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A Network Approach to Complex Problems:

Understanding Collaborative Governance in Watershed Management

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The complexity of current environmental problems poses a challenge to the field of public management. With multiple stressors acting on the earth's natural systems, the likelihood that complex environmental problems will persist is undeniable. Traditional approaches to such problems follow a top-down method, often useful for problem management within public policy; however, it proves too rigid when considering the complexity of environmental policy. Recent literature points to the use of collaboration and coordination in addressing complex problems, whereby stakeholders accumulate knowledge and resources across a variety of fields. One such method is network governance, identified as a problem-solving approach capable of understanding and addressing complex problems. Therefore, the characteristics of this approach deem it appropriate to addressing complex environmental problems. Considering this in conjunction with the existing need to address environmental policy through a multidimensional lens, this paper discusses the management of complex environmental problems—specifically, the use of network settings in addressing compound problems. In doing so, the author finds that understanding the management of complex problems is best accomplished by understanding the complexity of the network within which the issue exists.

Introduction

The complexity of current environmental problems poses a challenge to the field of public management. The traditional approach is to implement new policies through a top-down method. One such approach is managerialism, in which an organization's structure and coordination are oriented toward achieving either program objectives or public service.¹ While this is often an appropriate method for addressing problems within public management, it proves too rigid when considering the multidimensional nature of environmental issues. Such issues transcend the boundaries of nature; they prove complex and interlinked not only among themselves, but also within larger social and economic contexts.² Additionally, environmental issues are difficult to address since the solution for one problem can exacerbate the negative effects of another or create a new problem altogether. With multiple stressors acting on the earth's natural systems, the likelihood that complex environmental problems will persist is undeniable. Therefore, efforts to improve problem management and policy implementation practices that address these topics are of great importance; however, outcome success depends on the accumulation of knowledge and resources from multiple actors across multiple fields.

Recent decades have seen a shift in the focus of public management, whereby a larger and more diverse body of actors is incorporated into the problem-solving stage. In terms of addressing complex policy problems, this is a necessary step forward; however, it does not mean that such approaches are undertaken in the most effective way or that they achieve their objectives. The literature asserts that problem-solving methods based in collaboration and coordination are more capable of understanding and addressing complex problems. One collaboration-based approach is network governance, in which participants interact to solve complex problems by realizing collective goals, sharing resources, and facilitating learning.³ The flexibility, efficiency, and innovation fostered in network settings proves to be a more compatible approach to finding solutions for complex environmental problems; however, the integration of multiple actors and resources can create a challenge in and of itself.

This paper serves as a review of the existing literature on complex problem management with an eye toward finding a way to address complex environmental problems. It aims to inform academics and practitioners alike, by comparing one of the most commonly used management approaches with a newfound approach specific to collaborative management of environmental problems in small-scale settings. The goal is to dig deeper into the practicality

and feasibility with which network governance can be applied to find solutions to environmental problems that span multiple jurisdictions and user interests. Provided the ability of network governance to result in successful environmental outcomes, this analysis may lead to several telling implications for the future of complex environmental issue management.

This paper focuses on the complexities surrounding collective watershed management – specifically, the need to integrate actor collaboration and coordination into the problem-solving stage and the challenges that arise when doing so. The paper analyzes problem management in the context of two approaches—managerialism and network governance—focusing primarily on the use of network settings in solving problems. Additionally, network settings are discussed in terms of collaborative governance, a newly developed governance strategy specifically applicable to environmental policy. While collaborative governance is not the theoretical focus of this paper, it is a subtype of network governance relevant to environmental problem-solving and is, thus, a necessary part of the discussion. Following this is a review of case studies applying network governance settings to watershed management, then a brief discussion of the challenges associated with developing collaborative partnerships. The paper concludes with a discussion of problem management as it relates to complex environmental concerns, as well as the implications that collaboration and coordination have on the future of environmental policy.

