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RESEARCH ARTICLE

Scale matters: The scale of environmental issues in corporate collective actions

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Research Summary: Much of the research on corporate collective action to manage common pool resources is focused on coordinated actions, such as voluntary programs, rather than collaborative actions, such as technology sharing. In this article, we examine inductively the collective actions taken by a consortium of 12 oil sands companies to address three environmental issues of different scale. We identified a set of organizing rules that determined whether the relationship among industry members would be collaborative or competitive, and found that the organizing rules for collaborative collective action were more effective for smaller scale issues (i.e., tailings ponds and water) than the larger scale issue (i.e., greenhouse gas emissions). Our findings contribute to research on the competitive dynamics of collaborating with competitors and on industry self-regulation.

Managerial Summary: Many environmental issues, such as climate change, water quality, and contaminated land, are caused by the overexploitation of commonly shared natural resources. Firms will often overuse resources because their cost of use is less than the benefit that accrues. In Alberta's oil sands, 12 of the major oil sands operators, all competitors, have agreed to collaborate by sharing technology, which goes against the received wisdom of competition. This multiparty collaboration among competitors, while still relatively rare, is becoming increasingly commonplace. In this article, we outline the rules that allow this collaboration to flourish. Our most important finding is that the rules are shaped by the scale of the issue being managed, not the size of the collaboration.

KEYWORDS

collective action, environmental issues, industry self-regulation, issue scale, multimarket competition

1 | INTRODUCTION

Environmental issues, such as climate change, water use, and contaminated land, present some of the most significant threats to the planet, society, and organizations. What makes environmental issues different from most other issues, including many social issues, is that they involve common pool resources—all users affect the resource and no users can be excluded (Ostrom, 1990). One firm's actions can negatively affect the resources available to other firms. Overusing the resources can contribute to the tragedy of the commons, which penalizes all firms and society that rely on these resources (Hardin, 1968).

Industry can manage common pool resources by taking collective action, which are actions taken by a group of people or organizations for a common cause (Olson, 1965). Prior strategic management literature on collective actions for protecting common pool resources has focused primarily on voluntary programs or standards, such as certification of products (e.g., United States Department of Agriculture [USDA] Certified Organic; Leadership in Energy and Environmental Design [LEED]-certified buildings), certifications of production processes (e.g., International Organization for Standardization [ISO] 14001), and industry-specific standards, such as the chemical industry's Responsible Care (King & Lenox, 2000; King, Lenox, & Terlaak, 2005; Lee, Hiatt, & Lounsbury, 2017; York & Lenox, 2014).

However, most of this prior work on collective action focuses on *coordinated*, not *collaborative,* actions. In coordinated actions, a group of organizations agree on the rules, such as the requirements for certification, monitoring of the practices, and sanctions for noncompliance. One firm's decision to certify is independent of the decisions of other organizations to certify. In collaborative actions, organizations share resources and technologies, including intellectual property, so that organizational actions are interdependent. Even Ostrom's (1990, p. 40) seminal work on managing common pool resources focused on "independent action in an interdependent situation." Collaboration is likely to be more effective than coordination in managing common pool resources because sharing resources and technologies improves the performance of all organizations with each technological breakthrough and optimizes resource use. Even though organizations and society benefit through such collaborations, corporations are unlikely to collaborate because of the incentives to shirk or free ride. The tenuous balance between collaboration and competition means that such collaborations are relatively rare in managing common pool resources.

We uncovered one such collaborative collective action in Canada's oil sands. The oil sands are very large—they represent 13% of the world's known oil supply and approximately 60% of reserves available for private investment. Yet, separating oil from sand imposes heavy environmental costs. The oil sands industry accounted for 7.8% of Canada's greenhouse gas emissions in 2011 (Environment Canada, 2013), which were expected to double by 2025 (Council of Canadian Academies, 2015). As a result, the industry has been facing considerable backlash from civil society worldwide.

In March 2012, 12 oil sands producers representing almost 90% of Canadian oil sands production signed a charter to take collective action and share intellectual property to accelerate "improvement in environmental performance through collaborative action and innovation."[1] They called this initiative Canada's Oil Sands Innovation Alliance (COSIA). This initiative was particularly interesting because the members shared intellectual property to manage common pool resources in an industry in which technology was central to competitive advantage.

We collected and analyzed data inductively about three different environmental issues managed by COSIA: tailings, water, and greenhouse gases (GHGs). We discovered a set of organizing rules that permitted collaborative collective action to manage common pool resources. These rules differed by

[1]COSIA vision, retrieved December 14, 2015, from http://www.cosia.ca/about-cosia/charter.

issue and determined whether the relationship among industry members would be collaborative or competitive. We found that the organizing rules that shaped collaborative collective actions were more effective for the smaller scale issues (i.e., tailings ponds and water) than the larger scale issue (i.e., greenhouse gas emissions). Through these findings, we contribute to the literature on industry self-regulation, which has focused on coordinated actions, by recognizing the importance of issue scale in the effectiveness of collaborative self-regulation. We also contribute to the literature on the competitive dynamics of competitor collaborations, which tends to focus on bilateral alliances, by describing the issue-based rules needed for multiparty competitor collaborations.

2 | THEORETICAL BACKGROUND

2.1 | Collective action through industry self-regulation

Management scholars refer to the voluntary association of firms to control their collective actions without government intervention as industry self-regulation (King & Lenox, 2000). In most cases, these collective actions are based on private assessments of the relative costs and benefits of different courses of action (Ostrom, 1990; Prakash & Potoski, 2007). Organizations representing the industry develop rules and standards for self-regulatory schemes, and then each industry member decides independently if it will participate and the extent of its commitment (Montiel, Husted, & Christmann, 2012; Prakash & Potoski, 2006).

The results of such coordinated industry self-regulation schemes are mixed. There is a substantial body of empirical evidence that shows that these schemes often do not fix the problems they are designed to solve (King, Prado, & Rivera, 2012). For example, the individual environmental performance of participants in the U.S. chemical industry's Responsible Care, the ISO 14001 environmental management standard, and sustainable agriculture schemes are no better than the environmental performance of nonparticipants (Blackman & Rivera, 2011; Gamper-Rabindran & Finger, 2013; Russo & Harrison, 2005). In a meta-analysis of nine studies that included 30,000 U.S.-based firms, Darnall and Sides (2008) found that the environmental performance of firms that adopted voluntary environmental programs was approximately 7% *worse* than those that had not adopted these programs. However, other studies point to the effectiveness of self-regulation in improving environmental performance under specific conditions, such as the imposition of sanctions (Henriques, Husted, & Montiel, 2013; Potoski & Prakash, 2013), market pressures (Christmann & Taylor, 2006; Delmas & Toffel, 2008), and an active regulatory context (Dasgupta, Hettige, & Wheeler, 2000; Short & Toffel, 2010).

The focus on coordinated independent actions in the industry self-regulation literature has deflected attention from collaborative interdependent actions in which organizations share resources and technology, and consequently share the benefits and risks (Hennart, 1988; Parkhe, 1993). Collaborative approaches support the aphorism that a "rising tide lifts all boats," so that the technological gains made by one participant are shared with all. Arguably, such collaborative approaches are particularly important for common pool resources that are under significant threat. Yet, such approaches require industry members to manage the tenuous relationship between competition and collaboration.

2.2 | The competitive dynamics of collaborating with competitors

Collaborations with competitors are more difficult to manage than collaborations with other stakeholders or supply chain partners. Industry actors must share sufficient information and insights to benefit mutually from the exchange, yet not share so much information to risk eroding their competitive advantage. The flexibility of self-interested pursuits must be balanced with the learning and efficiencies of collaborative pursuits (Albert, Kreutzer, & Lechner, 2015).

Nalebuff and Brandenburger (1996, p. 4) coined this type of relationship *co-opetition*, which is when firms "compete without having to kill the opposition… [and] cooperate without having to ignore self-interest." By collaborating, competitors can grow resources, mitigate risks, and generate financing for significant investments, as reflected by the interfirm alliances among biotechnology firms to discover and develop new drugs (Rothaermel & Deeds, 2004). In other words, competitors can expand their niche through collaboration (Ingram & Yue, 2008).

The sparse research on the outcomes of such collaborations paints an optimistic picture. Lado, Boyd, and Hanlon's (1997) conceptual work argued that competitors that collaborate generate syncretic rents, which are higher than purely collaborative or purely competitive rents, because of the constructive conflict arising from the tension between competition and collaboration. Luo, Rindfleisch, and Tse (2007) found empirical support for the "right" or "optimal" balance between competition and collaboration—where profitability was highest when organizations do not share too much or too little.

This tension between collaboration and competition has been described as a paradox (Chen, 2008), which is best managed by isolating the collaborative parts of the organization from the competitive parts (Bengtsson & Kock, 2000; Luo, 2007). In doing so, the collaborative parts of the organization can build trust with its partners, which is facilitated through personal friendship ties (Ingram & Roberts, 2000), rich communications and a cooperative task orientation (Ghobadi & D'Ambra, 2012), shared goals and objectives (Bengtsson & Kock, 2000), and interdependencies, such as risk sharing (Luo, 2007). To prevent knowledge spillovers to the competitive parts of the relationship, the organization can use legal instruments, such as patents, trademarks, and copyrights (Estrada, Faems, & de Faria, 2016). Competitors are also advised to carefully control the information they share (Hamel, Doz, & Prahalad, 1989), by sharing abstracted or aggregated information about only outcomes and not processes, so the competitive information cannot be reverse engineered (Fernandez & Chiambaretto, 2016).

