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Between Governance and Markets: An Assessment of Environmental Boundary Organizations

Andy Tuholski
Indiana University Kokomo, atuholsk@iu.edu

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ANDY TUHOLSKI*
Indiana University Kokomo

ABSTRACT

This article considers the genesis, characteristics, and dynamics of boundary organizations as they apply specifically to environmental boundary objects, that is, pieces of science on which policy is reliant. Boundary organizations have been widely discussed since the 1990s but are undertheorized in terms of political concepts; this paper approaches environmental boundary organizations as essentially liberal vehicles of power using Lukes's (1974) definition, in which the liberal dimension of power is divided into (a) eliciting and (b) meeting wants of stakeholders equitably. Environmental boundary organizations are compared and contrasted with single-perspective organizations (that is, organizations beholden to either government or industry) and the failure of single-perspective organizations to bridge the needs of multiple stakeholders insofar as environmental issues are concerned. Case studies of successful boundary organizations, such as the Health Effects Institute (HEI) and California Ocean Science Trust (COST), are utilized to demonstrate how and why well-designed environmental boundary organizations function, with the basis of success being a commitment to multiple parties' interests as represented by a neutral, balanced organization that supports joint agenda-setting, governance, research, and arbitration of knowledge. The findings support the claim that environmental boundary organizations are highly effective, sitting as they do between the needs of governance and the market, and the details provided in the case studies provide a convenient summarization of how such organizations should be approached and structured for maximum benefit to all parties.

KEY WORDS Boundary Organizations; Environmental Policy; Science-Policy Interface; Stakeholder Engagement; Agenda-Setting

THE ORIGIN OF THE BOUNDARY ORGANIZATION CONCEPT

Boundary organizations have received substantial scholarly attention (Carr and Wilkinson 2005; Cash 2001; Guston 2001; Miller 2001; O'Mahony and Bechky 2008; Parker and

* Correspondence concerning this article should be addressed to Andy Tuholski, atuholsk@indiana.edu.

Crona 2012; Schneider 2009; Star and Griesemer 1989). Although there is no consensus in the existing literature on exactly when boundary organizations first came into being, Star and Griesemer (1989) have made a compelling argument that the emergence of museums in the 17th century represents one of the first times that institutions had to balance the interests of producers and consumers of scientific research in a manner characteristic of Guston's (2001) general definition of the boundary organization.

Star and Griesemer's (1989) article was among the first rigorous explorations of the boundary organization concept, albeit situated very specifically in the context of American natural history museums, and it departed significantly from previous theoretical models of how a boundary object—that is, a research product that can be utilized for different reasons by scientists, politicians, and the public—is institutionally managed. In contrast to their own theoretical approach, Star and Griesemer described what they called the Callon-Latour-Law model, in which boundary objects are ultimately managed in a manner that privileges a single stakeholder, such as either a scientific organization or a governmental branch. Star and Griesemer subsequently distinguished this older managerial model from a true boundary organization in which "several obligatory points of passage are negotiated with several kinds of allies" (Star and Griesemer 1989:390).

Guston (2001) built on this idea and noted that the true boundary organization represents the interests of different audiences in a more balanced and federalized manner than is the case in the Callon-Latour-Law model. In this context, Guston (2001:405) offered an admirably simple explanation of the boundary organization:

> To the scientific principal, it says, "I will do your bidding by demonstrating to the politicians that you are contributing to their goals, and I will help facilitate some research goals besides." To the consumer, who is also a principal, it says, "I will do your bidding by assuring that researchers are contributing to the goals you have for the integrity and productivity of research." The boundary organization thus gives both the producers and the consumers of research an opportunity to construct the boundary between their enterprises in a way favorable to their own perspectives . . . [thus balancing] interests to reduce the threat that either side will find the boundary organization inimical, because it will actually pursue the interests of both parties.

The boundary organization can therefore be succinctly defined as an institution that reflects input from multiple stakeholders (typically, in the classic model, a scientific stakeholder and a governmental stakeholder) in order to manage boundary objects in a federalized manner that serves multiple interests simultaneously. Star and Griesemer believe that the modern natural history museum is a boundary organization par excellence, but, based on the more generalized definition offered by Guston, any organization that simultaneously supports scientific and governmental interests can be described as a boundary organization.