The Need for a New Approach

Efforts to address complex policy problems involving multiple fields and stakeholders have been ongoing since the 1970s. The assumption prior to this was that attaining adequate information, specifying objectives, and choosing appropriate management methods would lead to efficient and effective outcomes.⁴ This assumption is commonly found in managerialist approaches to policy problems, whereby hierarchical systems of control focus primarily on setting and monitoring performance outcomes. Such an approach is appropriate when considering problems that are predictable, straightforward, and easily managed; problems that are unpredictable, complex, and not easily managed present a challenge for organizational management insofar that they require new, non-routine solutions. As Head and Alford note, government organizations are good at addressing problems that are relatively standardized, routine, and high volume; however, such an approach consequently limits opportunities for individuals and agencies to think about complex policy issues on a larger scale.⁵

It should be noted that managerialism is not incapable of leading agencies to effective outcomes; rather, the rigidity of the decision-making process maintained by managerialism limits its ability to readily address more complex policy problems. Therefore, it is important to discuss managerialism in comparison to network governance, such that each has a different structural organization and set of objectives that are better suited to a specific type of policy problem. The most notable aspect of managerialism that weakens its applicability to complex problems is its separation of policy and delivery, whereby those who create policy are removed from those affected by it. This fragments the knowledge and understanding of problems held between members of the public and public officials. Additionally, the nature of managerialism to promote efficiency and effectiveness removes the opportunity for individuals to coordinate and collaborate.⁶

Head and Alford assert that one of the most widespread forms of collaborative management is network governance, an approach in which participants share knowledge and resources across boundaries to collectively reach problem solutions.⁷ They deem coordinated goals, innovative thinking, and adaptive leadership as three necessary characteristics of network settings for achieving successful outcomes. Weber and Khademian also promote network settings as a way to organize when addressing complex problems, governing shared resources, and facilitating learning.⁸ Specifically, the authors argue that networks are able to address complex tasks because they are flexible, efficient, and innovative. Perhaps most important is the ability of networks to achieve group outcomes by enabling the collective to meet objectives that would not be realized by the individual. This is due in part to the accumulation of power and resources required to complete shared tasks of a complex problem. Consequently, network settings are likely to be central instruments in fostering an understanding of the problem, promoting development of provisional solutions, and mobilizing solutions from discussion to implementation.⁹

Given this understanding of network settings, it follows that such an approach be applied to watershed management initiatives. After all, watershed management is a prime example of a complex environmental problem such that watersheds constitute a common pool resource. They are a combination of privately-managed land and publicly-demanded resources, not to mention the additional ecosystem processes that interact with each. As competing interests vie for water use, demand increases beyond a sustainable replenishing rate of supply. The need for watershed management is necessitated by the lack of organized use and access. Thus, collective watershed management provides “[a] platform as a mechanism for negotiating

and coordinating collective action by multiple users ...” thereby introducing a more organized and equal means of resource distribution.¹⁰

Network Settings in Environmental Management: Governing Complex Problems

Complex problems pose a challenge to public management by requiring innovative strategies and solutions. The environmental sector commonly encounters complex problems due to the inability to contain environmental issues, which regularly cross social, political, and geographical boundaries. As a result, developing solutions to environmental problems often requires greater resources and involvement. This is where the use of network settings proves beneficial. The literature agrees that the characteristics of network settings play an important part in achieving successful and long-term outcomes.¹¹ More specifically, the literature agrees that these characteristics are highly applicable to watershed management – one complex environmental problem that represents a public policy arena with high public interest, in which a variety of agencies share the responsibility of governing it.¹²