There are two research biases in this literature on collaborating with competitors that have left gaps that can be informed by researching the management of common pool resources. First, most research on collaborating with competitors focuses on *bilateral* joint ventures and alliances, rather than the *multiparty* relationships needed to manage common pool resources. Second, research on collaborating with competitors assumes that the competitive parts of the organization can be isolated from the collaborative parts, yet this separation is difficult to maintain in managing common pool resources because the technologies needed to manage water, land, and air are often core to the entire organization. To address these research gaps, we seek to understand *how can collaborative collective actions be organized to manage common pool resources?*

3 | METHODS

3.1 | Research context

Our research context is a collaborative collective action among competitors in Canada's oil sands. Twelve major oil sands companies established COSIA in 2012 with the goal of accelerating the industry's environmental performance by sharing technology. The founding member companies included BP Canada, Canadian Natural Resources Limited, Cenovus Energy, ConocoPhillips

Canada, Devon Canada, Imperial Oil, Nexen, Shell Canada, Statoil Canada, Suncor Energy, Syncrude Canada, and Total E&P Canada. Together, the member companies represented almost 90% of Canada's oil sands production (COSIA, 2014).

At the time of our study, Canada housed the third largest oil reserves in the world, after Saudi Arabia and Venezuela (OSDC, 2011). Large companies dominated the industry because extracting oil required high capital investments. In 2012, COSIA members had a combined global market capitalization of more than $750 billion. Industrial activity in the oil sands had grown exponentially over the previous decade and was barely interrupted by the global financial crisis and recession. Due to sustained capital investment, totaling $25 billion in 2012 alone, oil sands output was expected to more than double to 3.7 million barrels a day by 2025 (OSDC, 2011).

Environmental groups were highly critical of the oil sands due to the significant environmental issues caused by extracting the oil from the sand, which included the creation of toxic tailings ponds, high water usage, substantial greenhouse gas emissions, and clearing boreal forest. Many stakeholders were calling for the oil sands to be shut down because the "dirty oil" produced such significant greenhouse gas emissions and toxic by-products, tarnishing the industry's reputation worldwide. Faced with such mounting pressures, managers in the industry formed COSIA to improve the industry's environmental performance, and thereby its reputation.

We chose to focus our research on COSIA for several reasons. First, the oil sands industry generates significant environmental impacts, which allowed us to examine how firms voluntarily organize to address common pool resources. Second, the member companies agreed to collaborate to respond to environmental issues by sharing technologies, rather than simply certifying to existing standards, so we could observe a phenomenon that has garnered limited attention among strategy scholars.

We focused on COSIA's response to three different environmental issues—tailings, water, and greenhouse gas emissions. COSIA had also tackled a fourth issue, land, which we did not include because at the time we began our study COSIA included social concerns such as sustainable communities in how they addressed land issues, rather than exclusively focusing on environmental common pool resources.

3.2 | Data collection

We collected primary data from September 2011 to September 2013. Data collection began when the larger oil sands companies were discussing the formation of an industry-wide alliance in Fall 2011. COSIA was officially launched in March 2012, when 12 companies signed the COSIA charter. COSIA's first task was to negotiate the scope and workings of the alliance in each of its issue areas, which it called Environmental Priority Areas (EPAs). During our data collection period, COSIA members negotiated and set up joint venture agreements to govern the activities of each EPA. We ended our primary data collection once the final joint venture agreement was signed in September 2013. We continued collecting secondary data until 2015 to observe the outcomes of the collaboration.

Our data comprised interviews, observations, and archival documents. In total, we conducted 59 semistructured interviews, including key decision makers involved in COSIA, the participating companies, members of NGOs, and industry experts. Interviews lasted about one hour each, and were transcribed fully. We observed 12 half-day meetings and a full-day retreat of working groups in which industry participants discussed water and greenhouse gas issues. One of the authors and a research assistant attended these meetings and took detailed notes of the activities, interactions, decision-making processes, and informal discussions. We collected secondary data sources, including media articles, internal documents, website content, and industry reports. We searched Factiva to identify media articles related to the oil sands in major Canadian newspapers using the keywords *tailings*, *water*, *climate change*, and *greenhouse gases*. This information was used to further understand the context and to validate our primary data sources. We also used secondary sources gathered after our primary data collection phase to evaluate the outcomes of each EPA 1 year after the end of our primary data collection, in November 2014.

3.3 | Data analysis

We analyzed the data between waves of data collection, and again in their entirety after all the data were collected. This process allowed us to continuously refine our research focus and questions, while probing more deeply into our emerging findings. We soon realized that each COSIA EPA was organized differently. We then focused our interview questions on how each EPA was organized, the issues that each EPA addressed, how members decided the collaborative activities in which they would be involved, and the consequences of these choices.

We organized and coded the large volume of textual data using QSR NVivo. We first coded the language used by informants to describe the processes and goals of COSIA. We then explored connections between and among these first-order concepts, which helped us group these first-order concepts into second-order themes (see Figure 1). We allowed concepts and relationships to emerge from the data in an inductive process. The data analysis consisted of three stages: a within-case analysis to understand how each issue was being addressed within its respective EPA, a cross-case comparison comparing EPAs and their respective environmental issues, and a theory-building stage.

We began by coding for the first-order concepts and second-order themes, which generated four aggregate dimensions: (a) issue scale; (b) organizational context; (c) organizing rules; and (d) organizational and environmental outcomes. Applying axial coding (Miles & Huberman, 1994), we refined the set of codes that we developed as we recoded each interview. To ensure within-case reliability, we prepared a summary sheet for each EPA, and then for each round of interviews. Using these summary sheets, we then searched for relationships within each EPA among the concepts and themes. After we identified the aggregate dimensions, we compared our insights across the different issues (EPAs), using the approach proposed by Eisenhardt (1989). We compared the concepts and relationships between the cases, and consulted existing literature that described issue scale and industry self-regulation. Through extensive discussions, we debated the emerging categories and relationships, and discussed discrepancies until we reached agreement.

In the next stage, we engaged in an iterative process between data and theory. In the later stages, we recoded the data, looking for examples of the different organizing rules and how they applied within each EPA. Comparing this with the collaborative outcomes alerted us to the different ways in which each EPA attempted to manage the challenges of common pool resources, with different degrees of success among the three EPAs. Finally, we used COSIA's experience with organizing rules in each EPA to theoretically articulate how issue-based rules can help to manage collaborations with competitors, and how different organizing rules are better suited for managing common pool resources of different scale.

4 | FINDINGS

In this section, we first describe the organizing rules developed within COSIA to manage member firms' activities. We then describe the environmental issues, outcomes, and organizing rules as they

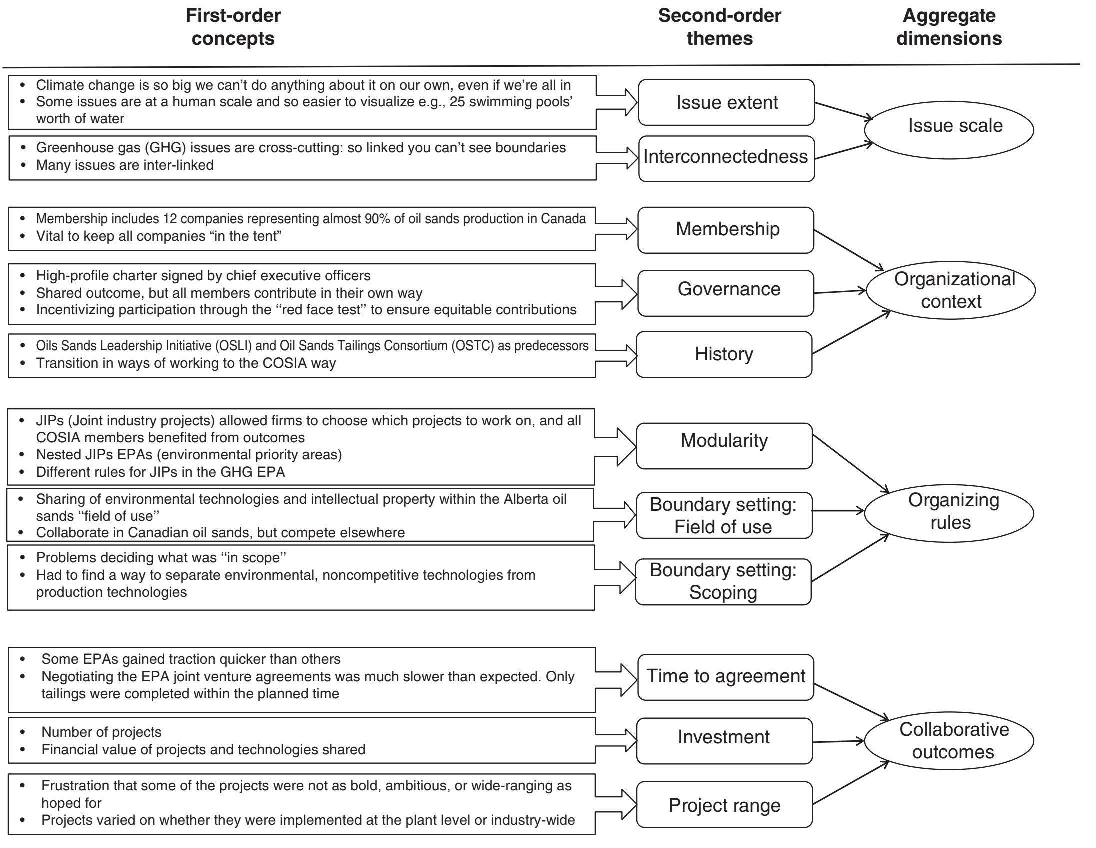

FIGURE 1 Data structure

were applied within each of the three EPAs we studied. We close with a comparative summary of the three environmental issues, EPAs, and outcomes.

4.1 | Organizing rules

COSIA members developed formal joint venture agreements for each EPA. These agreements took considerable time to negotiate because they required formalized rules to govern shared activities. Members described COSIA as more "rigid" and "corporate," and less "entrepreneurial" than previous attempts at collaboration among oil sands companies. Some members complained that working within COSIA "feels like we're getting buried in procedures and paperwork" (Water EPA member). The members of each EPA were expected to share intellectual property and collaborate on developing new technologies. COSIA, therefore, needed to identify the rules for governing activities, and eventually developed three general rules: joint industry projects (JIPs), a field of use rule, and scoping rules. These rules were then applied and negotiated within each EPA to identify the environmental technologies the members would collaborate on. Each of these rules is described more fully below and in Table 1.