The word *boundary* has a special connotation with respect to boundary organizations in that, according to Gieryn (1999), this boundary is specifically between science and politics. The point made by Gieryn (1999), Guston (2001), and Star and Griesemer (1989) in slightly different contexts is that scientific research produces objects that can be, and are, consumed by government after they are produced by science. Understood from this perspective, a boundary organization also sits between the interests of scientific producers (i.e., researchers) and government consumers of that research in a manner that is supposed to defend the integrity of science while also respecting the right of government to utilize and benefit from this research in particular ways.

Star and Griesemer noted that, in the Callon-Latour-Law model, the alternative to the true boundary organization was an organization that privileged a single stakeholder (i.e., either a scientific or a governmental institution). Guston (2001) then noted the theoretical superiority of the boundary organization model, which, unlike a Callon-Latour-Law organization, had genuine value to provide to different stakeholders. In Guston's account, boundary organizations are both classically liberal and utilitarian, the existential rationales for such organizations. In Lukes's (1974) political taxonomy, the liberal dimension of power is based on finding out what people want and giving it to them, and from a utilitarian perspective, the success of any such liberal exercise of power is how much total value it producers for stakeholders. From this perspective, according to Guston, boundary organizations are successful when they are able to (1) elicit what the interests of scientific and governmental stakeholders are and (2) deliver on these interests in a manner that comes close to maximizing the expressed wants of both sides.

THE SPECIAL ROLE OF THE ENVIRONMENT

The environment plays a special role as far as boundary objects and organizations are concerned, for the reasons elucidated by Jasanoff (1987). First, many kinds of science focus on the environment from perspectives such as ecology, biology, climatology, chemistry, physics, and the like. The environment has historically been a domain of immense interest to multiple branches of science. Second, and more relevantly for the issue of boundary organizations, there is a nexus between policy and the environment. The environment is therefore a classic example of a domain combining what Jasanoff described as policy-relevant science and science-dependent policy.

In the context of the environment, the classic boundary objects are items of scientific knowledge that inform or influence policy in some way. Jasanoff (1987) gives the example of findings related to carcinogens. A scientific finding that asbestos causes cancer is, of course, of intrinsic interest to scientists as the end product of a scientific investigation, but it is equally compelling to policymakers who have to decide whether and how to integrate this knowledge into governance, such as by banning or regulating asbestos. One of Jasanoff's key contributions to the literature on boundary objects and organizations was to emphasize that knowledge, as a boundary object, is constructed, deconstructed, and reconstructed in complex and interest-dependent ways. In other words, it is not merely the case that scientific knowledge itself is constructed and emerges subjectively, that is, in a manner that reflects the power of specific scientific journals and

the prevailing paradigms and power alignments in science; it is also true that, once the scientific object solidifies, it is deconstructed and reconstructed in content-dependent pragmatic ways by different parties. As Jasanoff (1987:195) summarizes,

> The processes of deconstructing and reconstructing knowledge claims give rise to competition among scientists, public officials and political interest groups, all of whom have a stake in determining how policy-relevant science should be interpreted and by whom. All of these actors use boundary-defining language in order to distinguish between science and policy, and to allocate the right to interpret science in ways that further their own interests.

The focus of Jasanoff's (1987) article was on how the construction, deconstruction, and reconstruction of knowledge are what is at stake in boundary organizations, with contingent opportunities for both cooperation and competition between different actors depending on a host of variables, such as the electoral bases that policymakers are trying to appeal to, levels of activism among scientists, and degrees of power institutionally or informally allocated to different participants in a boundary organization. Jasanoff's article is important for primarily two reasons: (1) the identification of the environment as a key domain for boundary organizations, given that the environment is replete with examples of policy-relevant science and science-dependent policy, and (2) the discussion of knowledge construction, deconstruction, and reconstruction processes as being key dynamics governing how well, and to what ends, boundary organizations work. The article is not as sweeping as the seminal work of Star and Griesemer (1989) in examining the various levels at which boundary organizations are supposed to work, but its joint emphases on the environment and knowledge processes are useful perspectives to apply to any discussion of boundary organizations operating in the environmental domain.

