

Society & Natural Resources

An International Journal

ISSN: 0894-1920 (Print) 1521-0723 (Online) Journal homepage: <https://www.tandfonline.com/loi/usnr20>

Concurrent Governance Processes of California's Sustainable Groundwater Management Act

Anita Milman & Michael Kiparsky

To cite this article: Anita Milman & Michael Kiparsky (2020): Concurrent Governance Processes of California's Sustainable Groundwater Management Act, Society & Natural Resources, DOI: [10.1080/08941920.2020.1725696](https://doi.org/10.1080/08941920.2020.1725696)

To link to this article: <https://doi.org/10.1080/08941920.2020.1725696>

 View supplementary material 

 Published online: 19 Feb 2020.

 Submit your article to this journal 

 Article views: 14

 View related articles 

 View Crossmark data 

Concurrent Governance Processes of California's Sustainable Groundwater Management Act

Anita Milman^a  and Michael Kiparsky^b 

^aEnvironmental Conservation, University of Massachusetts, Amherst, MA, USA; ^bWheeler Water Institute, Center for Law, Energy and the Environment, School of Law, University of California at Berkeley, Berkeley, CA, USA

ABSTRACT

California's Sustainable Groundwater Management Act (SGMA) is a landmark policy that requires achievement of sustainability at the groundwater basin level. In this policy review and analysis, we describe the horizontal, vertical, and network governance processes occurring under SGMA and discuss how they interact with one another. In doing so, we review existing governance theories that can help to shed light on how each governance process may unfold. Depicting SGMA as a complex system of simultaneous and interacting governance processes provides a useful platform for future evaluations of SGMA successes and failures as well as for transferring lessons learned from California's implementation of SGMA to groundwater governance in other locations.

ARTICLE HISTORY

Received 15 June 2019
Accepted 30 January 2020

KEYWORDS

California; governance; groundwater; implementation; institutional collective action; networks; Sustainable Groundwater Management Act

Introduction

In 2014, California passed the Sustainable Groundwater Management Act (SGMA)—a landmark policy that overcame years of stasis. Passage of SGMA advanced California's limited ability to control groundwater depletion toward a nominal commitment to the highest standard of sustainability. The new law requires planning to achieve sustainability at the groundwater basin level, with a novel approach to groundwater governance¹ that distributes authority and responsibility between local and state agencies, seeking to balance the benefits of and demands for local control with the need for oversight.

Prior to SGMA, groundwater across the state was primarily governed by a complex and unsettled combination of overlying, appropriative, and prescriptive rights (Littleworth and Garner 2007). Localized interventions to impose greater control were rare, and largely, though not entirely, limited to the courts and through adjudications, restricted county government regulation, or voluntary adoption of groundwater management plans (Cal. Water Code § 10750 et seq.). Despite acute impacts of groundwater depletion across the state, prior attempts to impose state-level oversight of the resource had been unsuccessful (Sax 2002). Resistance from water users, concerns about economic impacts, and the lack of unified political support all contributed to the failure to

CONTACT Anita Milman  amilman@eco.umass.edu  Environmental Conservation, University of Massachusetts, 210 Holdsworth Hall, Amherst, MA 01003, USA.

 Supplemental data for this article is available online at <https://doi.org/10.1080/08941920.2020.1725696>

© 2020 Taylor & Francis Group, LLC

generate an overarching framework for addressing California's growing groundwater problem (Leahy 2015).

California's challenges in strengthening groundwater governance are not unique. Though groundwater depletion is a well-recognized global concern (Famiglietti 2014) and governance is seen as a solution to the global crisis (Foster et al. 2013), imposition of new forms of groundwater governance is frequently resisted. Water users have a strong short-term interest in unfettered use and resist top-down control, while policy-makers are often unwilling or unable to overcome the political risk of confronting strong constituencies. Further, in spite of the enumeration of multiple paradigms for groundwater governance (see e.g. Varady et al. 2016), it remains unclear which is most effective, under which conditions.

Through SGMA, California adopted an approach to governance that requires a strong movement toward sustainability while allowing the state to retain prior groundwater governance structures, including existing water rights and regulations, and to balance tensions related to local versus top-down control. Scholars and practitioners around the world have rushed to put California's new approach to groundwater governance under their microscopes. Many are eagerly watching as implementation of SGMA unfolds, seeking to evaluate whether and under what conditions the approach can be successful in California and elsewhere (Kiparsky et al. 2017). The valuable developing body of literature on SGMA (see [Supplementary Appendix 1](#)) contains many individually insightful observations, yet each study examines only part of SGMA's changes to both the governance and, subsequently, the management of groundwater in California. While SGMA has a unifying statutory core, in practice, it is not a single policy, action, or even approach. Identifying the key facets of SGMA that influence success on the ground, let alone generalizing to other contexts, will require making sense of multiple simultaneous dimensions of action.