Joint Industry Projects (JIPs) allowed firms to opt into the projects on which they wanted to work, recognizing that not all companies would want to or be able to participate in all projects. COSIA had 12 member companies, and they differed in their production activities and environmental impacts. For example, not all companies were involved in operations that generated tailings ponds. Joint industry projects allowed firms to choose the projects in which they would contribute their time, expertise, and money, but the results of each project would be shared with all COSIA member companies. Instead of each company undertaking technology projects independently, or alternatively, all companies participating in all projects, joint industry projects allowed smaller groups of firms to pool resources on specific projects. According to participants, joint industry projects helped to decrease overlap, enhance specialization, accelerate innovation, and leverage limited resources.

Field of use rules stipulated that the technologies co-developed within COSIA could be used only in the Alberta oil sands and not be applied to the other regions in which the member companies operated. Several of the global oil and gas firms were competitors in other oil fields, such as in the Middle East, Latin America, or Russia, and did not want any technologies shared within COSIA to be applied by competitors in other resource plays. The field of use rule ensured that companies could collaborate on technologies within the "IP free zone" of the Canadian oil sands, knowing that any technologies they shared could not be applied elsewhere. The field of use rule helped ensure that joint investments did not "leak" into other areas where some global companies were competitors.

Scoping rules determined which projects or technologies were in or out of the scope of the EPA. COSIA was formed to address common pool environmental issues, but some technologies were also competitive, such as efficiencies that lowered costs or conferred a competitive advantage. Interviewees described technologies as being on a "spectrum" from primarily an environmental impact to primarily a production impact. They argued that collaboration on technologies with a production impact that reduced costs or dampened competition were not in the best interests of shareholders. For example, within the Water EPA, the companies excluded technologies that lowered the steam-to-oil ratio because lowering energy used to generate the steam also lowered production costs.

COSIA members had intended to apply the three rules as a "template" uniformly across the different EPAs. Although there was widespread agreement that such rules were necessary, a member of the COSIA Water EPA said that "The proof will come when we actually try to execute a project under that COSIA template." The rules evolved considerably in the 2 years over which the joint venture agreements were negotiated. Importantly, each EPA resulted in very different outcomes that offer some insight into the effectiveness of the rules. In the remainder of this section, we describe the environmental issue, outcomes, and rules for each EPA. The findings are summarized in Table 2.

4.2 | Tailings Environmental Priority Area (EPA)

4.2.1 | The tailings issue

Tailings ponds are by-products of the oil extraction process. They are large engineered dams of a toxic sludge that contain water, sand, clay, toxins, and residual oil. Only above-ground extraction operations (mining) generated tailings ponds, not operations that extracted oil below ground (in situ). This EPA comprised the four COSIA companies with above-ground mining operations.

These ponds posed two important challenges. First, they are toxic, putting wildlife at risk, including fish and birds. For example, 1,600 ducks died in April 2008, when they landed on a tailings pond owned by Syncrude. Hundreds of thousands of waterfowl migrate across Northeastern Alberta every year. It is not uncommon for ducks to land on a tailings pond, mistaking it for a lake. The bitumen-laden tailings water covers the ducks in oil, which impairs the waterproof capability of feathers and exposes ducks to extreme temperatures. Syncrude was fined $3 million for failing to install noise devices near the pond to scare waterfowl away. Second, the bottom layer of a tailings

TABLE 1 Organizing rules within Canada's Oil Sands Innovation Alliance (COSIA)

Rule	Description	Illustrative quotations
Joint Industry Projects (JIPs)	Allowed firms to choose on which sub-issues to work, and all COSIA members would benefit from outcomes	• *JIPs, joint industry projects—we can have all seven companies… or you'll have a subset or you can have just one, an independent project. But the JIPs are the actual projects.* (Tailings EPA member) • *Two or three or five of however many companies can form a joint industry project, which will have its own agreement, do that work together, co-fund it and then contribute the results of that work to the [EPA] as well*. (Water EPA member) • *We hope that each JIP might have two or three or six companies involved… certainly not every one will have all twelve companies involved. And, you actually don't want that. You kind of prefer to keep the groups small, let them run with it. The other companies get to share the technology anyway if it's a winner. And, if it's not a winner, well, that's useful information too because it might be something that they… would have pursued if it hadn't been proven unsuccessful*. (COSIA leadership team) • *Because of the mandatory requirement to share everything that's developed in the alliance, a company doesn't have to be part of every single JIP. In the past you had to be part of 10 JIPs in order to get the intellectual property and use it. Now you only have to be part of one. You can trust your alliance colleagues to go forward and lead and produce results in 9 other JIPs because you get results back. So it can decrease the amount of effort you have to give for the same amount of gain again by an order of magnitude.* (COSIA leadership team)
Field of use	Stipulated that any technology developed within COSIA was for use only in the Canadian oil sands	• *The other thing we've done is we've taken pains to make sure that the sharing aspects of this technology is very tightly limited to what we call 'field of use'. So it has to be oil sands only in Canada. So, if a technology is developed inside of the EPA, everybody gets to share it; but, they only get to share it inside of Canada on oil sands.* (COSIA leadership team) • *But at the end of the project you still get the intellectual property that resulted from the project but only to apply in the field of use. But if you're interested in it for global then you have to let the contamination aspect go and join.* (Greenhouse Gases EPA member) • *And what we were saying is we can be your competitor… in Amman and Abu Dhabi but you're not going to be our competitor for water in the oil sands.* (Greenhouse Gases EPA member)
Scoping	Each EPA decided which technologies would be considered out of scope—usually cost-reduction technologies	• *We're trying to figure out what do we want to collaborate on, you know, what's the extent of the scope and what are the contractual arrangements and commercial agreements that we have to sort of set up before we can start engaging.* (Water EPA member) • *So some companies at the table wanted a very broad scope and other companies wanted a very narrow scope, and the process was put in place in December to break down or understand all the reasons… Was it contamination reasons, business opportunities reasons, competitive law reasons? And once we understood what the reasons were then we were able to build solutions to address those concerns and broaden the scope to a point where every company at the table was comfortable with it.* (Greenhouse Gases EPA member) • *One aspect is the scope of what we're dealing with. It tries to take that spectrum of technologies that are not competitive but have environmental impact to ones that are highly competitive and don't have an environmental impact, and then there's everything in between… We had to draw a circle for companies to be able to be prepared to lend access to anything they're for in that scope.* (COSIA leadership team)

Note. EPA = environmental priority area.

pond, a mixture of water and clay, can take up to 30 years to settle and solidify, so full reclamation can take decades. The Tailings EPA aimed to develop new technologies that would shorten this time frame.

Tailings ponds covered the smallest geographical area of COSIA's three EPAs. Tailings ponds from oil sands production covered 175 km^2 (67 $miles^2$) or around 0.03% of the geographical area of the province of Alberta (Alberta Government, 2014). Although tailings ponds peppered the landscape, turning wilderness into wasteland (Kunzig, 2009), they were geographically limited to above-ground oil sands production. Despite the potential risks of local fugitive effluents and dam failure (Council of Canadian Academies, 2015), tailings can be generally contained through chemical and construction technologies that confine the ponds to the areas immediately adjacent to the oil sands mines.

4.2.2 | Outcomes of the Tailings EPA

The Tailings EPA joint venture agreement generated a number of technological improvements, primarily accelerating reclamation of tailings ponds within the geographical footprint of the oil sands industry. A member of the COSIA Tailings EPA explained that through the work of the EPA, "there's going to be fewer [tailings ponds]. They're going to be smaller. The ones that aren't operating, we're going to reclaim faster." In addition, this EPA took the least amount of time to negotiate (8 months) and resulted in the most technology sharing among the three EPAs. A COSIA member indicated that "Of all four areas, [tailings] would be the easiest." By November 2014, the group had shared $401 million in technologies; almost double that of the Water or Greenhouse Gases EPAs. One Tailings EPA member indicated that an important benefit of the Tailings EPA was the reduced duplication of similar research activities: "when the company … did share what they were doing it turns out three of them were working on the exact same project. So that's a great thing… It costs less money and you can invest that money in other parts of the alliance." By November 2014, over 100 joint industry projects were completed, with a further 42 active projects in the EPA's pipeline (Table 2).

4.2.3 | Organizing rules in the Tailings EPA

The Tailings EPA effectively negotiated organizing rules that facilitated COSIA's goals of collaboration and innovation (see Table 2). A member of the COSIA leadership team described the easy alignment among the four EPA members:

> With tailings, everybody knows where we want to go. We're all driven in the same direction. There's no conversation about strategy because we all know what it is… and we're all aligned… tailings is narrow and all the rest are wide.

The first rule, joint industry projects, was easily negotiated. Tailings EPA member companies found it relatively easy to identify where they could best contribute their expertise, and they agreed relatively quickly to share all intellectual property among all members of the EPA. Members were willing to contribute a significant amount of cash and technology to address the tailings issue. This same member of the COSIA leadership team indicated that

> [the mining companies] came in and said, "you know, I've spent five hundred million dollars on this and I'm willing to share it with you." "I've spent six hundred million on this and I'm willing to share it with you." And, they went around the table and they all anted up their technologies.