GUIDING QUESTIONS

With this framework in mind, and having discussed the special role of the environment in the context of boundary objects and organizations, it is possible to take up the question of whether environmental boundary organizations are effective responses to the failures of alternative responses to managing boundary objects. This question can be usefully situated in the key literature on boundary organizations. In particular, the question should be understood in terms of what Star and Griesemer defined as a Callon-Latour-Law type of organization, which is designed to facilitate the interests of either a scientific or a governmental institution. The question can then become, To what extent have single-perspective attempts at managing environmental boundary objects failed? Single-perspective attempts can, in this context, be understood as solely market-oriented, science-oriented, or policy-oriented.

With the question having been refined, the theme of failure can then be considered more closely in light of what Guston (2001) described as the liberal and utilitarian dimensions of the true boundary organization. The underlying question informing the literature review can then be refined in the following ways:

- Q1: Have single-perspective attempts at managing environmental boundary objects failed because they have not successfully *elicited* the wants of both scientific and governmental stakeholders? If so, how and why has this kind of failure come about, and how do boundary organizations reflect a potential improvement?
- Q2: Have single-perspective attempts at managing environmental boundary objects failed because they have not successfully *delivered* the wants of both scientific and governmental stakeholders? If so, how and why has this kind of failure come about, and how do boundary organizations reflect a potential improvement?

ELICITING WANTS

Star and Griesemer (1989) and Guston (2001) emphasized that, once a boundary object is created, different stakeholders will have different wants vis-à-vis that boundary object. Guston noted that, in many cases, scientists or scientific organizations will want to continue adding to a research object; they will also want their creation of this object to be explicitly recognized by government so that, for example, they can satisfy funding conditions and continue generating budgetary and other forms of support. In considering environmental organizations (both boundary and non-boundary organizations), it is therefore appropriate to examine the rationale for boundary organizations by asking whether they have done better than single-perspective organizations in eliciting the wants of both scientific and governmental stakeholders. As part of this want-eliciting evaluation, the particular reasons for the relative success of boundary organization can also be considered.

The want-eliciting characteristics of single-perspective as well as boundary organizations can be considered from the perspective of ocean industries. An example of a single-perspective organization that reflects government interests is the United Nations (UN), particularly in the context of the United Nations Convention on the Law of the Sea (UNCLOS). UNCLOS created a definition of exclusive economic zones (EEZs) that coastal nations can exploit, but, in eliciting wants regarding this law, it communicated only with member states, not with stakeholders such as scientific organizations, private-sector organizations, or the general public (Egede 2023). A single-perspective organization representing market interests is the World Ocean Council (WOC), which, when eliciting wants for its own agenda, obtained input from companies in the ocean industries, not from governments, scientific organizations, or the public (Voyer et al. 2018). These approaches are in contrast to that of a boundary organization, the California Ocean Science Trust (COST), which, in its want-eliciting process, reached out to the government of the state of California, climate and ocean scientists, and even the general public (Lowell et al. 2012)—the last of which is a particularly important function of boundary organizations that has not

been widely discussed in the literature. Through outreach programs, educational initiatives, and transparent communication of scientific findings, COST also ensures that the public is aware of and involved in ocean governance (Lowell et al. 2012). Such inclusive public involvement contrasts with the often limited public-engagement efforts of single-perspective organizations, which may focus more narrowly on the interests of their primary stakeholders; after all, neither WOC (Voyer et al. 2018) nor UNCLOS (Egede 2023) has had input from the public.