In this policy review and analysis, we depict the complex system of simultaneous and interacting governance processes occurring as part of SGMA and examine the ways in which those processes influence how SGMA unfolds. Specifically, we elucidate the vertical, horizontal, and network governance processes associated with SGMA and how those processes interact with one another. Our analysis synthesizes well-established theories of governance and draws on our experience researching, observing, and participating in SGMA implementation since the law was first passed. By providing a holistic perspective on the interacting governance processes embedded within SGMA, we paint a more complete picture of the concurrent processes contributing to the successes and failures of SGMA.

California's Sustainable Groundwater Management Act

SGMA sets a state policy of sustainably managing groundwater resources. Under the statute, sustainability is defined as the "management and use of groundwater in a manner that can be maintained during the [law's] 50-year planning and implementation horizon without causing undesirable results" (Cal. Water Code § 10721). SGMA's six undesirable results include "significant and unreasonable" (1) Depletion of supply, indicated by chronic lowering of groundwater levels; (2) Reduction of groundwater storage;

(3) Seawater intrusion; (4) Degraded water quality; (5) Land subsidence that substantially interferes with surface land uses; and (6) Adverse impacts on the beneficial uses of interconnected surface water (Cal. Water Code § 10721).

In this paper, we refer to several classes of key actors in SGMA.

- *Local agencies* are preexisting public agencies such as irrigation districts that are eligible to form GSAs singly or in groups.
- *Groundwater Sustainability Agencies (GSAs)* are made up of one or more local agencies,² and are responsible and empowered to meet SGMA goals.
- *State agencies* including DWR and SWRCB are responsible for oversight, enforcement and technical support of GSAs.

To achieve this goal, SGMA encouraged the formation of new local-level institutions for groundwater governance. These new “Groundwater Sustainability Agencies” (GSAs) were to be self-organized by any existing city, county, water utility, special district, or combination of these agencies by June 2017. SGMA then delegates to GSAs responsibility for the development and implementation of Groundwater Sustainability Plans (GSPs). GSPs must include sustainability goals that include minimum thresholds—quantitative metrics representing the point at which groundwater conditions are unacceptable—for each of the six undesirable results. GSPs must also include measurable objectives—quantifiable goals for maintenance and improvement of groundwater conditions—and interim milestones—target values for groundwater conditions in 5-year increments—designed to achieve sustainability within 20 years of plan adoption (Cal. Water Code §10727). Where multiple GSAs formed in a basin, they are required to coordinate to ensure they use the same data and assumptions in their planning and that their efforts collectively will lead to sustainability on the basin scale (Cal. Water Code §10727.6). SGMA offers GSAs an array of authorities and substantial flexibility for implementation.

A crucial and unique feature of SGMA lies in the combination of local governance required and supported by state law and the backstop of direct state oversight. The California Department of Water Resources (DWR) is tasked with review and approval of GSPs. Where local agencies are unable or unwilling to carry out SGMA responsibilities, or a GSA fails in its governance, planning, or implementation, SGMA provides for enforcement and sanctions, including potential intervention and takeover of management by the State Water Resources Control Board (SWRCB) (Cal. Water Code §10735).

SGMA’s Concurrent Governance Processes

SGMA triggers a complex system of interacting governance processes. The statute and accompanying regulations delegate responsibilities to newly formed GSAs, yet also create substantial guidance and oversight roles for state agencies. GSAs are comprised of existing public agencies, each of which has its own institutional structure, rules, and processes to which it must adhere. Further, SGMA is unfolding within the context of existing water and non-water governance, policies (Littleworth and Garner 2007) and politics within California, an already contentious and ever-changing landscape.