TABLE 2 Environmental issues, organizing rules, and outcomes within each environmental priority area (EPA)

	Tailings EPA	Water EPA	Greenhouse Gases EPA
Issue scale			
Issue extent	**Local** Confined to oil sands production area	**Regional** Three river basins were affected: the Athabasca, Beaver, and Peace River Basins	**Global** Greenhouse gas emissions from the oil sands affected the global carbon cycle
Interconnectedness	**Low** Environmental impacts discrete and relatively contained	**Medium** Water quality impacts biodiversity, habitat, and wildlife across the watershed area	**High** Climate change also affects other global and long-term issues, including ocean acidification, weather events, habitat changes, food security
Organizing rules as applied within each EPA			
Joint Industry Projects (JIPs)	**Widely shared** Companies joined the projects they wanted, and shared technology/intellectual property among all EPA members	**Widely shared** Companies joined the projects they wanted, and shared technology/intellectual property among all EPA members	**Not widely shared** Greenhouse Gases was the only EPA where only those companies that participated in a project benefited from the technology/intellectual property
Field of use	**No concerns with intellectual property mobility** Limiting technologies to Canadian oil sands was not of concern, given that developed technologies could be commercially applied only to the Alberta oil sands	**Some concerns with intellectual property mobility** Limiting technologies to Canadian oil sands presented some concerns because technologies could be applied in other jurisdictions. But it was possible to limit some types of technology development to the region	**Significant concerns with intellectual property mobility** Limiting technologies to the Canadian oil sands presented significant concerns because technologies developed to reduce greenhouse gases could be transferred to, and create equivalent benefits in, other competitive arenas globally
Scoping	**Broad** Scope remained broad. All companies agreed to share IP on reclamation, even if it was potentially cost-reducing	**Somewhat broad** Scope of EPA was broad enough to include water at the surface level, even if it was considered cost-reducing. Subsurface water (incl. steam) was deemed out of scope	**Narrow** Scope of EPA became very narrow and limited to environmental technologies and excluding cost-reducing technologies to ensure all companies signed on
Outcomes			
Time to agreement	8 months (October 2012)	12 months (March 2013)	19 months (September 2013)
Investment			
Technologies shared[a]	117 technologies, \$401 m	171 technologies, \$232 m	124 technologies, \$232 m
Projects completed[a]	100 projects, \$626 m	26 projects, \$12 m	12 projects, \$2 m
Active projects[a]	42 projects, \$75 m	43 projects, \$231 m	26 projects, \$15 m
Project range	Addressed issue scale e.g., reclamation technologies	Addressed issue scale e.g., Regional Water Solutions	Did not address issue scale e.g., Carbon Capture and Storage

[a] By November 2014, approximately a year after the end of our formal data collection. *Source:* COSIA Performance Update.

The Tailings EPA also easily applied the field of use rule. The members were easily able to limit shared technologies for use exclusively in the Canadian oil sands, given that tailings technology was generally an oil sands issue and could not be applied to other oil production sites around the world. Three of the four Tailings EPA companies were global oil companies with significant oil sands investments outside Alberta, particularly in Venezuela. However, the Venezuelan oil sands deposits were too deep to mine (they required below-ground operations) and did not generate tailings ponds. A member of the COSIA leadership team confirmed that "all of the research in the world on tailings is done by the members of the Tailings [EPA]."

Finally, the scoping rule worked effectively within the Tailings EPA. All the technologies developed within the EPA would primarily reduce environmental impacts, so there was no need to exclude competitive technologies. Other EPAs experienced more tensions because some technologies were viewed as much more competitive, even if they did offer environmental benefits. As a result, other EPAs were more inclined to work carefully through the activities that would be included in their scope. In contrast, the Tailings EPA was scoped widely, requiring members to share everything since the environmental benefits of all tailings-related solutions outweighed the competitive advantages derived by individual firms. A member of the Tailings EPA explained that "in the case of the Tailings EPA—and this is fairly important—… if you and I were partners, you're obliged to share, you're legally obligated to share anything within this defined scope of tailings." This scope included some cost-reduction technologies as well as the strictly environmental ones that COSIA was designed to tackle.

4.3 | Water Environmental Priority Area (EPA)

4.3.1 | Water pollution and freshwater usage issues

Water was an important environmental issue for oil sands companies due to effluent to rivers and excessive freshwater usage. In 2010, an independent researcher found that the Athabasca River contained elevated levels of toxic elements, such as mercury and lead, as a result of oil sands production. These pollutants were finding their way into the Athabasca River watershed via airborne and waterborne pathways. The study found that the pollutants existed at levels that exceeded government guidelines for the protection of aquatic life (Wingrove, 2010).

The second challenge was freshwater usage. In Alberta, the demand for water often exceeded the availability of water, as industries including agriculture and ranching in the South and the oil sands in the North are water intensive. In 2011, oil sands operators used approximately 170 million cubic meters of water, equivalent to residential water usage by 1.7 million Canadians for a year. Almost none of the water used in oil sands production was returned to the natural water cycle (Pembina Institute, 2015). Water withdrawal, combined with the lower flow rates resulting from climate change, risked exceeding ecological limits in the future during low-flow periods (Council of Canadian Academies, 2015).

Water issues were regional, with water pollution and withdrawal impacting land, habitat, and wildlife across the watershed area. Three river basins were affected by the oil sands: the Athabasca, Beaver, and Peace River Basins. Below-ground production took place in all three basins, while mining only affected the Athabasca River Basin (Council of Canadian Academies, 2015). The Athabasca River travelled 1,231 km (765 miles) across the province of Alberta from Jasper National Park in the Rocky Mountains, through the oil sands in Northern Alberta, before flowing into the Peace-Athabasca Delta, which eventually flowed into the Arctic Ocean. Although particulate levels were greater near oil sands developments than at more remote sites, the effects of pollutants were detectable in the Athabasca River up to 85 km (52 miles) away from the facilities (Kelly et al., 2010).

Most companies within the Water EPA understood the need to work together on water issues, given their regional nature. A member of the COSIA leadership team described the "cumulative impacts [that] became really the key regional concern." Because critics saw the water issue as regional without clearly demarcated boundaries, the industry knew they had to work together to solve water issues. The COSIA leadership team member continued with his remarks by describing the collective reputational risk to oil sands operators: “so, you know, the critics were looking at cumulative impacts, not, ‘gee, [this company is] greener than the other guys.’ Like, you couldn’t distinguish yourself from peers very easily.”

4.3.2 | Outcomes of the Water EPA

The Water EPA, once signed, contained projects such as the Regional Water Solutions project, which used nonpotable wastewater from oil sands mining operations to supply in-situ facilities. This project and others were designed to address the regional nature of the water issue within the oil sands region. Projects were developed not only at the facility level but also at the regional level. These joint industry projects would allow the industry to develop technologies to reduce water usage and pollution in the oil sands.

The Water EPA agreement took longer to negotiate than the Tailings EPA agreement but less time than the Greenhouse Gases EPA (see Table 2). By November 2014, the Water EPA included 26 completed projects, compared to 100 for Tailings and 12 for Greenhouse Gases. One company dropped out of the Water EPA because it considered the scope of technologies in the Water EPA important to the company’s competitive interests. Nevertheless, the Water EPA was still able to make meaningful progress on the water issue. Two years after COSIA’s initial formation, the Water EPA had the most active projects and the most active investment compared to the two other EPAs. The active joint industry projects included $165 million in the Water Technology Development Centre, which was a test site for technologies specific to the waste fluids found in Canadian oil sands production. Seven of the largest below-ground producers committed to this project.

4.3.3 | Organizing rules in the Water EPA

The joint industry projects, field of use, and scoping rules were applied relatively easily in the Water EPA. The rule to identify joint industry projects was important because companies could join the projects to which they wanted to contribute, but would benefit from the intellectual property and technologies of all projects coming out of the Water EPA. This approach allowed members to select the projects in which they wanted to participate while benefiting from innovations developed in all the Water EPA projects. Crucially, all 12 COSIA member companies agreed to widely share the outcomes of any individual project, even with member firms that did not participate in any given project.

Similarly, the field of use rule was important in convincing the companies to sign onto the Water EPA. Some companies had been concerned that their competitors could use technologies developed within the Water EPA in operations outside the oil sands. One COSIA member noted that,

> Water was our first test of whether or not this could really work. The reason is that water is an area that you deal with everywhere in the world. You deal with it around the globe and you deal with it as competitors.

Despite some challenges, it was possible to agree to projects that could be applied to reducing water usage and pollution in the oil sands region, without having these technologies used in operations around the globe. For example, the Regional Water Solutions project allowed the companies to have an impact in the oil sands by linking mining water supply with in-situ demand, which was a technology applicable only in areas with oil sands mines and not to other competitive arenas.

The field of use rule also permitted investment in the Water Technology Development Centre designed as a “hot-coupled,” live test site for new water treatment technologies for in-situ facilities.

Since the test center is physically connected to Suncor's Firebag in-situ facility, the live fluids treated there have particular physical-chemical characteristics found in the Athabasca reservoir in-situ oil facilities. A member of the COSIA Water EPA explained the distinctiveness of the test center:

> And the key one is that the characteristics of the fluids that we're most interested in do change with time. So it's important to [hot-couple] to the source material in something permanent rather than involving something like trucks to pick up fluids and deliver it to some remote test center. So a very important attribute of the test center is … it's actually built into an existing facility.

However, according to another member of the COSIA Water EPA, despite the ability to define the geographic scope of water issues, global companies were only "half-warm to lukewarm interest [ed] in joining" the test center because their global R&D departments had already invested significantly in similar technologies. The interviewee explained that "[Some global companies] actually turn R&D into a business. They have branches of their companies that sell and market the technologies they develop." The field of use rule simultaneously protected Canadian test center participants in that water technologies could not be exploited elsewhere by the global companies, but also limited the extent to which the global companies were willing to share within COSIA.

Water EPA members also faced challenges in deciding which of the wide range of water issues and technologies were in scope, so could be shared within the EPA, and which were not. In the Water EPA, scoping rules were used to emphasize environmental rather than cost-reduction technologies. In the end, water technologies at the surface level, including upgrading, water treatment, and metering, were deemed to be in scope, whereas subsurface water, which included technologies to reduce the steam-to-oil ratio for in-situ operation, was not. Members saw insignificant competitive advantage in managing surface water, but there were significant cost efficiencies to be gained by dealing with subsurface water. For subsurface water, steam was used to melt the bitumen located deep underground and bring it to the surface. Reducing the steam-to-oil ratio was one way to reduce water and energy usage, and thereby costs, and some firms refused to share their proprietary technologies that reduced this ratio.

Despite the exclusion of subsurface water technologies, the final scope of the Water EPA remained broad enough to meaningfully improve pollution and usage of surface water. A COSIA Water EPA member described competitive forces in sharing water-related technologies:

> I think the companies have found [a way] to collaborate in those areas where there isn't a competitive force at play… But, …we all benefit by this sharing and a lot of that [competitiveness] has disappeared. I think one of the things we've said to one another is... We probably have more challenges as an industry in the face of the public than we do competitive position relative to one another.

