Strategic Alliances for Environmental Protection

2 **AUTHORS**, INCLUDING:

Nicole Darnall
Arizona State University

46 PUBLICATIONS **1,442** CITATIONS

Strategic Alliances for Environmental Protection[1]*

Haiying Lin**
University of Waterloo
Faculty of Environment, Business and Environment, EV1-231
200 University Ave. West
Waterloo, ON 2NL-3G1
Email: h45lin@uwaterloo.ca

Nicole Darnall
George Mason University
Department of Environmental Science & Policy
4400 University Dr, MSN 5F2
Fairfax, VA 22030
Email: ndarnall@gmu.edu

* **Running Title:** Strategic Alliances for Environmental Protection
** **Corresponding Author**

Strategic Alliances for Environmental Protection

ABSTRACT

Existing scholarship regarding strategic alliances has been limited by the tendency to view alliance formation through a single theoretical lens and to focus solely on the economic aspects (e.g. acquisition of capabilities) of narrowly defined relationships. As yet, there has been little attention towards examining how strategic alliances—of all sorts—can address social, economic and environmental issues. This chapter addresses these concerns by integrating the resource-based view of the firm with institutional theory to assess firms' decisions to participate in a strategic alliance. Drawing on these motivations, this chapter articulates a framework to characterize strategic alliances based on their focus on competency- and legitimacy-orientation. A conceptual model is then constructed to examine the extent to which these strategic alliances are likely to encourage firms to adopt more (or less) proactive environmental strategies.

KEYWORDS: Strategic alliances, alliance formation, environmental performance, resource-based view, institutional theory

INTRODUCTION

In the last decade, the increasing uncertainty and complexity of the global business environment have led to the rapid proliferation of strategic alliances. Between 2000 and 2002 alone, over 20,000 strategic alliances were formed worldwide (Martin, 2002). Related to the natural environment, corporations increasingly are using strategic alliances to address complex environmental issues like climate change because of the scale and uncertainty embedded in these issues.

While previous research has recognized the importance of strategic alliances, these studies have had a strong tradition of assessing the economic aspects of inter-firm relationships (e.g. Mitchell and Singh 1996). However, strategic alliances also involve cross-sector partnerships, and alliances of all sorts have been formed not only to address economic concerns, but also complex environmental issues. Additionally, previous scholarship has tended to treat strategic alliances as a dichotomous variable with participation relative to non-participation, thus failing to appreciate important nuances about their formation. For instance, some alliances may develop because of external institutional pressures, whereas others may form because of new market opportunities. These variations may lead to significant differences in an alliance's ability to accomplish meaningful environmental improvements.

Understanding these issues is important for policy-makers and non-government organizations alike because these entities are increasingly relying on strategic alliances as self-regulation mechanisms for firms to proactively manage their environmental problems. By recognizing which types of strategic alliances lead to more meaningful environmental outcomes, these organizations may be in a better position to shift their resources accordingly.

This chapter poses addresses two research questions: 1) What types of strategic alliances

are formed? 2) Which of these strategic alliances encourage firms to adopt more proactive environmental strategies? To attend to the first question, this paper integrates the resource-based view of the firm (RBV) with institutional theory to assess the variations in firms' motivations to participate in a strategic alliance. The second question is addressed by constructing a conceptual model that assesses how different types of strategic alliances are more likely to address complex environmental issues.

UNDERSTANDING STRATEGIC ALLIANCE FORMATION

Strategic alliances are short- or long-term voluntary collaborations between organizations involving exchange, sharing or co-development of products, technologies and services to pursue a common set of goals or to meet a critical business need (Dacin et al. 2007; Gulati 1998). In spite of their emphasis on collaboration, organizations that form strategic alliances retain their initial identities.

Strategic alliances involve both inter-firm alliances and cross-sector alliances. Inter-firm business alliances are established among two or more firms. For instance, since 2003 BP has partnered with DuPont to develop, produce and market the next generation of biofuels. By contrast, cross-sector alliances are partnerships between two or more organizations with fundamentally different governance structures and missions (Rondinelli and London 2003). For instance, the U.S. Climate Action Partnership (USCAP) is a cross-sector alliance that was formed by ten U.S.-based firms and four environmental non-government organizations (NGOs). This alliance seeks to establish a mandatory U.S. cap-and-trade program for carbon dioxide emissions.