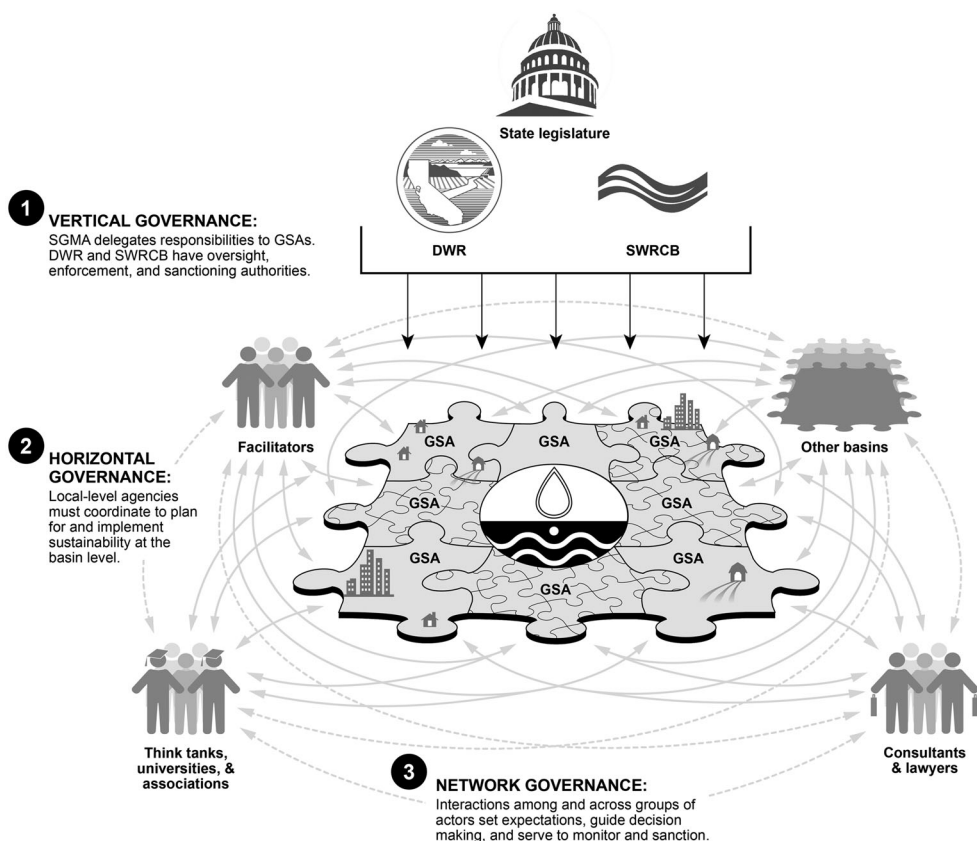


Figure 1. Interaction across the multiple governance processes embedded in SGMA. Implementation of the statute (vertical) will depend on outcomes of institutional collective action within each basin (horizontal) as well as DWR and SWRCB oversight, and if necessary, intervention (vertical). GSA decisions are influenced by their constituents—depicted as urban, agricultural, and rural residential – and perceptions of the mandate (vertical). Institutional collective action (horizontal) within each basin is motivated by the statute and the threat of intervention and facilitated by resources and support provided by DWR and the state. Institutional collective action is mediated by the support, advice, and pressure created through interactions across GSAs as well as with third parties—consultants, lawyers, facilitators, think tanks, industry associations, and universities (Network). Lastly, networks emerged in response to passage of the statute and seek to inform both state agency (vertical) and local-level (horizontal) decision-making.

We contend that SGMA governance can be conceptualized as three concurrent and interacting processes: vertical, horizontal, and network governance (Figure 1). The remainder of this paper develops this conceptual structure.

Vertical Governance: SGMA as Policy Implementation

The vertical dimension of SGMA governance is its primary governance process—a higher level of government requiring action by a lower level of government (Kiparsky et al. 2017). Such mandates occur commonly in the field of natural resources, in part due to the distribution of authority across levels of government. The relationship

between state and local governments under SGMA is analogous to the relationship between the federal government and states under cooperative federalism (Owen 2018). Under cooperative federalism, the federal government sets standards and policy goals and states then define and undertake actions to achieve those standards and goals, with federal oversight and potential intervention where states do not comply. Under SGMA, the State of California set requirements for groundwater sustainability and delegates authorities and responsibilities to local agencies to achieve those objectives. Thus, the vertical governance under SGMA is local-level implementation of a top-down mandate.

Implementation—the process of executing a policy—has long been an explanation for variation in successful achievement of policy goals and objectives (Hill and Hupe 2002). Several of the central components of policy, public administration and planning theories of implementation, and their effects on outcomes, are especially relevant to SGMA. Implementation depends in part on the design of the policy mandate, including the specificity and clarity of policy goals and requirements (Hill and Hupe 2002; Hupe and Hill 2016); the inclusion mechanisms for overseeing, enforcing, and sanctioning non-compliance; and the support or resources provided to the local-level entities charged with implementation (Deyle and Smith 1998; Berke, Lyles, and Smith 2014). Characteristics of “street-level bureaucrats”—the front-line civil servants who undertake implementation—matter (Lipsky 1969), including how they interpret and understand the mandate (Hill and Hupe 2002) and their capacities for and commitment to implementation (Dahill-Brown and Lavery 2012; Tummers, Steijn, and Bekkers 2012; Norton 2005).