4.4 | Greenhouse Gases Environmental Priority Area (EPA)

4.4.1 | The climate change issue

The oil sands industry used a relatively intense amount of energy (and thereby, greenhouse gas emissions) to extract and upgrade the tarlike bitumen to usable oil (CAPP, 2015). Given the mounting evidence of the potentially catastrophic consequences of climate change (IPCC, 2014), there was increasing pressure on the industry to reduce its emissions. Climate change was seen as a global issue.

Greenhouse gas emissions (primarily carbon dioxide) from the oil sands were released into the atmosphere, so they were not contained geographically. A Greenhouse Gases EPA member said, “So what makes GHG difficult? Many things. But it starts with the fact that it is a global problem, global interest, global challenge, and global competitiveness.” Greenhouse gases are cumulative and stay in the atmosphere for hundreds or thousands of years, so addressing climate change requires organizational responses over long timescales. Environmental irregularities due to climate change are also deeply interconnected with other global and long-term issues, including ocean acidification, risk of extreme weather events, habitat changes, and food security (IPCC, 2014).

4.4.2 | Outcomes of the Greenhouse Gases EPA

The Greenhouse Gases EPA was the least successful of the three EPAs we studied. In 2013, the oil sands were collectively responsible for emitting 62 megatons of greenhouse gases (mostly carbon dioxide) into the atmosphere, yet the EPA’s flagship carbon capture and storage (CCS) project aimed to reduce just one megaton of greenhouse gases per year. In addition, the EPA took the longest to negotiate, and had the fewest active and completed projects by November 2014 (see Table 2). Two years after the EPA agreement was signed, the average size of projects within this EPA was still only \$110,000, far smaller than projects in the other EPAs (\$800,000 for Water EPA projects, and \$2.6 million for Tailings).

4.4.3 | Organizing rules in the Greenhouse Gases EPA

COSIA’s organizing rules were not easily applied within the Greenhouse Gases EPA. Joint industry projects were especially problematic for the EPA because companies did not want to share technologies they perceived as proprietary and competitively valuable with all the COSIA companies. To reach agreement, the companies ultimately agreed that any contribution to a joint industry project, and the technologies developed within the project, would be made available only to project participants, not to all COSIA companies. This concession prevented some companies from dropping out of the Greenhouse Gases EPA due to concerns about sharing important intellectual property. The result, however, was less sharing of intellectual property than in the other EPAs. As a member of the Greenhouse Gases EPA explained:

> with the original COSIA model you share everything… you don’t even know what you have and you are sharing it. And that was uncomfortable for a lot of companies [in the Greenhouse Gases EPA] though. Let’s find a different model that works for GHGs… you share on a JIP by JIP basis. So as projects come in you all agree [whether] to share…Rather than a blanket agreement, it’s essentially a project by project.

The field of use rule was also challenging to apply, given that greenhouse gas reduction technologies developed in the Canadian oil sands could be used to reduce equivalent carbon emissions in other areas around the globe. For example, developing novel boiler configurations or using different solvents for more efficient carbon capture and sequestration could be applied globally, wherever carbon may be captured, including in other industrial facilities such as power plants or cement facilities. The field of use rule limited sharing in the Greenhouse Gases EPA because “there’s not a whole lot happening on GHGs that’s purely Canadian” (Leadership team).

Within the Greenhouse Gases EPA, much debate took place around the need to have scoping rules to include only purely environmental technologies, as opposed to having both environmental and cost-reduction technologies. This was particularly challenging because energy used in extracting and processing the oil was such a significant proportion of operating costs. Treating energy efficiency technologies out of scope limited the range of GHG technologies on which firms could work.

4.5 | Comparing the Environmental Priority Areas (EPAs)

By comparing the three EPAs, we were able to see that the scale of the issue interacted with the effectiveness of COSIA's organizing rules in affecting EPA outcomes (see Table 2). COSIA's rules worked best for environmental issues of local or regional scale. The rules worked less well and led to more difficulties sharing technology for the environmental issues of global scale. One year after the last EPA agreement was signed, the Tailings EPA had innovated the greatest number of projects, the Water EPA had innovated fewer projects than Tailings, and the Greenhouse Gases EPA had innovated the fewest. Even 2 years after we stopped collecting primary data, the number and average value of projects within the Greenhouse Gases EPA remained significantly lower than the other EPAs.

The organizing rules worked well for tailings and water because participating firms used them to facilitate sharing across a smaller competitive arena than required for a large-scale issue like greenhouse gas emissions. One member of the COSIA leadership team described the relationship between the scale of issues and level of risks associated with sharing technologies:

> If the EPA is something like tailings which is … very specific in terms of technology it's much easier for companies to ascertain their level of risk in signing an EPA… When you move into Water you're getting into things that are regional in nature like the rivers and so forth but you're starting to get into more broad technologies that have application outside the region, offshore and that type of thing. As you move further to GHGs you broaden it out substantially more because the technologies associated with that aren't necessarily regional.

Given that issues of different scale alter the balance between collaboration and competition, the companies developed issue-based rules to manage their collaboration. Therefore, we are able explain *why* larger scale issues present greater risk to collaborative collective action. The success of collaborative collective action, and eventual impacts on the issue, arise out of how well the organizing rules address the scale of the issue. In the next section, we develop a model of collaborative collective action for common pool resources.

5 | THEORY BUILDING

In this study, we addressed the question: *How can collaborative collective actions be organized to manage common pool resources?* Prior industry self-regulation research has acknowledged the potential to manage common pool resources through coordinated actions, but has virtually ignored collaborative actions in which competitors share resources and technology. Such collaborative actions can more fully and quickly manage the tragedy of the commons. We addressed our research question by investigating the approach taken by COSIA, a collective action taken by 12 oil sands companies. We focused on three environmental issues tackled by COSIA: tailings, water, and greenhouse gas emissions. We developed our theoretical insights inductively, based on interviews, observations, and archival data.

By almost every measure, COSIA's achievements were impressive. COSIA had garnered more financial resources, undertaken more projects, involved more companies, and spanned more technology development areas than any other collective action by the industry. Two years after the formation of the alliance, COSIA companies had shared 560 distinct technologies that cost over $900 million to develop (COSIA website, August 2015). What surprised us most about the collaborative outcomes, however, is that the Tailings and Water EPAs were more effective than the Greenhouse Gases EPA, reflected by the investment in joint projects and the ease of reaching technology-sharing agreements. We wanted to know why.

Our data pointed to two important explanations. First, each EPA was governed by three different organizing rules: joint industry projects, field of use, and scoping. These organizing rules were issue-based, in that they reflected the biophysical characteristics of the environmental issue. Prior literature on competitive dynamics describes governance rules that manage the paradox between collaboration and competition (Chen, 2008), but is silent about the biophysical aspects of the issue.

Second, we found that the scale of the issue mattered. Collaborative collective action is better able to tackle smaller scale issues, such as tailings and water, than larger scale issues, such as greenhouse gas emissions, because of the mechanics of issue-based organizing rules. In the next subsection, we define and describe issue scale and then explain how it moderates the relationship between organizing rules and collaborative outcomes. The model we propose is illustrated in Figure 2.

5.1 | Environmental issue scale

Issue scale is the "spatial and temporal attributes of processes" (Bansal, Kim, & Wood, 2017). The concept of "scale" has been used in at least three different ways in organization theory. First, scale is often confused with size, as reflected by the economies of scale that arise when organizations produce more (D'Aveni & Ravenscraft, 1994; Makadok, 1999). Second, scale is used to differentiate between micro and macro levels of analysis, such that systems analyzed at a small compared with large scale reveal different phenomena and relationships (Granovetter, 1973; Perey, 2014). Indeed, if the same patterns emerge across different levels, then a theory is "scale-free" (Boisot & McKelvey, 2010; Plowman et al., 2007). Third, scale has been used in the sense of "scalability," particularly with respect to increasing the number of adopters of innovation or participants in a business model; but scaling up is treated akin to sizing up (Knudsen, Levinthal, & Winter, 2013). All of these conceptions of scale refer to the size of organizations or governance arrangements and do not consider the spatiotemporal characteristics of the phenomena. In this article, we follow the conceptualization of scale proposed by Bansal et al. (2017) and focus on the spatiotemporal scale of environmental issues faced by organizations.

Environmental issues, such as chemical pollution, fresh water use, or climate change, are material processes, operating over a definable time and space range (Rockström et al., 2009). Scale "fixes the outer boundary" of phenomenon (Gibson, Ostrom, & Ahn, 2000, p. 219), so that "large scale refers to a large area, and small scale to a small area" (McMaster & Sheppard, 2004, p. 5). Issue scale includes two important attributes: (a) the spatial or temporal extent over which a process operates, and (b) the interconnectedness of processes across higher and lower hierarchical levels (Matthews, 2014).

Because of self-organizing processes, environmental issues tend to exhibit spatiotemporal coupling, so that smaller scale issues tend to cycle faster over a smaller geographical region than do larger scale issues (Holling, Gunderson, & Peterson, 2002). Climate change is a large-scale issue because it is detected by the variability in its properties that persist over a long period of time—"typically decades or longer" (IPCC, 2014, p. 30). As well, carbon is pervasive throughout the earth, locked in air, water, and land, so that smaller cycles are interconnected with larger cycles.

Scale discriminates narrow, discrete environmental issues at human or facility scale, from broad, global issues with complex, interconnected processes (Sexton, Waller, McMaster, Maldonado, & Adgate, 2002). These broad, global issues suggest that a firm's actions in one region may affect a firm's resource availability or use in distant geographic locations (Barrett, 1990). The scale of environmental processes may help explain why organizations fail to respond to some issues, such as global climate change, because the environmental irregularities occur over such a long time period or involve so many actors that it is difficult to attract managerial attention (Bansal et al., 2017; Howard-Grenville, Buckle, Hoskins, & George, 2014).

5.2 | Issue-based rules in collaborative collective action

Issue scale is important to collective action for two reasons. First, larger scale issues create boundary challenges between competition and collaboration. Actors that might collaborate in one region may compete in another, creating conflicts of interest when sharing technologies. Second, larger scale issues have more complex interconnections among system elements, which make them harder to solve than smaller scale issues; solving one part of the problem may lead to organizational or environmental problems elsewhere.