In theoretical terms, eliciting wants can be described as a matter of agenda-setting, which, in turn, can be understood in terms of principals and agents. Close alignment between the principal and the agent, as is typically the case in single-perspective organizations, is the reason why such organizations elicit a limited set of wants. For example, the principals of WOC are private-sector companies involved in oceanic industries, such as multinational fishing companies, and the agents of WOC are either drawn from the cadres of such companies or beholden to such companies, as WOC exists only because it is funded by companies (Voyer et al. 2018). It is therefore logical to expect that the WOC agenda will be aligned primarily with the interests of maritime companies and only secondarily, if at all, with the interests of scientists, governments, and the public.

By contrast, boundary organizations by definition have more than one set of principals; at a minimum, such organizations must have at least one government agency and at least one scientific institution as principals. Often, the agents of boundary organizations are themselves drawn from these two groups of principals so that, for example, agenda-setting necessarily reflects the wants of these two groups. Even if agents are professional managers rather than representatives of a scientific or governmental group, the nature of a boundary organization is such that agenda-setting is formally encoded into processes. This point was made in detail by Star and Griemer (1989) in their description of how the governance of Berkeley's Museum of Vertebrate Zoology included a highly detailed discussion of how to elicit agenda items from the museum's scientific as well as governmental stakeholders. Star and Griemer went on to note that this detailed and explicit approach to agenda-setting has been widely adopted, so that modern boundary organizations are formally set up to be able to elicit agenda items from all stakeholders. Indeed, according to Star and Griemer, this approach is what makes a boundary organization a boundary organization; otherwise, the organization would become a single-perspective organization following what Star and Griemer called the Callon-Latour-Law model.

In a detailed case study of a boundary organization, Klerkx and Leeuwis (2008) made the point that boundary organizations can best be understood in terms of networks, with these networks including multiple decision-making agents who, in the distributed power structure characteristic of the boundary organization, have equal or at least similar power over different agenda items. These authors emphasize that the issue is complex insofar as there are also multiple agenda types within a boundary organization; for example, the selection of a research focus could be an agenda item on which the scientific component of the organization has more influence, whereas items on the funding agenda would be more in the domain of government—as was the case in Klerkx and Leeuwis's case study; however, the larger point remains: The very nature of a boundary organization is better designed for eliciting wants from both the scientific and governmental components

of the organization, whereas a single-perspective organization remains vulnerable to the agenda-setting dominance of a single stakeholder group, which, as Voyer et al. (2018) noted in the case of WOC, ensures that agents act on behalf of its interests.

Additional examples of the want-eliciting advantages of environmental boundary organizations abound. In the late 1970s, the Environmental Protection Agency (EPA) in the United States made efforts to establish emissions standards and ambient air quality, efforts that were met with resistance from the auto industry, highlighting a contentious relationship between governmental and commercial priorities. The landmark 1977 Clean Air Act Amendments introduced new regulations, requiring the auto industry to scientifically prove that their parts did not harm the environment. The EPA did not trust the industry's research efforts, however, and the industry was reluctant to defer to the EPA's impartiality (Guston and Clark 2000:14). This adversarial stance reflected the limitations of single-perspective approaches in effectively eliciting the wants of both stakeholders.

Recognizing the need for a collaborative approach, Chuck Powers, Vice President and Chief Environmental Officer of Cummins Engines, and Michael Walsh, EPA Deputy Assistant Administrator, established the Health Effects Institute (HEI). This boundary organization was designed to address the demands of the EPA while considering the operational realities of the auto industry. By creating a neutral ground for dialogue, the HEI aimed to elicit the wants of both the EPA and the auto industry, fostering a cooperative environment in which both parties could work toward common goals (Guston and Clark 2000:14).

The HEI's structure allowed it to balance the interests of the scientific and industrial stakeholders. It facilitated open communication and negotiation, ensuring that both sides could voice their concerns and set agendas collaboratively. This process was essential for eliciting the wants of both the EPA, which sought stringent regulatory compliance, and the auto industry, which needed feasible implementation strategies. By involving both parties in the decision-making process, the HEI exemplified how boundary organizations could effectively elicit and integrate diverse stakeholder interests, reducing tensions and promoting cooperation.