Viewing SGMA through a policy implementation lens highlights the importance of the vertical relationship between the state and local levels in determining outcomes. The SGMA statute and regulations are specific and directive, but contain ambiguity. How state agencies and GSAs interpret requirements will influence the content, review, execution, and enforcement of GSPs. For example, SGMA requires defining of sustainable yield, an amount of groundwater extraction consistent with the law’s sustainability definition. A GSP will be, in effect, a GSA’s initial quantitative interpretation of these definitions in local context, but all GSPs will then be subject to state interpretation through DWR review. Capacities for implementation also vary. GSAs differ in size, technical knowledge, institutional support, and budgets (Milman et al. 2018). In spite of state technical and financial support administered by DWR, local capacity will constrain implementation actions in many cases, regardless of motivation.

Local-level pressures also have a strong influence on how GSAs respond to the mandate. GSAs are comprised of agencies with existing authorities and responsibilities, particularly to the constituents whom they serve. These agencies are often run by elected public officials and/or are reliant on public votes for imposing fees or approving decisions. As such, the political will of GSAs in responding to SGMA is defined by their constituents, including how those constituents see implementation of SGMA as affecting their interests and the bottom-up pressures they place upon GSAs.

Lastly, GSAs operate with uncertainty about the state’s future choices as backstop, which have not yet been clearly signaled. Given ambiguity in requirements and definitions, combined with the latitude to locally define sustainability and sustainability pathways, many GSAs will weigh the costs of various compliance options against the

probability of state sanctions. GSA perceptions vary regarding the state's enforcement priorities and the potential impacts of such enforcement. Many GSAs recognize that DWR and SWRCB have limited capacity, and expect the agencies to focus on the areas with the most acute problems.³ Consequently, GSA representatives may anticipate that their GSP only needs to be better than the worst batch, in the same way that an antelope need not run faster than a lion, it only need run faster than the slowest member of its herd. As such, within the vertical framework, decision-making by some GSAs is partly motivated by strategic, game theoretic considerations.

Horizontal Governance: SGMA as Institutional Collective Action

The horizontal dimension of SGMA governance encompasses the institutional collective action that has emerged in GSA formation and GSP development and will continue through implementation. Collective action occurs when interdependent resource users self-organize to jointly pursue a common goal. SGMA implementation, in general, and GSA formation in particular, requires such self-organization by local agencies. The need for institutional collective action is common in natural resources, since frequently a separation of powers and authorities across agencies leads to multiple jurisdictions having control and impact on activities that affect shared resources or shared outcomes (Epstein et al. 2015). Under SGMA, GSAs are generally constrained in their geographies by the service areas of their founding agencies. Agency boundaries rarely coincide with the boundaries of the groundwater basin. In order to achieve basin-level sustainability, agencies had the choice of forming a multi-agency GSA or coordinating across GSAs in GSP development. In either circumstance, institutional collective action is necessary.

Whether and how effective institutional collective action occurs is largely determined by how organizations balance a variety of sometimes competing motivations. Inter-organizational relationships reflect bounded rational decisions that weigh the perceived merits of collective action and concerns about autonomy and control, both of which are moderated by existing relationships (Rossignoli and Ricciardi 2015; Feiock 2007, 2013; Scott and Thomas 2017). Institutional collective action is facilitated by linkages, a sense of interdependence, and a shared perspective on the problem and potential solutions (Kwon and Feiock 2010; Watson 2015), and made more challenging when agencies and their constituents have more diverse and divergent populations and interests (Feiock 2013, 2007; Kwon and Feiock 2010). Insufficient resources or the potential for economies of scale can motivate institutional collective action (Feiock 2007; Kwon and Feiock 2010); yet high transaction costs may outweigh potential gains (Feiock 2007, 2013). Lastly, organizational histories and established power relations are important as they influence trust and expectations (Brummel, Nelson, and Jakes 2012; Watson 2015; Kwon and Feiock 2010).

Viewing SGMA through the lens of institutional collective action highlights the central role of the horizontal relationships between local agencies in determining groundwater sustainability outcomes. Outcomes of SGMA will depend on individual local agencies and their willingness to work together to address groundwater management concerns throughout the basin.

Conditions are more ripe for institutional collective action in some groundwater basins than in others (Milman et al. 2018). Even prior to SGMA, some water agencies had been taking steps to address groundwater depletion. In some basins, agencies also have a history of collaboration—for example, through voluntary groundwater management plans, integrated water resources management plans, and urban water management plans. In other basins, tensions are higher and relationships are fraught with histories of lawsuits and disagreements. Further, basins vary in the heterogeneity of groundwater extraction and users within the basin, the distribution of surface and groundwater supplies, and the non-SGMA legal, institutional, and procedural factors influencing water management policies and actions. These differences have immense implications for basin-level sustainability. In many basins, access to surface water has become the dividing point, with strong tensions between the haves and have-nots. Yet even variation in prior fees, regulations, and monitoring serve as barriers to agencies working together. As a result, institutional collective action has emerged in some basins yet not in others. Examples include multi-agency GSAs that span an entire basin, multiple GSAs with formal commitments to produce joint GSPs, and coordination agreements and committees working to coordinate across separate GSPs (Milman et al. 2018).

