model



Model B: Water quality minimum thresholds