To understand the reasons for why all sorts of strategic alliances are formed, we draw on literature on the RBV and institutional theory.

Resource-Based Explanations

RBV emphasizes the importance of firms' internal resources and competencies in explaining firm heterogeneity and competitive advantage (Prahalad and Hamel 1990). Within the strategic alliance context, competitive advantages are derived from access to idiosyncratic resources, especially tacit knowledge-related resources from other organizations within an alliance setting (Das and Teng 2000). When idiosyncratic resources/competencies are absent in the market, strategic alliances can help to combine complementary assets owned by different organizations (Hagedoorn 1993) to develop valuable organizational competencies.

Given the ambiguities and uncertainty associated with environmental issues, strategic alliances can facilitate the flow of valuable information and opportunities to participating firms. By promoting organizational learning, firms may increase their ability to recognize and evaluate technological innovations in the marketplace. Improved organizational learning can mobilize firms to develop, acquire, and utilize their knowledge-based capabilities in a more effective way. Doing so helps firms develop different interpretations of new and existing information under conditions of ambiguity and uncertain information (Sharma and Vredenburg 1998). Since the value of firm-level resources tends to dissipate over time as competitors replicate successful strategies, higher-order learning among participants can build up a capability for continuous environmental innovation, which can lead to sustained competitive advantage. (Sharma and Vredenburg 1998)

Another way in which strategic alliances may create competitive advantage opportunities is that they offer a vehicle for some firms to shift existing practices towards creating the next-generation (Hamel 1991) of technologies and business models. Radical repositioning of this sort is referred to as "creative destruction" and involves substituting existing unsustainable

technologies with radically improved technologies that are environmentally friendly (Kemp 1994). In creating next-generation technologies and business models, strategic alliances bring together unconventional partners and stakeholders, and examine emerging technologies and trends in product markets, with an eye towards creating new alternatives to existing products.

Finally, some strategic alliances foster societal opportunities (Eisenhardt and Schoonhoven 1996). These alliances involve a team of like-minded individuals and organizations (Larson 2000) who view achieving social and economic goals as being compatible and best achieved through mutual collaboration. For instance, firms that join these alliances may establish industry social codes of conduct that require industry participants to address their social impacts in a more robust way. Such actions can place competitors at a competitive disadvantage while benefiting the environment (Etzion 2007; Reinhardt 1998). Other firms may align with regulators to improve their environmental performance. Along the way, these firms may foster good will with regulators and increase trust to such a degree that they can influence the environmental policy agenda (Darnall et al. 2007). Related to climate change, industry leaders may align to support more stringent greenhouse gas mandates and force their competitors to follow suit. For instance, the Pew Center on Global Climate Change involved seven chemical and energy intensive companies to lobby the government for "early crediting" of firms' voluntary reductions of carbon dioxide and other greenhouse gases. Strategic alliances such as these greatly enhance firms' abilities to confer 'above-normal' competitive advantages

Regardless of participants' motives, the specialized skills and competencies that result from resource-based motivations are anticipated to yield strategic alliances that are decentralized, firm-specific, knowledge-based and socially complex. We therefore term strategic alliances that are borne out of resource-based motivations to be *competency-oriented alliances*.

6

Institutional Explanations

While RBV provides one explanation regarding firms' motivations to participate in strategic alliances, institutional factors may also have an important role. Institutional theory posits that rules, norms, and values exert pressures on firms within a common setting to adopt similar practices and structures (DiMaggio and Powell 1983) in an effort to gain social legitimacy and enhanced survival prospects (Meyer and Rowan 1977). Decisions to participate in a strategic alliance are shaped by these institutional pressures. Such pressures arise from regulators, markets and society (Hoffman 2000).