Network Governance: SGMA as Steering and Oversight Through Informal Interactions

The network governance dimension of SGMA encompasses the informal interactions among government and other private and public entities that influence and reinforce actions to achieve groundwater sustainability. Through these interactions, actors leverage relationships to disseminate information, create new/shared or reinforce existing norms, place pressure upon one another, and coordinate actions and activities (Rhodes and William 1996; Jones, Hesterly, and Borgatti 1997; Carlsson and Sandström 2007; Marsh and Smith 2000). Not only has passage of SGMA sparked the creation of new actors and relationships (i.e. networks), interactions across networks that pre-date SGMA have had and will continue to have an important role in the outcomes of SGMA.

Network governance can include, yet often occurs outside of formal governmental structures. Epistemic communities (Haas 2007), communities of practice (Goldstein and Butler 2010), boundary organizations (Guston 2001), and other forms of networks serve to create, translate, and disseminate knowledge between and among groups of actors (Phelps, Heidl, and Wadhwa 2012; Feldman 2012). This knowledge sharing facilitates policy diffusion and uptake (Lecy, Mergel, and Schmitz 2014). It also serves as a source of soft power (Feldman 2012). Networks can compel emulation of certain values, public policies and practices through the institutionalization of beliefs and values, development of common language and tacit rules for behavior (Jones, Hesterly, and Borgatti 1997; Carlsson and Sandström 2007). Further, networks can serve as a source of oversight and pressure, particularly when the exchange that occurs through them includes surveillance and the spreading of information about behavior or reputations (Jones, Hesterly, and Borgatti 1997).

Viewing SGMA through the lens of network governance serves to highlight the central role of the interactions between and among GSAs, non-profits, professional associations, think tanks, mediators, consultants, lawyers, and the media in determining groundwater sustainability outcomes. DWR, professional associations, interest groups, and GSAs themselves have sponsored conferences and calls to promote information sharing among GSAs. Think-tanks, non-profits, and universities continue to produce reports, hold workshops and disseminate information, tools, and recommendations to GSAs. In addition, facilitators, hydrogeologic and legal consultants and other professionals hired to assist GSA formation and GSP development have developed email list serves, held conference calls and used other mechanisms to exchange information about their experiences and transmit that information to entities with whom they work. Lastly, through newspapers, blogs, and new websites, third parties are disseminating information about SGMA and its implementation.

These activities serve as governance in a number of ways. First, they are leading to norm formation and reinforcement. Through these interactions, groundwater sustainability has become a focal point of water-related discourse in California, regularly raised as a topic of concern in meetings, announcements, planning and news. Interactions occurring through and across networks have also served to cement interpretations of the requirements of SGMA as well as approaches for complying with the law. For example, interactions occurring as a result of networks are influencing how GSAs, as well as DWR, understand and make decisions regarding defining and using measurable thresholds in planning, surface groundwater interactions, groundwater dependent ecosystems, and compatibility across technical analysis methods, among other topics ([Supplementary Appendix 2](#)). Second, the networks responding to SGMA are playing a role in oversight and enforcement. Analyses, examination, and commentaries by third parties serve as a form of transparency as well as public pressure for compliance as well as enforcement (see [Supplementary Appendix 2](#) for additional examples).

The intent of the information exchange varies across networks and network participants. In some instances, the exchange is intended as objective transmission of expert knowledge. Yet networks are not inherently neutral (Marsh and Smith 2000; Swyngedouw 2005) and, in some instances, the underpinnings of exchange seek to steer decision-making in ways that support a particular social, environmental, or professional agenda. Further, the influence of network governance under SGMA will depend on how information, ideas, and norms are received. Some GSAs have solidified ideas and norms about groundwater management, and are not easily swayed by outside input, whereas other GSAs are more open to and interested in receiving advice and guidance. Further, where third parties use information to increase pressure on GSAs, through news media, public engagement or lawsuits, network governance may have a stronger impact on implementation of SGMA.