The realization of interconnectivity and the role that community members play in the policy process has garnered much attention in recent decades, leading to discussions of governance arrangements for complex environmental problems, which is widely observed in the literature.¹³ Kauneckis and Imperial note that watersheds are commonly governed by multiple organizations, each having different jurisdictional preferences and boundaries.¹⁴ Whether the organizations are public or private, any group acting alone to resolve complex problems arguably represents only a subset of the interests involved. Thus, the collection of organizations and interests provides a more holistic approach to widespread problems, but it also presents a new challenge in the interaction of varying institutional rule sets and competing policy interests.¹⁵ However, these differences can be mitigated in the presence of trust, diversity, and shared problem definitions. Specifically, these features are identified as a way to facilitate greater interaction and cooperation, encourage policy-oriented learning and knowledge sharing, and support adaptable policy objectives.¹⁶ It is important to note, though, that in situations where adverse outcomes persist, the transition to a network approach is not always because collaborative solutions are better; rather, other strategies are distinguished as costly or ineffective, and the ensuing dissatisfaction of those approaches makes collaborative governance more appealing.

Watershed Partnerships: A Review of Case Studies

Collaborative governance is one approach to complex environmental issues that has gained recent momentum in problem resolution strategies. It is discussed in this paper for two reasons: 1) it is a subtype of network governance that keenly emphasizes the use of diverse stakeholders (especially those of local communities), accumulated resources, and shared knowledge; 2) among the literature, it is the most commonly used method of governance for complex and widespread environmental problems such as watershed management. This section explores the use of collaborative governance in case studies implementing watershed management strategies throughout the United States. A brief overview of the studies is provided, followed by the outcomes of each. It is the author's hope that this section will tie together the discussions on network settings, the complexity of environmental problems, and the outcomes that can be realized when the two are brought together.

Imperial developed a study of six watershed programs across the country to identify how collaboration enhanced network governance in situations where the capacity to solve problems was dispersed and constrained by the inability of one organization to accomplish policy objectives alone.¹⁷ Analysis was conducted at three separate levels of collaborative action: operational, policymaking, and institutional. The operational level relates to the day-to-day activities that people engage in, largely dictated by the structure of rules that guide those actions.¹⁸ At this level, Imperial found that all six watershed programs improved in environmental conditions, policy-oriented learning, and enhanced monitoring and enforcement programs through the use of collaborative activities. Similar results occurred at the policymaking level – how operational-level rules are created, adopted, and monitored – in which collaboration led to the simultaneous sharing of knowledge, resources, and social norms to help inform policy and regulation.¹⁹ The institutional level – how policymaking rules are created, adopted, and monitored – experienced an increase in new collaborative development that guided shared policies, rules, and norms. The outcomes observed in this study highlight the benefits of using a collaborative approach over a centralized structure when addressing a complex environmental problem.

Hardy and Koontz conducted a similar study of three watershed partnerships in Ohio to understand how collaborative membership profiles determined rules and implemented policy at different levels of action.²⁰ They focused on three membership profile types: government-centered, citizen-centered, and mixed. Results at the three levels of collaborative action were similar to the previous study, but the most noteworthy implications were the

differences among outcomes based on membership type. Government-only groups developed complex, costly, and large-scale solutions; citizen-only groups created stewardship programs and outreach-based initiatives; mixed groups produced restoration plans and actions based largely on local knowledge. This study suggests that group composition factors into a number of things: understanding the problem, accessing resources, and achieving successful outcomes. Based on these findings, it appears that the combination of inputs and outputs is maximized in mixed membership settings, which have access to a variety of resources and are able to achieve outcomes in a positive-sum manner.²¹

A study of collective watershed typologies by Diaz-Kope and Miller-Stevens also explored the ability of three watershed partnerships—interagency governance, cross-sector governance, and grassroots governance—to solve complex environmental problems.²² The interagency governance approach incorporated partnerships among all levels of government, which focused on policy objectives at the regional and national levels. While interaction occurred among organizations and jurisdictions, group composition remained mostly homogeneous to governmental affiliation. As such, the high degree of political affiliation, knowledge, and resources dispersed among the group is conducive to addressing large-scale complex environmental problems; however, it remains heavily siloed in the government sector, rendering it less useful when addressing community-level issues.²³ Cross-sector governance approaches also involved shared knowledge and resources, but they coordinated across sector boundaries and relied heavily on citizen input. While this is an appropriate structural approach to watershed issues, the authors note that involvement of agency actors sometimes results in outcomes other than those pursued by community members alone. Therefore, the authors contend that grassroots governance, which addresses local watershed issues through local actions, effectively builds trust and knowledge among stakeholders due to a shared sense of community; however, goals are focused on shaping environmental values, which perhaps detracts from the overall ability to address complex environmental problems.²⁴