This case illustrates the importance of boundary organizations in overcoming the challenges of single-perspective approaches. The HEI's success in eliciting wants from both the EPA and the auto industry underscores the value of collaborative frameworks in addressing complex regulatory issues. By balancing the needs and goals of different stakeholders, the HEI demonstrated how boundary organizations could facilitate more effective and harmonious interactions between regulatory bodies and industry players, leading to mutually beneficial outcomes.

The EPA case study should, however, also be understood in terms of Jasanoff's (1987) comments about knowledge contestation as part of the processes common in environmental boundary organizations. Ultimately, the HEI successfully bridged the distance between the EPA and the automotive industry, but this process involved what Jasanoff has described as the interest-motivated deconstruction and reconstruction of knowledge. For example, the EPA argued that catalytic converters were a proven technology that could significantly reduce harmful emissions (citing studies showing that these devices could cut emissions of carbon monoxide, hydrocarbons, and nitrogen oxides

by up to 90%), whereas the automotive industry-sponsored studies concluded that catalytic converters were not yet reliable enough for mass production. The EPA advocated for the reduction of lead in gasoline, citing research linking lead exposure to severe health issues, particularly in children, whereas the auto industry's studies argued that removing lead from gasoline would decrease engine performance and increase wear and tear, leading to higher maintenance costs. Finally, drawing on data from independent testing laboratories, the EPA maintained that stringent emissions testing and standards were essential to ensure compliance and achieve the desired reduction in air pollution, whereas industry studies criticized the EPA's testing procedures as unrealistic and not reflective of real-world driving conditions.

As a boundary organization, the HEI overcame some of the issues related to knowledge contestation by involving both the EPA and the automotive industry in agenda-setting, creating a framework for jointly sponsored rather than adversarial research, and serving as a neutral and trusted evaluator of evidence independent of both the EPA and the automotive industry. These were the aspects of the HEI boundary organization that enabled its success, and they can all be understood in terms of how well HEI overcame the knowledge-contestation problems that, according to Jasanoff, plague environmental boundary objects and prevent the success of boundary organizations. These factors can also be understood under the heading of eliciting wants because joint agenda-setting allowed both sides to express their wants, joint research allowed these wants to be embedded in the process of knowledge construction, and the neutrality of the HEI provided a trustworthy forum within which wants could be evaluated and interpreted. This case study suggests that, if wants are elicited in a manner that bridges differences (especially as related to knowledge contestation), then the process of meeting wants is relatively straightforward, because the organic end product of the boundary organization's functioning is the creation of a want list on which all involved parties agree.

MEETING WANTS

Eliciting wants is, according to Lukes (1974), among the first things any nonauthoritarian organization does when it is framing its mission, strategy, and tactics. Eliciting wants is only the first step in organizational function, however; such wants, once elicited, must also be delivered to the respective stakeholders of an organization. Having considered both single-perspective organizations and boundary organizations from the basis of want-eliciting, it remains to be explored how well both of these organizational types have done at meeting wants.

In the context of the world's oceans, it is clear that single-perspective organizations have met the wants of their primary stakeholders. For example, although most of the world's governments have either mandatory or suggested pollution-mitigation practices in place for private-sector organizations that affect the ocean, a recent survey indicated that only 44% of companies involved in the global ocean economy actually take pollution-mitigating steps and only around 1 in 4 of such companies has a corporate social-responsibility stance with respect to their impacts on the ocean (Sardá et al. 2023). These statistics constitute some evidence that the wants of private companies—that is, to

minimize the expenses of pollution-mitigating corporate social responsibility while maximizing their use of the oceans—have received preference over the wants of governments. Moreover, these statistics also reinforce the conclusion that the WOC and similar single-perspective organizations designed to promote the rights of private-sector companies have not succeeded in meeting governmental wants related to pollution reduction (Voyer et al. 2018).