Discussion

The above analysis of SGMA shows how even a single, albeit complex, legislative mandate to address a heretofore relatively ungoverned commons can require multiple, intersecting governance processes. The many concurrent governance processes occurring as

a result of SGMA are strongly connected and serve to reinforce one another (Figure 1). While the statute itself is top-down (vertical), it incentivizes local-level collective action (horizontal), which in turn is motivated by the both the threat of potential state-level intervention and the resources, incentives, and support provided by the state (vertical). The intersection between horizontal and vertical governance also means that where horizontal governance efforts are incomplete or unsuccessful, the state backstop provides a mechanism for the state to assume responsibilities. Thus, failure of horizontal governance does not indicate failure of SGMA but rather calls for vertical governance to designate the pathway toward achieving groundwater sustainability. Network governance supports both vertical and horizontal governance by filling gaps in communication and knowledge and aiding in norm formation and enforcement.

Outcomes of SGMA, thus, need to be understood and evaluated not as simply an experiment in local-level governance, but in light of the interacting vertical, horizontal and network governance processes. However, this conceptual framework is far from comprehensive. Other essential and interrelated processes include those associated with the integration of land and water policy, and with the integration of science into policy, among others (Roberts, Milman, and Blomquist 2020). Within each governance process, how politics manifests and is resolved, have implications from SGMA.

Conclusion

SGMA has spawned a novel, hybrid approach to groundwater governance, embedded within specific constraints in California water policy and politics. Our analysis has highlighted some complexities in SGMA governance, in particular, the interplay between vertical, horizontal and network governance processes. This framework has a number of implications.

First, for those invested in the success of SGMA itself, and for scholars seeking clear understanding of SGMA, a holistic view will be important. With multiple moving parts, careful on-going evaluation and refinement of governance processes will be critical for long-term success. Further, it would be a mistake to define success of SGMA narrowly based on basin-scale outcomes. The crucial benefits of norm creation and shifting assumptions, network formation, a structure for broader topical and geographic integration, and learning within and between basins constitute individually and collectively powerful system-level advancement for California water management. Situating evaluations of SGMA within frameworks such as that proposed here could foster a broader, integrative perspective.

Second, for practitioners viewing SGMA as a potential model for governance schemes in other places, it is important to recognize that SGMA elements are interconnected and mutually reinforcing by necessity and by design. Porting any partial analog of SGMA's model to other areas without careful examination of the potential gaps that might result may have consequences for effective governance.

Finally, we commend SGMA's authors for finding a politically palatable approach through which the State could take action to address its groundwater problem. Much of the hybrid structure described here flows explicitly from SGMA legislation, and many of the essential elements are implicitly embedded in statute and regulations. There

remains much work to be done if SGMA is to succeed in its ambitious goals, but the foundation provides a strong point of departure.

Notes

1. Governance refers to full set of organizations, structures, rules, and processes through expectations, decisions, and actions are collectively decided and acted upon. Management refers to the specific policies and decisions that guide actions as well as day-to-day actions influencing water. Governance is a predecessor to and sets up the framework through which management is decided and acted upon (Lemos and Agrawal 2006).
2. Local public agencies could choose to join together to form a GSA either through a Memorandum of Agreement or a Joint Powers Agreement. These two legal mechanisms differ in the structure of the legal entity they create and responsibilities assigned to the agencies entering into the agreement. For more details see Kincaid, V., and Stager, R., (2015) "Know your options: A guide for formation of groundwater sustainability agencies" California Water Education Foundation: Sacramento. <http://www.stancounty.com/er/pdf/groundwater/gsa-guide.pdf>.
3. This statement is based on structured and semi-structured interviews about GSP development conducted by the authors with representatives from over 40 GSAs in the critically over-drafted basins between January and November 2019.

Acknowledgments

The authors are grateful for the input from anonymous reviewers. Alula Shields and Nell Green Nylen provided graphical design assistance. Any opinions, findings, and conclusions or recommendations expressed in this paper are those of the author(s) and do not necessarily reflect the views of the funding entities.

Funding

This work was supported in part by the National Science Foundation under [Grant no. 1824066], by UC Water [University of California Office of the President Grant no. 13941], by the United States Department of Agriculture and Food Research Initiative under its National Institute of Food and Agriculture [Grant no. 2017-67026-26315], and by the Water Foundation [https://waterfdn.org].

ORCID

Anita Milman  <http://orcid.org/0000-0002-5712-9388>
Michael Kiparsky  <http://orcid.org/0000-0002-1910-8885>

References

- Berke, P. R., W. Lyles, and G. Smith. 2014. Impacts of federal and state hazard mitigation policies on local land use policy. *Journal of Planning Education and Research* 34 (1):60–76. doi: [10.1177/0739456x13517004](https://doi.org/10.1177/0739456x13517004).
- Brummel, R. F., K. C. Nelson, and P. J. Jakes. 2012. Burning through organizational boundaries? Examining inter-organizational communication networks in policy-mandated collaborative bushfire planning groups. *Global Environmental Change* 22 (2):516–28. doi: [10.1016/j.gloenvcha.2011.12.004](https://doi.org/10.1016/j.gloenvcha.2011.12.004).