These studies support an understanding of the ability of collaborative governance to address complex environmental problems. One might conclude that such a structural approach to these problems requires an array of inter-organizational interests, resources, and coordination. In that sense, it is unlikely to achieve the same outcomes by relying on a single sector. Diaz-Kope & Miller-Stevens note that highly complex environmental problems require the use of advanced, widespread resources, and the attainment of such resources often requires government involvement.²⁵ Additionally, the studies

discussed here conclude that the effectiveness of collaboration depends on governance structure and the ability to interact with members of different sectors. Overall, it is important to understand how collaborative governance influences environmental goals, but it is also necessary to remember that collaboration is more than a combination of governmental and non-governmental actors.

Tradeoffs of Collaboration and Network Governance

As suggested by the case studies, collaboration is an effective strategy for improving policy outcomes and governance in many situations; however, it is important to remember that such a strategy is only one option for approaching complex environmental problems, and it is not always the best option for all problems.²⁶ Under this pretense, it is necessary to acknowledge the trade-offs that occur when transitioning from traditional governance approaches to those rooted in networks and collaboration. Trade-offs include decentralized organization, changes in accountability, institutional constraints, and opportunities for conflict. This is by no means an exhaustive list, but it includes the most common arguments made within the literature. These trade-offs are important to discuss insofar that they predict the work still to come in the field of network governance.

Decentralization is an inherent property of network settings such that the integration of multiple actors removes the ability to maintain a rigid top-down structure. This is beneficial to network settings because it increases process efficiency, brings the decision-making process closer to those affected by governance outcomes, and encourages decision-makers to incorporate time- and place-specific knowledge of the problem.²⁷ Some scholars urge caution in this, though: while giving authority to state and local agencies helps promote policy formation for small-scale environmental problems, centralized decision-making of complex environmental problems helps direct government attention and resources to national-scale problems.²⁸ Likewise, Lemos and Agrawal suggest that decentralization can lead to a more suffocating form of governance if it goes unchecked by safeguards against localized power and accountability.²⁹ Furthermore, collaborative governance does not have an established set of principles that guide group formation, which is problematic whereby there is not a systematic approach for decision-makers to use when developing and implementing new policy initiatives.³⁰

There are also problems of conflict and power that arise in network settings. Agranoff states that, despite the cooperative nature of collaborative

structures, they are not without issues of conflict and unbalanced power.³¹ Common issues arise in conflict over agency turf, resource contribution, and time devoted to the group. Moreover, power distribution in network settings is not always equal or interdependent; rather, different actors can occupy positions of various weight, creating unequal leadership among the group. Agranoff also discusses the costs encountered by managers and professionals when opting into collaborative governance, including opportunity costs of working in a network setting versus strictly within the home agency, time and energy costs lost in the collaborative decision-making process, resource loss when agencies fail to share necessary inputs, and public policy barriers inherent to the legislation process.³²

Additionally, there are institutional barriers to network settings that place constraints on the actions of those working within a group. Head and Alford argue that collaborative approaches would be more feasible if structural changes were made within the public sector to allow for greater organizational flexibility, strategic approaches to performance measurement, and enhanced human resources that support collaborative environments.³³ Such changes may require a more comprehensive upgrade of the public sector and its overall ability to be integrated into network settings; however, these changes are likely to benefit accountability within collaborative governance by emphasizing the role of the group in meeting collective goals and establishing long-term solutions.³⁴