Regulatory pressures involve coercive legal mandates for organizations to adhere to regulations, rules and norms (Oliver 1991). Firms that fail to adhere to these pressures risk obtaining non-compliance penalties, revocation of permit approvals, and unwanted media attention. In an attempt to seek approval from regulatory stakeholders, firms may strategically align with regulators for whom they depend for legal, physical, financial or reputation capital (Baum and Oliver 1991; Dacin et al. 2007). The fact that firms' strategically align with regulators demonstrates that businesses are both influenced by government policies and actively involved in shaping their contexts and contesting, remaking, and redefining their institutional constituencies (Oliver 1991).

Other types of institutional pressures arise from industry constituents. Perceived environmental uncertainty and social pressures (Baum and Oliver 1991) encourage firms within the same industry to collaborate on specific environmental issues. For instance, in order to hedge their risk of an upcoming climate change policy, some industry participants may be motivated to align to manage their external constituencies collectively and work closely with political groups in an effort to influence public policy in a way that benefits existing products and processes.

Moreover, to enhance industry-wide legitimacy, representative firms within an industry may align to explore technologies and solutions to ensure the legitimate operation of their current practices. These alliances share risk and investment among partners (Ring and Van de Ven 1992) through economies of scale and scope. For instance, in response to institutional pressures related to climate change, the world's ten largest coal and energy companies came together to explore the applicability of clean coal technology. Their alliance pooled together $1 billion to design, build and operate the world's first coal-fueled, near-zero emissions power plant.

Community constituents also exert institutional pressures on firms that may influence their decision to participate in a strategic alliance. Public concerns about environmental degradation rise, community constituents (especially environmental NGOs) are playing increasingly important roles. These individuals and groups can mobilize public sentiment, alter accepted norms, shift firms' environmental perceptions and imposing new roles to the firms (Hoffman 2000), especially when they manage to align with influential constituents, such as regulators and investors to advance their agenda. For instance, in 1997 Environmental Defense Fund (EDF) published a report entitled *Toxic Ignorance*, which identified a lack of publicly available data on the chemicals produced in the highest production volumes. This report and the public attention it created put significant pressure on the chemical industry to respond. The pressure motivated the industry's trade association, American Chemistry Council, to partner with Environmental Protection Agency (EPA) and EDF to initiate the cross-sector alliance, High Production Volume Chemical Challenge Program. This alliance encouraged chemical firms to collect, summarize, compile and evaluate their existing chemical data, in addition to undertaking additional testing if necessary (Kent 2004).

Whether regulatory, industry, or community-based, institutional pressures encourage

firms to participate in strategic alliances to maintain or increase their social legitimacy. Yielding

to these pressures can improve partnering firms' images, reputations, resources and market

access, which in turn may enhance firms' chance of survival and improve their strategic market

position (Dacin et al. 2007). We therefore term strategic alliances that are borne out of

institutional pressures to be *legitimacy-oriented alliances*.

DYNAMIC STATEGIC ALLIANCE ORIENTATION

While individually, RBV and institutional theory lend knowledge about the reasons why

strategic alliances form, the integration of these two perspectives sheds more light on how these

alliances are configured. We anticipate that firms participate in strategic alliances competency-

or legitimacy-oriented, because of the particular societal or business issue confronting them.

However, these societal and business issues may shift over time. Firms consequently respond in

a dynamic way based on this change in context.

For instance, firms that participate in competency-oriented alliances develop innovations

to enhance future business opportunities. These alliances can help speculating firms to obtain

greater legitimacy with regulators and other social constituents. The outcome may be the

establishment of tighter regulations in participants' favor or new industry standards that

competing firms must adhere to, else risk lose their competitiveness. In response, competing

firms may align and form legitimacy-oriented alliances to imitate the practices of industry first-

movers. This situation exemplifies how strategic alliances can be seen as 'experiments in

institution building' (Osborn and Hagedoorn 1997) that explain why common alliance practices

emerge, are copied over time, and eventually become generally accepted practice.