- Carlsson, L., and A. Sandström. 2007. Network governance of the commons. *International Journal of the Commons* 2 (1):33–54. doi: [10.18352/ijc.20](https://doi.org/10.18352/ijc.20).
- Dahill-Brown, S. E., and L. Lavery. 2012. Implementing federal policy: Confronting state capacity and will. *Politics and Policy* 40 (4):557–92. doi: [10.1111/j.1747-1346.2012.00368.x](https://doi.org/10.1111/j.1747-1346.2012.00368.x).
- Deyle, R. E., and R. A. Smith. 1998. Local government compliance with state planning mandates: the effects of state implementation in Florida. *Journal of the American Planning Association* 64 (4):457–69. doi: [10.1080/01944369808976004](https://doi.org/10.1080/01944369808976004).
- Epstein, G., J. Pittman, S. M. Alexander, S. Berdej, T. Dyck, U. Kreitmair, K. J. Rathwell, S. Villamayor-Tomas, J. Vogt, and D. Armitage. 2015. Institutional fit and the sustainability of social–ecological systems. *Current Opinion in Environmental Sustainability* 14:34–40. doi: [10.1016/j.cosust.2015.03.005](https://doi.org/10.1016/j.cosust.2015.03.005).
- Famiglietti, J. S. 2014. The global groundwater crisis. *Nature Climate Change* 4 (11):945–8. doi: [10.1038/nclimate2425](https://doi.org/10.1038/nclimate2425).
- Feiock, R. C. 2007. Rational choice and regional governance. *Journal of Urban Affairs* 29 (1): 47–63. doi: [10.1111/j.1467-9906.2007.00322.x](https://doi.org/10.1111/j.1467-9906.2007.00322.x).
- Feiock, R. C. 2013. The institutional collective action framework. *Policy Studies Journal* 41 (3): 397–425. doi: [10.1111/psj.12023](https://doi.org/10.1111/psj.12023).
- Feldman, D. L. 2012. The future of environmental networks—governance and civil society in a global context. *Futures* 44 (9):787–96. doi: [10.1016/j.futures.2012.07.007](https://doi.org/10.1016/j.futures.2012.07.007).
- Foster, S., J. Chilton, G. Nijsten, and A. Richts. 2013. Groundwater—a global focus on the ‘Local’ Resource. *Current Opinion in Environmental Sustainability* 5 (6):685–95. doi: [10.1016/j.cosust.2013.10.010](https://doi.org/10.1016/j.cosust.2013.10.010).
- Goldstein, B. E., and W. H. Butler. 2010. Expanding the scope and impact of collaborative planning. *Journal of the American Planning Association* 76 (2):238–49. doi: [10.1080/01944361003646463](https://doi.org/10.1080/01944361003646463).
- Guston, D. H. 2001. Boundary organizations in environmental policy and science: An introduction. *Science, Technology, and Human Values* 26 (4):399–408. doi: [10.1177/016224390102600401](https://doi.org/10.1177/016224390102600401).
- Haas, P. 2007. Epistemic communities. In *The Oxford Handbook of International Environmental Law*, ed. D. Bodansky, J. Brunnee, and E. Hey, 791–806. Oxford, UK: Oxford University Press.
- Hill, M. J., and P. L. Hupe. 2002. *Implementing public policy: Governance in theory and practice*. London, Thousand Oaks: Sage.
- Hupe, P. L., and M. J. Hill. 2016. And the rest is implementation. Comparing approaches to what happens in policy processes beyond great expectations. *Public Policy and Administration* 31 (2):103–21. doi: [10.1177/0952076715598828](https://doi.org/10.1177/0952076715598828).
- Jones, C., W. S. Hesterly, and S. P. Borgatti. 1997. A general theory of network governance: Exchange conditions and social mechanisms. *Academy of Management Review* 22 (4):911–45. doi: [10.5465/amr.1997.9711022109](https://doi.org/10.5465/amr.1997.9711022109).
- Kiparsky, M., A. Milman, D. Owen, and A. T. Fisher. 2017. The importance of institutional design for distributed local-level governance of groundwater: The case of California’s sustainable groundwater management act. *Water* 9 (10):755. doi: [10.3390/w9100755](https://doi.org/10.3390/w9100755).
- Kwon, S., and R. C. Feiock. 2010. Overcoming the barriers to cooperation: Intergovernmental service agreements. *Public Administration Review* 70 (6):876–84. doi: [10.1111/j.1540-6210.2010.02219.x](https://doi.org/10.1111/j.1540-6210.2010.02219.x).
- Leahy, T. C. 2015. Desperate times call for sensible measures: The making of the California Sustainable Groundwater Management Act. *Golden Gate University Environmental Law Journal* 9 (1):5–40.
- Lecy, J. D., I. A. Mergel, and H. P. Schmitz. 2014. Networks in public administration: Current scholarship in review. *Public Management Review* 16 (5):643–65. doi: [10.1080/14719037.2012.743577](https://doi.org/10.1080/14719037.2012.743577).
- Lemos, M. C., and A. Agrawal. 2006. Environmental governance. *Annual Review of Environment and Resources* 31 (1):297–329. doi: [10.1146/annurev.energy.31.042605.135621](https://doi.org/10.1146/annurev.energy.31.042605.135621).
- Lipsky, M. 1969. *Toward a theory of street-level bureaucracy*. Wisconsin: Institute for Research on Poverty, University of Wisconsin.