Conclusion

Watersheds are an ideal subsystem for exploring actor collaboration in network settings. Their expansion across social, political, and geographical boundaries exemplifies the challenges of addressing complex environmental problems. Thus, understanding the management of a complex resource is best accomplished by developing an understanding of the complex network in which it operates. This suggests the need for collaboration when addressing such complex environmental problems; however, many watershed governance efforts fail because they underestimate the need for inter-organizational actions. It should be noted that collaboration alone does not address all aspects of a complex problem, but it is a necessary first step in governing shared problems. Furthermore, complex problems hold within them a challenge of governance; the integration of multiple actors, experiences, and resources can cause disagreement among stakeholders, requiring greater time and effort when finding shared solutions. Yet, some conflict within a network setting is a healthy characteristic of problem-solving because it fosters learning, generates new ideas, and stimulates policy change.

It is largely beneficial for policymakers and practitioners to understand the rules and settings that influence interactions within collective management scenarios. After all, watershed partnerships present a unique governance arena in which neither administrators nor practitioners have frequently operated. Generally speaking, the formation of watershed partnerships requires considerable time and effort building a network, acquiring resources, and prioritizing group goals. While there is not a single approach to all complex environmental problems, collaborative governance is gaining momentum as an innovative policy tool applicable to governmental agencies and grassroots organizations, alike. In light of this, the author recommends that future policymaking regarding collective action for environmental management builds partnerships based on the following:

A. The effectiveness of collective watershed governance depends on group ability to operate within both formal and informal networks, especially because watershed partnerships often span multiple jurisdictions and stakeholder interests. Partnerships should, thus, contain members from a variety of interest groups and resource sectors.

B. Success of collective watershed governance depends, in large part, on the governing structure within the partnership. Therefore, groups should determine early on which governance structure best meets the goals and resources of the partnership (e.g., interagency, cross-sector, or grassroots profile types) while maintaining a flexible organizational structure.

C. Network theory posits that the spread of new information and ideas is accelerated when communication also occurs from outside the group, versus only internally. Thus, the polycentric approach offered by network governance can be equally effective as managerialism in terms of communication; yet, a network approach is also capable of targeting specific problems with various groups of collaborative partnerships by allowing for greater organizational involvement, information diffusion, and opportunities for joint action. To capitalize on these outcomes, it is important that partnerships highlight external communication, as well as shared values and interests, in an effort to enhance group productivity and maximize societal well-being.

This paper does not argue that all problems will be solved through a network setting. It does, however, argue that the complex nature of environmental problems, such as watershed management, presents an opportunity to employ network settings to achieve goals that would not be realized by the individual. Thus, collaboration should be viewed as a means to an end rather than an end in itself. Again, this is not to say that network

governance is the ultimate management approach for all public policy problems. Traditional approaches still hold their own value in addressing policy problems, although many of these problems are predictable, straightforward, and easily managed. It is when policy problems simultaneously cross social, political, and geographical boundaries that they demand innovative strategies. Consequently, the literature calls for adaptive and collaborative leadership roles in addressing complex environmental problems. After all, no single organization possesses the authority, resources, and knowledge to adequately address complex policy problems. Understanding the strengths and weaknesses of network governance enhances the ability of decision-makers to address complex problems. Further research is needed to develop a strategy for group formation and policy implementation within network settings; however, it is doubtful that this need will be realized given the unique nature of complex policy problems. These challenges might only be addressed by thoroughly rebuilding the capacity of the public sector. Regardless, today's complex policy problems demand new governance approaches, and while it is unclear if a single governance structure will be able to meet those demands, it is evident that the most effective approach will include coordination and collaboration among multiple actors.

Notes

¹ Brian W. Head and John Alford, "Wicked Problems: Implications for Public Policy and Management," *Administration and Society* 47, no. 6 (2013), 711-739.

² Rosina Bierbaum and Annette Cowie, "Integration: To Solve Complex Environmental Problems," Scientific and Technical Advisory Panel to the Global Environment Facility, (Washington, DC, Global Environment Facility, 2018).