Prior literature on collaboration with competitors and industry self-regulation has recognized the importance of the size of the collective action (Olson, 1965; Ostrom, 1990) and governance arrangements, such as the degree to which a standard is adopted by industry members (e.g., Bartley, 2003; King et al., 2012) and the economies gained by pooling lobbying or communications efforts (e.g., Barnett & King, 2008). The self-regulation literature has not, however, spoken to the salience of the scale of the issue. Our research shows that the interaction between organizing rules and the scale of the issue influences the effectiveness of collaborative outcomes (see Figure 2).

Our study describes the organizing rules that facilitate collaborative collective actions. COSIA's joint industry projects, field of use rule, and scoping rules helped manage the free-riding often associated with common pool resources. However, these rules were more effective for smaller scale issues than larger scale ones. We found that COSIA members managed collaborative collective actions in two important ways: first, by deconstructing issues into modular parts; and second, by clearly defining issue-based boundaries covered by the collaborative arrangements. When the issue scale became too large, these rules failed to sustain collaboration and organizations would act more independently. In these cases, we believe coordinated industry self-regulation in which organizations

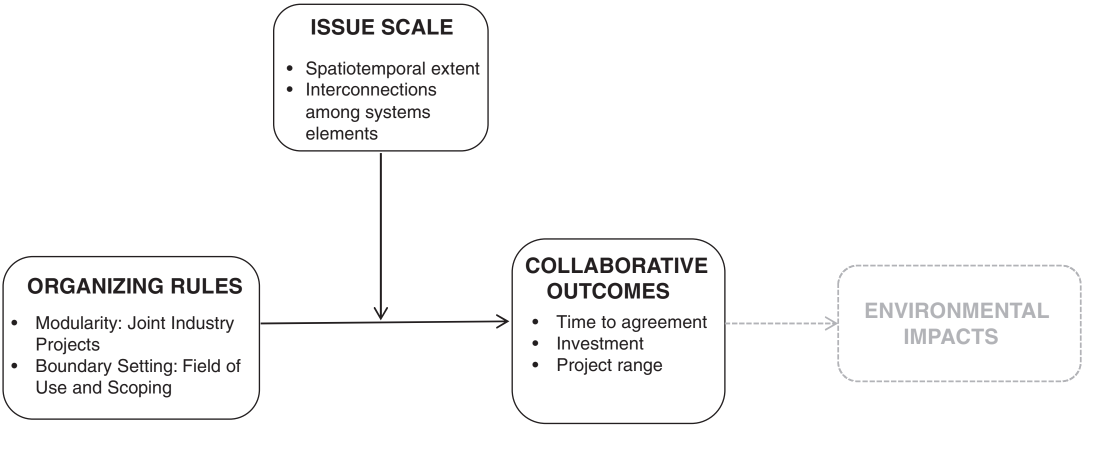

FIGURE 2 A model of collaborative collective action for common pool resources

can independently choose to participate, as has been the focus of strategy researchers, will be more effective than collaborative actions. In the remainder of this section, we describe why these rules are better at managing collaborative collective actions in small-scale issues.

5.2.1 | Modularity

COSIA used joint industry projects to modularize issues into separate parts, so they could tackle different aspects of the issue through different technologies. In splitting the environmental issue areas into subissues, the problems associated with the issue became more manageable. Each EPA comprised numerous joint industry projects, which nested together into a modular form. The small-scale issues, specifically tailings and water, could be deconstructed into a limited number of joint industry projects to cover most of the environmental issue. So, even though individual projects might be somewhat related to each other, it was possible to manage the complexity among projects. As well, industry members could choose to join the subgroups of their choice, so trust could be built among the members of each project and each group could act with agility and speed.

The members of the Tailings EPA were able to consider the full range of subissues and identify a cohesive set of potential projects to address the issues associated with the tailings ponds and were willing to work with each other and share intellectual property. However, the members of the GHG EPA were reluctant to share intellectual property and ultimately acted more independently rather than through collaborative research and development activities, generating fewer environmentally beneficial projects than the companies had hoped. The greater interconnectedness among the elements of the large-scale issue of greenhouse gas emissions likely presented challenges to the collaborative collective action because it increased the cost and uncertainty of managing interrelated processes.

5.2.2 | Boundary setting

The second way in which COSIA overcame the challenges of competition was through boundary setting. Through the field of use and scoping rules, they set the geographical boundaries over which the intellectual property could be applied. Because tailings and water covered a smaller spatiotemporal extent, it was possible to set the boundaries around the common pool resources. Greenhouse gas emissions, however, crossed multiple organizational and geographical domains, so it created tensions among the industry members. Even though there were field of use and scoping rules, some industry members were concerned that the knowledge would spill into other geographical areas.

COSIA tried to manage the breadth of complexity with greenhouse gas emissions through the field of use and scoping rules, by drawing narrow boundaries around potential projects. However, by scoping the projects more narrowly, fewer projects were shared, not more. COSIA members failed to recognize that the scale of the issue governed complexity, not just the size of the collaborative activities. Although COSIA members were initially ambitious in their desire to form a "world-scale" collaboration to deal with greenhouse gas emissions (COSIA leadership team member), the scale of the greenhouse gases issue was insurmountable.

6 | DISCUSSION

6.1 | Implications for strategic management theory

6.1.1 | Competitive dynamics

Our research contributes to prior work on competitor collaborations by extending the focus from bilateral alliances between competitors to multiparty collaborations among competitors to manage common pool resources. Prior research recommends managing the tension between collaboration and competition by isolating the collaborative parts of the organizations from their more competitive activities (Fernandez & Chiambaretto, 2016; Hamel et al., 1989). In so doing, competitors can build trust with each other; however, such trust is harder to achieve with numerous partners because of greater opportunities for shirking and free riding (Garcia-Canal, Valdes-Llaneza, & Arino, 2003).

In this article, we extend this prior work, which describes *organizational-based* approaches to managing the tension between collaboration and competition, to describing an *issue-based approach*. Specifically, we found two rules helpful in managing multiparty collaborations in common pool resources: modularity and boundary setting. Modularity deconstructs issues into smaller subissues, so that smaller issues can aggregate and represent the overarching issue. Modularity allows industry participants to choose the subissue on which they work, allowing them to identify the areas in which they are comfortable sharing technologies and to build trust with a smaller group of partners. Boundary setting is defined as the geographical domain over which the technologies could be applied, so that the knowledge and resources gained in one domain cannot help the organization compete in another domain with different competitors. This rule ensured that the benefits accruing to participating organizations were equally distributed, which is an important aspect of successful collaborations among competitors (Yu & Cannella, 2013).

We found that both of these rules were more effective for smaller scale issues than for larger scale issues. For smaller scale issues, modularity and boundary setting can facilitate collaboration across the entire issue. In larger scale issues, such as greenhouse gas emissions, the spatiotemporal span and interconnectedness among the various processes related to the issue increased the perceived risk and eroded trust among collaborators. Modularity rules generated fewer projects with fewer participants, and boundary rules led to less ambitious scoping and sharing.

Our findings have implications for research in multimarket competition, which is when "firms compete against each other simultaneously in several markets" (Karnani & Wernerfelt, 1985, p. 88). Organizations that have frequent points of contact across markets tend to be less competitive with each other because competing aggressively in one market can elicit retaliation in other markets—a phenomenon called mutual forbearance. This phenomenon has been uncovered in several sectors, including banks and airlines (e.g., Chen, 1996; Gimeno, 1999). Our research begs the question whether mutual forbearance in product markets can be extended to collaborative behaviors in factor markets with common pool resources.

We did not find evidence of mutual forbearance in multimarket competition related to common pool resources. In fact, multimarket competition undermined the likelihood of sharing resources and technology. Competitors were less willing to share technologies related to global scale issues because those technologies could spill over to other factor markets. On the other hand, technologies associated with geographically unique issues yielded cooperative behavior. In other words, firms sharing common pool resources seem to resist mutual forbearance.

There is relatively little research on the competitive dynamics of competitors entering collaborative agreements in multiple markets that involve only some overlapping competitors. Khanna, Gulati, and Nohria (1998) argue that companies collaborating on only a small subset of activities are less likely to share knowledge, and the collaborations are less likely to be successful. Our research is consistent with theirs and suggests that the likelihood of sharing depends not only on the scope of an organization's activities but also the scale of the issue. Small-scale, relatively well-bounded issues are more likely to sustain collaboration than large-scale, interconnected issues. In other words, multimarket competition may lead to *cooperation* or mutual forbearance across markets, but may impede *collaboration* or mutual learning within any single market. We believe that common pool resources provide an intriguing context in which to more fully explore multimarket collaboration in competitive environments.

6.1.2 | Industry self-regulation

Our research also contributes to prior research on self-regulation. Most prior work focuses on coordinated actions, and has largely ignored collaborative collective actions, which can more rapidly and efficiently manage common pool resources that are at risk of overexploitation. Furthermore, most of this prior research ignores the issue context, yet the effectiveness of the management of common pool resources may vary by the type of issue.

There are good reasons for this oversight. Most industry self-regulation research tends to focus either on general processes or standards, such as ISO 14001, in which issues are forced to the background, or a single issue in which variance among issues is ignored, such as worker safety and environmental health (King & Lenox, 2000), greenhouse gas emissions (Delmas & Montes-Sancho, 2010; Hiatt, Grandy, & Lee, 2015), or genetically modified organisms (Hiatt & Park, 2013). In this article, we foregrounded the issue context, and found that the effectiveness of collective actions could vary by the scale of issues.