Additionally, legitimacy-oriented alliances can help to facilitate information sharing and

best-practices imitation among the participants. Firms therefore demonstrate various extents of

incremental improvements and that may foster them towards expanding their knowledge capacities to a greater degree, which can better position them to participate in competency-oriented alliances at a later time

The case of BP exemplifies the dynamic orientation of firms' participation in strategic alliances. In the early 1990s, BP questioned the business opportunities related to climate change. As a consequence, it chose to join with other oil companies to form the Global Climate Coalition (GCC). This industry-based legitimacy-oriented alliance opposed ratification of the Kyoto Protocol by seeking to justify the industry's existing fossil fuel-based business practices. BP changed its position, however, in the late 1990s when technical improvements emerged and public concern about climate change was increasing. Because the company began to identify business opportunities associated with being proactive in its climate change position, the company shifted its alliance orientation to participate in competency-oriented alliances. BP became the first company to leave the GCC when it aligned with the University of California and DuPont, GE, and other firms to explore alternative energy solutions. Additionally, BP aligned with nine leading firms and NGOs to advocate that policy makers institute early carbon crediting and stringent mandates on allowable carbon thresholds. BP's aim was to disadvantage its competitors by forcing new industry standards. BP's efforts have helped increase regulatory pressures on ExxonMobil and other competitors by forcing them to soften their defiant stance towards climate change and consider how alternative energy technologies can help address the problem.

This example illustrates that participation in strategic alliances is not static in that companies either participate in competency- or legitimacy-focused alliances. Rather, a company can participate in both types of strategic alliances at different points in time, depending on the

business and societal issues confronting them. The example also illustrates that a firm's participation in strategic alliances may have consequences for other firms within that company's network or industry.

RELATIONSHIP BETWEEN STRATEGIC ALLIANCES AND FIRMS' ADOPTION OF ENVIRONMENTAL STRATEGIES

The previous section discusses how institutional pressures and resource-based factors relate to the formation of different types of strategic alliances. This section extends the discussion by explaining how different types of strategic alliances facilitate the adoption of various environmental strategies.

Types of Environmental Strategy

Many scholars (e.g. Hart 1995; Roome 1992) have developed typologies of corporate environmental strategy. A commonality among them is that they recognize that corporate postures towards the natural environment range from reactive to proactive (e.g. Aragon-Correa 1998).

A reactive posture is a response to changes in environmental regulations and stakeholder pressures that involve defensive lobbying and investments in end-of-pipe pollution control technologies (Aragon-Correa and Sharma 2003:73). Such technologies focus on addressing pollution after it has been created rather than eliminating waste before it is produced (Jones and Klassen 2001). Related to climate change, carbon sequestration involves the separation of carbon dioxide from industrial and energy-related sources. Carbon dioxide is then transported to a storage location and isolated from the atmosphere (International Panel on Climate Change 2005). This practice is considered reactive since it involves capturing carbon dioxide after it has produced. Similarly, the practice of converting waste to electricity is an example of a reactive

posture in that it uses waste after it has been produced.

By contrast, proactive postures involve anticipating future regulations and social trends by designing or altering operations, processes, and products to prevent (rather than merely ameliorate) negative environmental impacts (Aragon-Correa and Sharma 2003). There are at least three types of proactive environmental practices—pollution prevention, product stewardship and clean technology—that comprise a company's proactive posture (Hart 1995).

Pollution prevention reduces pollution generation at the source before it is produced through better housekeeping, material substitution, recycling, or process innovation (Hart 1995). Compared to end-of-pipe pollution control, pollution prevention focuses on extracting and using natural resources more efficiently, generating products with fewer harmful components, minimizing pollutant releases to air, and water and soil during manufacturing and product use (Organisation for Economic Co-operation and Development 1995). In the area of climate change, one example of a pollution prevention practice is decarbonization from coal to gas. This process reduces the amount of carbon emitted per unit of primary energy by substituting natural gas for coal, which reduces carbon emissions per unit of electricity by half (Anderson and Newell 2004). Similarly, cogeneration (combined heat and power) is an energy efficient technology that combines the usage of a power station to simultaneously generate both electricity and useful heat. Improved fuel economy, improved power plant efficiency and more efficient buildings are the three other pollution prevention options that address climate change concerns (Pacala and Socolow 2004).