The same kind of point can be made in reverse when considering how single-perspective organizations prioritizing governments have delivered on the wants of stakeholders. For example, UNCLOS has, in its definition of EEZs, severely hurt the fishing economies of African countries:

> The rights of landlocked states are limited to the excess of the allowable catch of living resources in the same subregion or region's EEZs as determined by coastal States. Africa has 16 landlocked States. . . . No African States have entered into any agreements to allow their neighbouring landlocked and geographically disadvantaged States to exploit living resources in their EEZs. (Egede 2023)

A single-perspective organization (in this case, the UN) thus has not delivered on the wants of landlocked African countries vis-à-vis their fishing industries. When the private sector generates organizations—such as the WOC—to manage commercial activity, the wants of organizations are privileged over the wants of governments (Voyer et al. 2018). In the case of UNCLOS, the wants of coastal state governments are prioritized over the wants of the fishing industries of landlocked African nations (Egede 2023).

Boundary organizations have demonstrated the potential to better balance the interests of science and government as they pertain to the oceans. For example, COST organizations can meet the wants of diverse stakeholders more effectively than can single-perspective organizations (Lowell et al. 2012). Unlike WOC, which primarily advocates for the interests of private-sector companies, COST bridges the gap between science and policy. For governments, COST aids in the development of evidence-based regulations and management strategies for ocean resources, balancing environmental protection with economic considerations (Lowell et al. 2012). As a result, the wants of government and businesses vis-à-vis the ocean are better balanced (Lowell et al. 2012).

Also in contrast to COST, UNCLOS has faced challenges in balancing the wants of different stakeholders (Egede 2023). Its focus on the rights of coastal states has led to unintended negative impacts on the fishing economies of landlocked African countries, demonstrating how a single-perspective approach can fail to address the broader needs of all affected parties (Egede 2023). A boundary organization such as COST is better positioned to meet the wants of multiple stakeholders (Sardá et al. 2023).

The HEI also offers an example of a boundary organization doing better at meeting wants. The HEI's mandate was to produce independent scientific research that could be trusted by both the EPA and the auto industry, succeeding in what Jasanoff (1987) identified as the critical domain of smoothing over knowledge contestation. By doing so,

it met the EPA's need for credible evidence that automotive emissions controls were effective, while also addressing the industry's desire for feasible and cost-effective compliance solutions. This dual focus ensured that the research outcomes were relevant and actionable for both stakeholders (Guston and Clark 2000:14). One of the key ways in which the HEI met the wants of its stakeholders was by creating a framework where both the industry and the EPA could collaborate on research projects. This collaborative approach ensured that the research conducted was aligned with the regulatory standards required by the EPA and the practical constraints faced by the industry. By involving representatives from both sides in the research process, the HEI was able to produce findings that were both scientifically rigorous and practically applicable, thus meeting the needs of both parties (Guston and Clark 2000:14).

COUNTEREXAMPLE

Jasanoff's (1982) article is of interest because it discusses how a single-perspective approach, that of the Occupational Safety and Health Administration (OSHA) with respect to late-1970s/early-1980s carcinogen policy, was inefficient and failed to equitably elicit and meet the needs of stakeholders. This case can serve as a contrast to HEI, with HEI's success illustrating what a boundary organization can add that OSHA, a single-perspective organization, did not.

Jasanoff (1982) summarized OSHA's carcinogen policy as a failure because the policy (1) was contested vigorously in court by industry; (2) stipulated stringent criteria established for evaluating scientific evidence, such as epidemiological studies and high-dose animal tests, that were often impractical and impossible to meet; (3) failed to build a consensus among the scientific community and other stakeholders; (4) resulted in administrative inefficiency because of procedural complexity and inflexibility, partly because of its attempt to create generic rules that did not account for the nuances and evolving nature of scientific knowledge about carcinogens; (5) failed to address the economic realities faced by the regulated industries; and (6) established overly rigid criteria for accepting scientific evidence that failed to integrate knowledge from new scientific discoveries or advancements, thus "freezing science."

What the case studies of HEI and COST demonstrate is that boundary organizations could have done better than OSHA because of (1) inclusive agenda-setting that could have involved both scientific experts and industry representatives in setting the agenda for carcinogen regulation, (2) the facilitation of collaborative research between stakeholders, (3) neutral evaluation of evidence that would have helped the "freezing of science" problem faced by OSHA, (4) building trust among stakeholders, and (5) supporting policy flexibility and responsiveness. In these ways, well-run environmental boundary organizations would have addressed many of the shortcomings of OSHA's carcinogen policy, leading to more effective regulation that was simultaneously scientifically sound, economically feasible, and broadly supported by all key stakeholders.