³ Edward P. Weber and Anne M. Khademian, "Wicked Problems, Knowledge Challenges, and Collaborative Capacity Builders in Network Settings," *Public Administration Review* 68, no. 2 (2008), 334-49.

⁴ Head and Alford, "Wicked Problems: Implications for Public Policy and Management."

⁵ *Ibid.*, 10-11.

⁶ *Ibid.*, 12-13.

⁷ Head and Alford, "Wicked Problems: Implications for Public Policy and Management."

⁸ Weber and Khademian, "Wicked Problems, Knowledge Challenges, and Collaborative Capacity Builders in Network Settings."

- ⁹ Head and Alford, "Wicked Problems: Implications for Public Policy and Management."
- ¹⁰ Helle Munk Ravnborg and Mara del Pilar Guerrero, "Collective Action in Watershed Management: Experiences from the Andean Hillside," *Agriculture and Human Values* 16, (1999), 257-266.
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- ¹² Mark T. Imperial, "Using Collaboration as a Governance Strategy: Lessons from Six Watershed Management Programs," *Administration & Society* 37, no. 3 (2005), 281-320; Maria Carmen Lemos and Arun Agrawal, "Environmental Governance," *Annual Review of Environment and Resources* 31, no. 1 (2006), 297-325.
- ¹³ Scott D. Hardy and Tomas M. Koontz, "Rules for Collaboration: Institutional Analysis of Group Membership and Levels of Action in Watershed Partnerships," *The Policy Studies Journal* 37, no. 3 (2009), 393-411; Wendy A. Kellogg and Aritree Samanta, "Network Structure and Adaptive Capacity in Watershed Governance," *Journal of Environmental Planning and Management* 61, no. 1 (2018), 25-48; Kurt W. Smith, "Watershed Management Networks and the Necessary Role of Collaboration," *Journal of Soil and Water Conservation* 68, no. 2 (2013), 53A-54A.
- ¹⁴ Derek Kauneckis and Mark T. Imperial, "Collaborative Watershed Governance in Lake Tahoe: An Institutional Analysis."
- ¹⁵ Kauneckis and Imperial, "Collaborative Watershed Governance in Lake Tahoe: An Institutional Analysis," 509-513.
- ¹⁶ Eran Vigoda, "From Responsiveness to Collaboration: Governance, Citizens, and the Next Generation of Public Administration," *Public Administration Review* 62, no. 5 (2002), 527-40.
- ¹⁷ Imperial, "Using Collaboration as a Governance Strategy: Lessons from Six Watershed Management Programs."
- ¹⁸ Edella Schlager and Michael Cox, "The IAD Framework and the SES Framework: An Introduction and Assessment of the Ostrom Workshop Frameworks," in *Theories of the Policy Process*, 4th ed., (Boulder, CO: Westview Press, 2018), 215-52.
- ¹⁹ Imperial, "Using Collaboration as a Governance Strategy: Lessons from Six Watershed Management Programs."; Schlager and Cox, "The IAD Framework and the SES Framework: An Introduction and Assessment of the Ostrom Workshop Frameworks."
- ²⁰ Hardy and Koontz, "Rules for Collaboration: Institutional Analysis of Group Membership and Levels of Action in Watershed Partnerships."
- ²¹ *Ibid.*, 403-407.

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- ²² Luisa Diaz-Kope and Katrina Miller-Stevens, "Rethinking a Typology of Watershed Partnerships: A Governance Perspective," *Public Works Management & Policy* 20, no. 1 (2014), 29-48.
- ²³ *Ibid.*, 42-44.
- ²⁴ *Ibid.*, 36-39.
- ²⁵ Diaz-Kope and Miller-Stevens, "Rethinking a Typology of Watershed Partnerships: A Governance Perspective."
- ²⁶ Imperial, "Using Collaboration as a Governance Strategy: Lessons from Six Watershed Management Programs."
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- ³² *Ibid.*, 62.
- ³³ Head and Alford, "Wicked Problems: Implications for Public Policy and Management."
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