- Littleworth, A. L., and E. L. Garner. 2007. *California Water II*. Point Arena, CA: Solano Press.
- Marsh, D., and M. Smith. 2000. Understanding policy networks: Towards a dialectical approach. *Political Studies* 48 (1):4–21. doi: [10.1111/1467-9248.00247](https://doi.org/10.1111/1467-9248.00247).
- Milman, A., L. Galindo, W. Blomquist, and E. Conrad. 2018. Establishment of agencies for local groundwater governance under California's Sustainable Groundwater Management Act. *Water Alternatives* 11 (3):458–80. doi: [10.3390/w9100755](https://doi.org/10.3390/w9100755).
- Norton, R. K. 2005. Local commitment to state-mandated planning in coastal North Carolina. *Journal of Planning Education and Research* 25 (2):149–71. doi: [10.1177/0739456x05278984](https://doi.org/10.1177/0739456x05278984).
- Owen, D. 2018. Cooperative subfederalism. *UC Irvine Law Review* 9:177.
- Phelps, C., R. Heidl, and A. Wadhwa. 2012. Knowledge, networks, and knowledge networks: A review and research agenda. *Journal of Management* 38 (4):1115–66. doi: [10.1177/0149206311432640](https://doi.org/10.1177/0149206311432640).
- Rhodes, R., and A. William. 1996. The new governance: Governing without government. *Political Studies* 44 (4):652–67. doi: [10.1111/j.1467-9248.1996.tb01747.x](https://doi.org/10.1111/j.1467-9248.1996.tb01747.x).
- Roberts, M. D., A. Milman and, W. Blomquist. 2020. The Sustainable Groundwater Management Act – California's prescription for three common challenges of groundwater management. In *Water resilience: Management and governance in times of change*, ed. Julia Baird and Ryan Plummer. New York: Springer.
- Rossignoli, C., and F. Ricciardi. 2015. Theories explaining inter-organizational relationships in terms of coordination and control needs. In *Inter-organizational relationships*, ed. Cecilia Rossignoli and Francesca Ricciardi, 7–36. Switzerland: Springer.
- Sax, J. L. 2002. We don't do groundwater: A morsel of California legal history. *University of Denver Water Law Review* 6:269.
- Scott, T. A., and C. W. Thomas. 2017. Unpacking the collaborative toolbox: Why and when do public managers choose collaborative governance strategies? *Policy Studies Journal* 45 (1): 191–214. doi: [10.1111/psj.12162](https://doi.org/10.1111/psj.12162).
- Swyngedouw, E. 2005. Governance innovation and the citizen: The Janus face of governance beyond the state. *Urban Studies* 42 (11):1991–2006. doi: [10.1080/00420980500279869](https://doi.org/10.1080/00420980500279869).
- Tummers, L., B. Steijn, and V. Bekkers. 2012. Explaining the willingness of public professionals to implement public policies: Content, context, and personality characteristics. *Public Administration* 90 (3):716–36. doi: [10.1111/j.1467-9299.2011.02016.x](https://doi.org/10.1111/j.1467-9299.2011.02016.x).
- Varady, R. G., A. Zuniga-Teran, A. Gerlak, and S. Megdal. 2016. Modes and approaches of groundwater governance: A survey of lessons learned from selected cases across the globe. *Water* 8 (10):417. doi: [10.3390/w8100417](https://doi.org/10.3390/w8100417).
- Watson, N. 2015. Adaptation through collaboration: Evaluating the emergence of institutional arrangements for catchment management and governance in England. *International Journal of Water Governance* 3 (3):55–80. doi: [10.7564/13-IJWG26](https://doi.org/10.7564/13-IJWG26).