DISCUSSION AND CONCLUSION

The previous sections of the literature review seem to support the hypothesis that boundary organizations exist in the space between policy and science. Indeed, scholars tend to define boundary organizations on this basis; a boundary organization must be interstitial (Carr and Wilkinson 2005; Cash 2001; Guston 2001; Howells 2006; Miller 2001; O'Mahony and Bechky 2008; Parker and Crona 2012; Pham et al. 2010; Schneider 2009; Zald 2008). This aspect of boundary organizations requires further interrogation. Given that boundary organizations require substantial investment of time, money, and intellectual resources to create, the question becomes why so many boundary organizations have appeared over the past several decades.

The answer to this question appears to be that boundary organizations ultimately address problems that are not adequately resolved by governance/policy alone or by markets alone. The preceding discussion of boundary organizations has offered some case study examples of how boundary organizations are able to exist within the gap between markets and governance; however, it remains to give a more formal account of why stakeholders on either side of the boundary would want to support the existence and operation of boundary organizations.

In the domain of the environment in particular, a key consideration is that, once a boundary object (such as a scientific finding) is generated, it is likely to be relevant to policy, and policymakers are often going to want to act on it somehow (Jasanoff 1987). In this process, the key need that policymakers have for scientists is justification, because, as Jasanoff noted, policymakers have a vested interest in showing that their policies are somehow rooted in science. The prestige and reliability of science remain desirable supports for policymakers, and if a policy is critiqued or unpopular, science also provides a cover, as policymakers can claim that they were just following the science (Jasanoff 1987). Meanwhile, scientists want funding from policymakers, and they also want to maintain their own cognitive prestige by driving actions based on the knowledge they have generated (Jasanoff 1987); therefore, as Jasanoff noted in one of the earlier articles on boundary organizations and the environment, there is already a structure in place for a symbiotic relationship between policymakers and scientists in the environmental domain. This symbiosis can be, and has been, embodied in the form of boundary organizations, and what becomes more relevant subsequently is to explain how particular environmental boundary organizations can thrive and can benefit their constituent stakeholders.

The framework of needs-eliciting and needs-meeting—which are themselves organic byproducts of boundary organizations that build power-sharing into agenda-setting, leader selection, and organizational bylaws—helps to explain the success of environmental boundary organizations such as HEI and COST. For stakeholders, the good news is that there are built-in reasons for wanting to support boundary organizations, as well as built-in reasons for such organizations to be efficient and successful, because, as Jasanoff (1987) summarized, scientists and policymakers need each for specific and compelling reasons. This need is, in turn, an organic driver for stakeholders' contributions to, or simply acceptance of, boundary organizations designed to serve their joint needs.

In conclusion, environmental boundary organizations can be situated ideally between governance and markets, effectively addressing the limitations of single-perspective approaches such as those of OSHA or WOC. Environmental boundary organizations can promote inclusivity, adaptability, and collaborative decision-making, all of which are particularly necessary in environmental contexts. HEI and COST have, as successful boundary organizations, efficiently combined policy and science interests by fostering trust and cooperation. Unlike OSHA's carcinogen policy, which struggled with rigid criteria, administrative inefficiency, and stakeholder discord, good boundary organizations are designed to elicit and meet the needs of all parties involved. They achieve this through inclusive agenda-setting, collaborative research initiatives, and neutral evaluation of evidence, thus ensuring policies that are scientifically robust, economically viable, and broadly supported.

REFERENCES

Carr, Anna, and Roger Wilkinson. 2005. "Beyond Participation: Boundary Organizations as a New Space for Farmers and Scientists to Interact." *Society and Natural Resources* 18(3):255–65.

Cash, David W. 2001. "In Order to Aid in Diffusing Useful and Practical Information: Agricultural Extension and Boundary Organizations." *Science, Technology & Human Values* 26(4):431–53.