Focusing on issue scale may offer important insights into the effectiveness of industry self-regulation. For example, the International Association of Antarctica Tour Operators (IAATO), formed in 1991, aimed to ensure environmentally sound tourism practices in the Antarctic. Since it was founded it has grown from seven members to 124, and since 2010, it has included all passenger vessels operating in Antarctic waters (IAATO, 2016). Haase, Lamers, and Amelung (2009) demonstrate that the robust collective action taken by IAATO is successful at least in part because Antarctica has a strong, natural physical boundary limiting the extent of impacts. Antarctica tourist operators face localized issues related to pristine wilderness and unique, geographically located species. Antarctica's environmental issues do not have equivalency elsewhere, even though most of IAATO's members are also competitors in other environmentally sensitive areas, such as the Arctic or the Amazon.

Recently, researchers are starting to tackle the interface between industry self-regulation and the biophysical attributes of the physical environment. Tashman and Rivera (2016) highlight the effects of uncertainty of snowpacks and local weather patterns on the ski resort industry, and Haigh and Griffiths (2011) describe the impact of climatic surprises on electricity suppliers. Our research suggests that the biophysical attributes of issues may have more influence on the effectiveness of industry self-regulation than previously recognized. Gibson et al. (2000) speak to the relevance of issue scale to human interactions, in an effort to encourage dialogue between social and natural scientists. Ostrom extends her own work on collective action to issue scale by arguing for polycentric systems of action in which "multiple public and private organizations at multiple scales jointly affect collective benefits and costs" (Ostrom, 2012, p. 355).

Self-regulation scholars have only recently picked up this notion of polycentric systems. For example, Tashman and Rivera's (2016) work on ski resorts describes the joint impact of facility-level and regional ecotourism certifications, showing that certification schemes are nested within certification schemes to create an interconnected system to manage hotel waste, local water quality, and ocean pollution issues. Further, Lee (2009) explores the interaction between the nested actions of industry self-regulation systems within an evolving government regulatory system, specifically within the organic food industry. Our work suggests alternative organizing rules to polycentric management in order to manage small-scale issues.

The fact that we found collaborative collective actions more difficult in the large-scale issue of greenhouse gas emissions may inform some prior work on coordinated industry self-regulation.

Darnall and Sides's (2008) meta-analysis of nine different studies found that environmental performance was actually worse for companies that certify to voluntary environmental programs. Yet, other work suggests that stringent schemes with strong monitoring, sanctions, and regulatory involvement can generate environmental benefits (King et al., 2005; Lenox & Nash, 2003; Short & Toffel, 2010). We wonder if stringency matters more for larger scale issues, such as greenhouse gas emissions, because stringency is important when individual firms' activities are not very visible. This might also be the case for environmental performance standards that can be applied to a range of issues, such as ISO 14001. In contrast, standards for small-scale, well-bounded issues, such as for Antarctic tourism, clean beaches, or community-based standards, may not need to be as stringent because organizations' impacts on the local issue are more directly observable by stakeholders.

6.2 | Extensions and future research

Our research uncovered the importance of issue scale in shaping the effectiveness of collaborative collective action. In the previous section, we recommended that researchers investigate multimarket collaborations and the relationship between issue scale and self-regulation. We believe that issue scale may also shape the efficacy of stakeholder actions or social movements on organizational actions, but this topic is beyond the scope of this study. Stakeholder theory and social movement theory have primarily focused on actors' attributes or tactics, but not the issue's attributes (e.g., Hiatt et al., 2015; Mitchell, Agle, & Wood, 1997). It is possible that stakeholders and social movements may be more effective in mobilizing around small-scale issues, where the boundaries are clearer and specific tactics can aggregate in a modular way, to create clear and meaningful impact.

As well, future research could mitigate some limitations of our article. First, we focus on a comparative case study of three environmental issues within a single industry's collective action. Future studies could explore these issues either in different contexts or in a cross-industry context to explore the generalizability of our findings and determine the boundary conditions of our theorizing. Some industries such as retailing, food products, electronics, and chemicals have many competing collective actions. For example, certification schemes in the coffee industry are designed to respond to environmental issues ranging from local land and water management, to preserving regional habitats of migratory songbirds, and the climate change impacts of global logistics (Reinecke, Manning, & Von Hagen, 2012). Extending the research to other industries will help to assess whether there is something unique about issue scale in "dirty" industries, such as the oil sands.

7 | CONCLUSION

As people push the planet further into the Anthropocene, industrial activities are damaging or depleting common pool resources at startling rates (Whiteman, Walker, & Perego, 2013). One way to address such environmental issues is for competitors to collaborate to manage common pool resources. Given that traditional, coordinated collective action is not yet slowing rates of environmental damage, there is an urgent need to better understand how competitors can collaborate. In this article, we focused on collaborative collective actions, calling attention to the importance of biophysical aspects of environmental issues, specifically their scale. Whereas prior research has acknowledged the importance of the size of the collaborative that draws from common pool resources, our key insight is that the scale of the issue also determines the effectiveness of collaborative collective action. Whereas technology sharing and resource pooling may work in small-scale issues, such as those pertaining to tailings ponds and water quality, they may be less effective for large-scale issues, such as climate change.

Although there is increasing interest in the relationship between the social worlds and the natural worlds, we believe there is quite some distance to go in solving what will become increasingly urgent environmental issues. We hope this research project advances insights, both theoretically and practically, to address some of the most significant threats facing current and future generations.

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REFERENCES

Albert, D., Kreutzer, M., & Lechner, C. (2015). Resolving the paradox of interdependency and strategic renewal in activity systems. *Academy of Management Review*, *40*(2), 210–234.

Alberta Government. (2014). *Oil sands information portal*. Retrieved from http://osip.alberta.ca/map

Bansal, P., Kim, A. K., & Wood, M. O. (2017). Hidden in plain sight: The importance of scale on organizational attention to issues. *Academy of Management Review* (published online ahead of print). https://doi.org/10.5465/amr.2014.0238

Barnett, M. L., & King, A. A. (2008). Good fences make good neighbors: A longitudinal analysis of an industry self-regulatory institution. *Academy of Management Journal*, *51*(6), 1150–1170.

Barrett, S. (1990). The problem of global environmental protection. *Oxford Review of Economic Policy*, *6*(1), 68–79.

Bartley, T. (2003). Certifying forests and factories: States, social movements, and the rise of private regulation in the apparel and forest products fields. *Politics and Society*, *31*(3), 433–464.

Bengtsson, M., & Kock, S. (2000). Coopetition in business networks: To cooperate and compete simultaneously. *Industrial Marketing Management*, *29*(5), 411–426.

Blackman, A., & Rivera, J. (2011). Producer-level benefits of sustainability certification. *Conservation Biology*, *25*(6), 1176–1185.

Boisot, M., & McKelvey, B. (2010). Integrating modernist and postmodernist perspectives on organizations: A complexity science bridge. *Academy of Management Review*, *35*(3), 415–433.

Canadian Association of Petroleum Producers. (2015). *Tailings ponds: Challenge and response*. Retrieved from http://www.oilsandstoday.ca/topics/Tailings/Pages/default.aspx

Canada's Oil Sands Innovation Alliance. (2014). Performance update 2014. Retrieved from https://www.cosia.ca/events/performance-update/performance-update-2014

Canada's Oil Sands Innovation Alliance. (2015). 2015 Performance update: Project highlights. Retrieved from https://www.cosia.ca/uploads/files/performance-goals/COSIA-2105-Performance-Update-Project-Highlights.pdf

Chen, M.-J. (1996). Competitor analysis and interfirm rivalry: Toward a theoretical integration. *Academy of Management Review*, *21*, 100–134.

Chen, M.-J. (2008). Reconceptualizing the competition-cooperation relationship: A transparadox perspective. *Journal of Management Inquiry*, *17*(4), 288–304.

Christmann, P., & Taylor, G. (2006). Firm self-regulation through international certificable standards: Determinants of symbolic versus substantive implementation. *Journal of International Business Studies*, *37*, 863–878.

Council of Canadian Academies. (2015). *Technological prospects for reducing the environmental footprint of Canadian oil sands*. Ottawa, Canada: Council of Canadian Academies.

Darnall, N., & Sides, S. (2008). Assessing the performance of voluntary environmental programs: Does certification matter? *Policy Studies Journal*, *36*(1), 95–117.

Dasgupta, S., Hettige, H., & Wheeler, D. (2000). What improves environmental compliance? Evidence from Mexican industry. *Journal of Environmental Economics and Management*, *39*(1), 39–66.

D'Aveni, R. A., & Ravenscraft, D. J. (1994). Economies of integration versus bureaucracy costs: Does vertical integration improve performance? *Academy of Management Journal*, *37*(5), 1167–1206.

Delmas, M., & Montes-Sancho, M. (2010). Voluntary agreements to improve environmental quality: Symbolic and substantive cooperation. *Strategic Management Journal*, *31*(6), 575–601.

Delmas, M., & Toffel, M. W. (2008). Organizational responses to environmental demands: Opening the black box. *Strategic Management Journal*, *29*(10), 1027–1055.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, *14*(4), 532–550.

Environment Canada (2013). *Canada's emissions trends*. Ottawa, Canada: Environment Canada.

Estrada, I., Faems, D., & de Faria, P. (2016). Coopetition and product innovation performance: The role of internal knowledge sharing mechanisms and formal knowledge protection mechanisms. *Industrial Marketing Management*, *53*, 56–65.

Fernandez, A. S., & Chiambaretto, P. (2016). Managing tensions related to information in coopetition. *Industrial Marketing Management*, *53*, 66–76.

Gamper-Rabindran, S., & Finger, S. (2013). Does industry self-regulation reduce pollution? Responsible care in the chemical industry. *Journal of Regulatory Economics*, *43*(1), 1–30.

Garcia-Canal, E., Valdes-Llaneza, A., & Arino, A. (2003). Effectiveness of dyadic and multi-party joint ventures. *Organization Studies*, *24*(5), 743–770.

Ghobadi, S., & D'Ambra, J. (2012). Competitive relationships in cross-functional software development teams: How to model and measure? *Journal of Systems and Software*, *85*(5), 1095–1104.

Gibson, C. C., Ostrom, E., & Ahn, T. K. (2000). The concept of scale and the human dimensions of global change: A survey. *Ecological Economics*, *32*, 217–239.

Gimeno, J. (1999). Reciprocal threats in multimarket rivalry: Staking out 'spheres of influence' in the U.S. airline industry. *Strategic Management Journal*, *20*, 101–128.

Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, *78*(6), 1360–1380.

Haase, D., Lamers, M., & Amelung, B. (2009). Heading into uncharted territory? Exploring the institutional robustness of self-regulation in the Antarctic tourism sector. *Journal of Sustainable Tourism*, *17*(4), 411–430.

Haigh, N., & Griffiths, A. (2011). Surprise as a catalyst for including climatic change in the strategic environment. *Business and Society*, *51*(1), 89–120.

Hamel, G., Doz, Y. L., & Prahalad, C. K. (1989). Collaborate with your competitors and win. *Harvard Business Review*, *67*(1), 133–139.

Hardin, G. (1968). The tragedy of the commons. *Science*, *162*(3859), 1243–1248.

Hennart, J. F. (1988). A transaction costs theory of equity joint ventures. *Strategic Management Journal*, *9*(4), 361–374.

Henriques, I., Husted, B. W., & Montiel, I. (2013). Spillover effects of voluntary environmental programs on greenhouse gas emissions: Lessons from Mexico. *Journal of Policy Analysis and Management*, *32*(2), 296–322.

Hiatt, S. R., Grandy, J. B., & Lee, B. H. (2015). Organizational responses to public and private politics: An analysis of climate change activists and US oil and gas firms. *Organization Science*, *26*(6), 1769–1786.

Hiatt, S. R., & Park, S. (2013). Lords of the harvest: Third party influence and regulatory approval of genetically modified organisms. *Academy of Management Journal*, *56*(4), 923–944.

Holling, C. S., Gunderson, L. H., & Peterson, G. D. (2002). Sustainability and panarchies. In H. Gunderson & C. S. Holling (Eds.), *Panarchy: Understanding transformations in human and natural systems* (pp. 63–102). Washington, DC: Island Press.

Howard-Grenville, J., Buckle, S., Hoskins, B. J., & George, G. (2014). Climate change and management. *Academy of Management Journal*, *57*(3), 615–623.

IAATO (2016). *IAATO Antarctica tourism fact sheet* (p. 4). Newport, RI: IAATO.

Ingram, P., & Roberts, P. W. (2000). Friendships among competitors in the Sydney hotel industry. *American Journal of Sociology*, *106*(2), 387–423.

Ingram, P., & Yue, L. Q. (2008). Structure, affect and identity as bases of organizational competition and cooperation. *Academy of Management Annals*, *2*(1), 275–303.

IPCC. (2014). Summary for policymakers. In O. Edenhofer, R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, … J. C. Minx (Eds.), *Climate change 2014: Mitigation of climate change. Contribution of working group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, England: Cambridge University Press.

Karnani, A., & Wernerfelt, B. (1985). Multiple point competition. *Strategic Management Journal*, *6*(1), 87–96.

Kelly, E. N., Schindler, D. W., Hodson, P. V., Short, J. W., Radmanovich, R., & Nielsen, C. C. (2010). Oil sands development contributes elements toxic at low concentrations to the Athabasca river and its tributaries. *Proceedings of the National Academy of Sciences of the United States of America*, *107*(37), 16178–16183.

Khanna, T., Gulati, R., & Nohria, N. (1998). The dynamics of learning alliances: Competition, cooperation and relative scope. *Strategic Management Journal*, *19*(3), 193–210.

King, A., & Lenox, M. J. (2000). Industry self-regulation without sancations: The chemical industry's responsible care program. *Academy of Management Journal*, *43*(4), 698–716.

King, A., Lenox, M. J., & Terlaak, A. (2005). The strategic use of decentralized institutions: Exploring certification with the ISO 14001 management standard. *Academy of Management Journal*, *48*(6), 1091–1106.

King, A., Prado, A., & Rivera, J. (2012). Industry self-regulation and environmental protection. In P. Bansal & A. Hoffman (Eds.), *The Oxford handbook of business and the natural environment* (pp. 103–121). Oxford, England: Oxford University Press.

Knudsen, T., Levinthal, D. A., & Winter, S. G. (2013). Hidden but in plain sight: The role of scale adjustment in industry dynamics. *Strategic Management Journal*, *35*(11), 1569–1584.

Kunzig, R. (2009, March). The Canadian oil boom. *National Geographic*, pp. 34–37.

Lado, A. A., Boyd, N. G., & Hanlon, S. C. (1997). Competition, cooperation, and the search for economic rents: A syncretic model. *Academy of Management Review*, *22*, 110–141.

Lee, B. (2009). The infrastructure of collective action and policy content diffusion in the organic food industry. *Academy of Management Journal*, *52*(6), 1247–1269.

Lee, B., Hiatt, S. R., & Lounsbury, M. (2017). Market mediators and the trade-offs of legitimacy-seeking behaviors in a nascent category. *Organization Science*, *28*(2), 447–470.

Lenox, M. J., & Nash, J. (2003). Industry self-regulation and adverse selection: A comparison across four trade association programs. *Business Strategy and the Environment*, *12*(6), 343–356.

Luo, X., Rindfleisch, A., & Tse, D. K. (2007). Working with rivals: The impact of competitor alliances on financial performance. *Journal of Marketing Research*, *44*(1), 73–83.

Luo, Y. (2007). A coopetition perspective of global competition. *Journal of World Business*, *42*(2), 129–144.

Makadok, R. (1999). Interfirm differences in scale economies and the evolution of market shares. *Strategic Management Journal*, *20*(10), 935–952.

Matthews, J. A. (2014). Scale. In J. A. Matthews (Ed.), *Encyclopedia of environmental change* (Vol. 2, p. 956). Los Angeles, CA: Sage.

McMaster, R. B., & Sheppard, E. (2004). Scale and geographic inquiry. In E. Sheppard & R. B. McMaster (Eds.), *Scale and geographic inquiry* (pp. 1–22). Malden, MA: Blackwell.

Miles, M. B., & Huberman, M. A. (1994). *Qualitative data analysis*. Thousand Oaks, CA: Sage.

Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. *Academy of Management Review*, *22*(4), 853–886.

Montiel, I., Husted, B. W., & Christmann, P. (2012). Using private management standard certification to reduce information asymmetries in corrupt environments. *Strategic Management Journal*, *33*(9), 1103–1113.

Nalebuff, B. J., & Brandenburger, A. M. (1996). *Co-opetition*. London, England: HarperCollins Business.

Oil Sands Discovery Centre (2011). *Facts about Alberta's oil sands and its industry*. Edmonton, Canada: Government of Alberta.

Olson, M. (1965). *The logic of collective action: Public goods and the theory of groups*. Cambridge, MA: Harvard University Press.

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge, England: Cambridge University Press.

Ostrom, E. (2012). Nested externalities and polycentric institutions: Must we wait for global solutions to climate change before taking actions at other scales? *Economic Theory*, *49*(2), 353–369.

Parkhe, A. (1993). Strategic alliance structuring: A game theoretic and transaction cost examination of interfirm cooperation. *Academy of Management Journal*, *36*(4), 794–829.

Pembina Institute. (2015, August 20). *Water impacts*. Retrieved from http://www.pembina.org/oil-sands/os101/water

Perey, R. (2014). Organizing sustainability and the problem of scale: Local, global, or fractal? *Organization and Environment*, *27*(3), 215–222.

Plowman, D. A., Baker, L. T., Beck, T. E., Kulkarni, M., Solansky, S. T., & Travis, D. V. (2007). Radical change accidentally: The emergence and amplification of small change. *Academy of Management Journal*, *50*(3), 515–543.

Potoski, M., & Prakash, A. (2013). Do voluntary programs reduce pollution? Examining ISO 14001's effectiveness across countries. *Policy Studies Journal*, *41*(2), 273–294.

Prakash, A., & Potoski, M. (2006). *The voluntary environmentalists: Green clubs, ISO 14001 and voluntary environmental regulations*. Cambridge, England: Cambridge University Press.

Prakash, A., & Potoski, M. (2007). Collective action through voluntary environmental programs: A club theory perspective. *Policy Studies Journal*, *35*(4), 773–792.

Reinecke, J., Manning, S., & Von Hagen, O. (2012). The emergence of a standards market: Multiplicity of sustainability standards in the global coffee industry. *Organization Studies*, *33*(5–6), 791–814.

Rockström, J., Steffen, W. L., Noone, K., Persson, Å., Chapin III, F. S., Lambin, E., & Schellnhuber, H. J. (2009). Planetary boundaries. *Ecology and Society*, *14*(2), 32.

Rothaermel, F. T., & Deeds, D. L. (2004). Exploration and exploitation alliances in biotechnology: A system of new product development. *Strategic Management Journal*, *25*(3), 201–221.

Russo, M. V., & Harrison, N. (2005). Organizational design and environmental performance: Clues from the electronics industry. *Academy of Management Journal*, *48*(4), 582–593.

Sexton, K., Waller, L. A., McMaster, R. B., Maldonado, G., & Adgate, J. L. (2002). The importance of spatial effects for environmental health policy and research. *Human and Ecological Risk Assessment*, *8*(1), 109–125.

Short, J. L., & Toffel, M. W. (2010). Making self-regulation more than merely symbolic: The critical role of the legal environment. *Administrative Science Quarterly*, *55*(3), 361–396.

Tashman, P., & Rivera, J. (2016). Ecological uncertainty, adaptation, and mitigation in the U.S. Ski resort industry: Managing resource dependence and institutional pressures. *Strategic Management Journal*, *37*(7), 1507–1525.

Whiteman, G., Walker, B., & Perego, P. (2013). Planetary boundaries: Ecological foundations for corporate sustainability. *Journal of Management Studies*, *50*(2), 307–336.

Wingrove, J. (2010, August 30). Elevated levels of toxins found in Athabasca river. *Globe and Mail.*

York, J. G., & Lenox, M. J. (2014). Exploring the sociocultural determinants of *de novo* versus *de alio* entry in emerging industries. *Strategic Management Journal*, *35*(13), 1930–1951.

Yu, T., & Cannella Jr., A. A. (2013). A comprehensive review of multimarket competition research. *Journal of Management*, *39*(1), 76–109.

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