Like pollution prevention, product stewardship focuses on improving a firm's existing products. However, it extends the firm's reach by looking beyond organizational boundaries to individuals and organizations who are involved in a product's life cycle. Firms that undertake

product stewardship assess the environmental performance of their products from raw material access, through production processes, to product use and disposal of used products (Hart and Milstein 2003). Related to climate change, product stewardship options involve smart design/life cycle management for energy savings. They also include green supply chain management practices, which involve firms collectively considering the environmental attributes of their suppliers to avoid unnecessary environmental risks (Klassen and Whybark, 1999). By asking that their suppliers continually improve their environmental performance, firms can reduce the risk of inheriting environmental problems and minimize potential long-term environmental liabilities associated with their product inputs (Darnall, Jolley and Handfield, 2008).

Clean technology refers not to the incremental product and process improvements associated with pollution prevention, but to innovations that leapfrog standard routines and knowledge (Hart and Milstein 2003). Companies that pursue these efforts engage external stakeholders and build partnerships with nontraditional stakeholders such as environmental groups, consumer groups, and other companies, to acquire new competencies, knowledge, and vision (London, Rondinelli, and O'Neill, 2005). It includes such disruptive technologies as genomics, biomimicry, information technology, nanotechnology and renewable energy applications that enable firms to shift away from traditional fossil fuel economies. Other examples include renewable energy applications such as biomass, solar thermal and photovoltaic, wind, hydropower, ocean thermal, geothermal and tidal power generation (Johansson, et al. 1993).

The above discussion suggests that proactive environmental practices are not necessarily independent of one another in that implementing a product stewardship program often requires firms to have a strong understanding of pollution prevention, else risk significantly greater

implementation costs (Darnall & Edwards, 2006). Additionally, there is a path dependence for firms that wish to implement clean technology such that they may need skills in pollution prevention and product stewardship innovate for the environment in a meaningful way (see Figure 1). Moving along the proactive environmental strategy path requires greater resource accumulations and reconfigurations. Such movement also requires that firms consider changing their business models, technologies, operation processes, and performance objectives (Sharma and Henriques 2005), in addition to significant investments in knowledge-based organizational systems and practices. As such, scholars (e.g. Ashford 1993) emphasize the potential conceptual, technical and organizational barriers that prevent firms from becoming more environmentally proactive. Strategic alliances may be one mechanism to overcome these obstacles.

<center>**—INSERT FIGURE 1 HERE—**</center>

Strategic Alliances and Environmental Strategy

Proactive environmental strategies often require firms to commit resources towards initiating significant changes in processes or new production technologies (Hart and Ahuja 1996). They necessitate a long-term vision shared among all relevant stakeholders, significant employee involvement, cross-disciplinary coordination and integration, a strong moral leadership and forward-thinking managerial style (Shrivastava 1995). Our belief is that firms which participate in competency-oriented alliances are positioned to adopt environmental strategies that are more proactive than firms that participate in legitimacy-oriented alliances.

Competency-oriented alliances help participants to improve their internal learning by combining complementary competencies from heterogeneous partners. These efforts can trigger environmental innovation. Compared to the legitimacy-oriented alliances that target incremental process innovation, the innovation spurred by competency-oriented alliances tends to create far-

<center>14</center>

reaching, radical and transformative changes to business models and markets. Such change includes the promotion of new products, formulation of new markets and identification of new means of sustainably servicing existing markets (Etzion 2007).

Since the economic returns associated with proactive environmental strategies may not be directly visible or may occur only in the long term, firms are discouraged from acquiring knowledge and shifting managerial attitudes towards implementing proactive environmental strategies (Ashford 1993). However, the higher-order learning that is developed by engaging in competency-oriented alliances can help corporate managers acquire knowledge of these long term benefits, inform attitudes, and subsequently build an internal commitment towards adopting more proactive environmental strategies. One way in which firms participating in competency-oriented alliances acquire this knowledge and shift managerial perceptions of environmental problems is by involving heterogeneous partners. Heterogeneous partners, which may include nonprofit social organizations and environmental NGOs, can provide stronger complementary assets for innovation or entry of new markets than homogeneous partners. Such diversity is also important for creating the innovation and new market entry that are a focus of competency-oriented alliances.