Egede, Edwin. 2023. "UNCLOS 82: Africa's Contributions to the Development of Modern Law of the Sea 40 Years Later." *Marine Policy* 148:105463.

Gieryn, Thomas F. 1999. *Cultural Boundaries of Science: Credibility on the Line.* IL: University of Chicago Press.

Guston, David H. 2001. "Boundary Organizations in Environmental Policy and Science: An Introduction." *Science, Technology, and Human Values* 26(4):399–408.

Guston, David H., and William C. Clark. 2000. *Report of the Workshop on Boundary Organizations in Environmental Policy and Science*. Cambridge, MA: Harvard University.

Howells, Jeremy. 2006. "Intermediation and the Role of Intermediaries in Innovation." *Research Policy* 35(5):715–28.

Jasanoff, Sheila S. 1982. "Science and the Limits of Administrative Rule-Making: Lessons from the OSHA Cancer Policy." *Osgoode Hall Law Journal* 20(3):536–61.

Jasanoff, Sheila S. 1987. "Contested Boundaries in Policy-Relevant Science." *Social Studies of Science* 17(2):195–230.

Klerkx, Laurens, and Cees Leeuwis. 2008. "Delegation of Authority in Research Funding to Networks: Experiences with a Multiple Goal Boundary Organization." *Science and Public Policy* 35(3):183–96.

Lowell, Sara M., Tegan C. Hoffmann, Meaghan McGrath, Gia Brazil, and Sarah L. Thomas. 2012. "Coastal and Ocean Science-Based Decision-Making in the Gulf of California: Lessons and Opportunities for Improvement." *Coastal Management* 40(6):557–76. doi:10.1080/08920753.2012.727725.

Lukes, Stephen. 1974. *Power: A Radical View*. New York: Free Press.

Miller, Clark. 2001. “Hybrid Management: Boundary Organizations, Science Policy, and Environmental Governance in the Climate Regime.” *Science, Technology & Human Values* 26(4):478–500.

O’Mahony, Siobhán, and Beth A. Bechky. 2008. “Boundary Organizations: Enabling Collaboration among Unexpected Allies.” *Administrative Science Quarterly* 53(3):422–59.

Parker, John, and Beatrice Crona. 2012. “On Being All Things to All People: Boundary Organizations and the Contemporary Research University.” *Social Studies of Science* 42(2):262–89.

Pham, Thu Thuy, Bruce M. Campbell, Stephen Garnett, Heather Aslin, and Minh Ha Hoang. 2010. “Importance and Impacts of Intermediary Boundary Organizations in Facilitating Payment for Environmental Services in Vietnam.” *Environmental Conservation* 37(1):64–72.

Sardá, Rafael, Stefano Pogutz, Manlio de Silvio, Virginia Allevi, Aristea Saputo, Roberta Daminelli, Federico Fumagalli, et al. 2023. “Business for Ocean Sustainability: Early Responses of Ocean Governance in the Private Sector.” *Ambio* 52(2):253–70.

Schneider, Anne L. 2009. “Why Do Some Boundary Organizations Result in New Ideas and Practices and Others Only Meet Resistance? Examples from Juvenile Justice.” *The American Review of Public Administration* 39(1):60–79.

Star, Susan Leigh, and James Griesemer. 1989. “Institutional Ecology, ‘Translations’ and Boundary Objects: Amateurs and Professionals in Berkeley’s Museum of Vertebrate Zoology, 1907–39.” *Social Studies of Science* 19(3):387–420.

Voyer, Michelle, Genevieve Quirk, Alistair McIlgorm, and Kamal Azmi. 2018. “Shades of Blue: What Do Competing Interpretations of the Blue Economy Mean for Oceans Governance?” *Journal of Environmental Policy & Planning* 20(5):595–616. doi:10.1080/1523908X.2018.1473153.

Zald, Mayer N. 2008. “Epilogue: Social Movements and Political Sociology in the Analysis of Organizations and Markets.” *Administrative Science Quarterly* 53(3):568–74.