For instance, BP America, DuPont, Alcoa, and other firms have aligned with World Resource Institute (WRI), a Washington, DC-based NGO, in an effort to deploy climate-friendly technologies, market green power, and campaign for early-crediting of greenhouse gas reductions. These alliances have included the U.S. Climate Action Partnership, The Green Alliances, and the Greenhouse Gas Protocol Initiative. Additionally, General Electric, Johnson & Johnson, and eleven other firms have aligned with WRI to initiate the Climate Northeast Partnership in an effort to develop strategies for business to thrive in a carbon-constrained

economy. The primary goal of each of these alliances was to expand renewable energy technologies and increase corporate demand and markets for renewable energy. These examples illustrate that combining complementary competencies from heterogeneous partners tend to create greater opportunities for transformative changes to business models and markets that stem from more proactive environmental strategies. By partnering with a broad array of stakeholders, committing resources towards significant changes in processes or new production technologies, and having leaders to see these efforts through, competency-oriented alliances are poised to improve the environment in a meaningful way.

Proposition 1: Competency-oriented alliances tend to associate with more proactive environmental strategies.

Compared to competency-oriented alliances, the primary driver in the formation of legitimacy-oriented alliances is not competency-building but achieving external credibility. Firms that participate in legitimacy-oriented alliances meet (but not exceed) social expectations. As a result, firms participating in legitimacy-oriented alliances firms may reproduce, imitate and sustain legitimate organizational structures, activities and routines and become resistant to change over time. Firms that participate in these alliances also tend to be skeptical of new technology until sufficient experience has developed within its industry. While this skepticism allows managers to reduce short-term risk, it also causes firms to miss profit opportunities related to the implementation of more proactive environmental strategies (King and Lenox 2002).

Additionally, firms participating in legitimacy-oriented alliances are more likely to have employees who are motivated to justify entrenched organizational habits and routines. This rigidity creates a cycle that limits cross-functional cooperation that might introduce innovative environmental solutions. Combined, these factors create substantial impediments to adopting

16

advanced innovations and more proactive environmental strategies (Ashford 1993). For these reasons, we propose that legitimacy-oriented alliances are more likely to be associated with a less proactive environmental strategy.

Proposition 2: Legitimacy-oriented alliances tend to associate with less proactive environmental strategies.

Figure 2 summarizes the relationships we have discussed. It illustrates how corporate motivations lead to firms choosing between participation in competency- and legitimacy-oriented alliances. Neither type of alliance is separate in that companies can participate in competency- or legitimacy-focused depending on the social and business context. Figure 2 further illustrates that alliance choice is associated with a continuum of environmental strategy outcomes that range from reactive to proactive.

—INSERT FIGURE 2 HERE—

CONCLUSION

This chapter contributes to our understanding of strategic alliances by developing a framework to assess alliance formation. This framework goes beyond treating strategic alliances as a dichotomous variable and appreciates the important nuances associated with their formation. We suggest that strategic alliances are formed because of firms' motivations to enhance their resources and capabilities, in addition to their desire to address institutional pressures. Variations in these motivations lead to a continuum of strategic alliances with competency-oriented alliances at one end and legitimacy-oriented alliances at the other. We posit that these variations lead to significant differences in each alliance's ability to accomplish meaningful environmental improvements. In particular, we suggest that competency-oriented alliances tend to associate with more proactive environmental strategies, whereas legitimacy-oriented alliances tend to

17

associate with less proactive environmental strategies.

     Future research would benefit by empirically examining whether or not firms that participate in competency-oriented alliances benefit the environment in a more meaningful way. Knowledge of this relationship has important implications for policy-makers and NGOs alike, since many of these individuals and groups are endorsing (and even developing) strategic alliances to advance their environmental protection goals. By appreciating which strategic alliances are more likely to lead to more meaningful environmental outcomes, policy makers and NGOs can shift their attention accordingly. For instance, since legitimacy-oriented alliances may be associated with less proactive environmental strategies, they may be less likely to lead to meaningful environmental outcomes than competency-oriented alliances. As such, policy makers and NGOs may achieve stronger environmental outcomes by not simply pressuring for environmental change among the regulated community, but also by aligning with businesses to foster stronger learning and innovation that leads to more ambitious environmental outcomes. Our hope is that the discussion presented in this chapter offers sufficient reason for future scholarship to consider these issues further.

References

Anderson, S. & Newell N., 2004. Prospects for carbon capture and storage technologies. *Annual Review of Environmental Resources*. 29: 109-42.

Aragon-Correa, J. A. 1998. Strategic proactivity and firm approach to the natural environment. *Academy of Management Journal*, 41: 556-567.

Aragon-Correa, J. A., & Sharma S. 2003. A contingent resource-based view of proactive corporate environmental strategy. *Academy of Management Review*, 28(1): 71-88.

Ashford, N. A. 1993. Understanding technological responses of industrial firms to environmental problems: Implications for government policy. In J. Schot & K. Fischer (Eds.), *Environmental strategies for industry: International perspectives on research needs and policy implications*: 277-310. Washington, DC: Island Press.

Barney, J. 1991. Firm resources and sustained competitive advantage. *Journal of Management*, 17(1): 99-120.

Baum, J., & Oliver, C. 1991. Institutional linkages and organizational mortality. *Administrative Science Quarterly*, 36: 187-218.

Dacin, M. T., Oliver, C., & Roy, J. 2007. The legitimacy of strategic alliances: An institutional perspective. *Strategic Management Journal*, 28: 169–187

Darnall, N., Henriques, I., & Sadorsky, H. 2008. Do environmental management systems improve business performance in an international setting? *Journal of International Management*, 14: 364-376.

Darnall N., Jolley G.J. & Handfield R. 2008. Environmental management systems and green supply chain management: complements for sustainability? *Business Strategy and the Environment* 17(1), 30-45.

Darnall N. & Edwards Jr. D. 2006. Predicting the cost of environmental management system

  adoption: the role of capabilities, resources and ownership structure. *Strategic*

  Management Journal 27(2), 301-320.

Das, T. K., & Teng, B. S. 2000. A resource-based theory of strategic alliances. *Journal of*

  Management, (26): 31.

DiMaggio, P. J., & Powell, W. W. 1983. The iron cage revisited: Institutional isomorphism and

  collective rationality in organizational fields. *American Sociological Review*, 48: 147-160.

Eisenhardt, K. M., & Schoonhoven, C. B. 1996. Resource-based view of strategic alliance

  formation: Strategic and social effects in entrepreneurial firms. *Organization Science*, 7:

  136-150.

Etzion, D. 2007. Research on organizations and the natural environment, 1992-present: A review.

  Journal of Management, 33(4), 637-664

Freeman, R.E. 1984. *Strategic Management: A Stakeholder Approach*. Boston: Pitman.

Gulati, R. 1995. Does familiarity breed trust? The implications of repeated ties for contractual

  choice in alliances. *Academy of Management Journal*, 38: 85-112.

Gulati, R. 1998. Alliances and networks. *Strategic Management Journal*, 19(4): 293-317.

Gulati, R. 1999. Network location and learning: The influence of network resources and firm

  capabilities on alliance formation. *Strategic Management Journal*, 20(5): 397-420.

Hagedoorn, J. 1993. Understanding the rationale of strategic technology partnering:

  Interorganizational modes of cooperation and sectoral differences. *Strategic Management*

  Journal, 14(5): 371-385.

Hall, J. K., & Martin, M. J.C. 2005. Disruptive technologies, stakeholders and the innovation

  value-added chain: A framework for evaluating radical technology development. *R&D*

Management, 35(3): 273-284.

Hamel, G. 1991. Competition for competence and inter-partner learning within international

strategic alliances. *Strategic Management Journal*, Summer Special Issue 12: 83-103.

Hart, S. 1995. A natural-resource-based view of the firm. *Academy of Management Review*,

20(4): 986-1014.

Hart, S. L., & Ahuja, G. 1996. Does it pay to be green? An empirical examination of the

relationship between emission reduction and firm performance. *Business Strategy and the*

Environment, 5(1): 30-37.

Hart, S. L., & Milstein, M. B. 1999. Global sustainability and the creative destruction of

industries. *Sloan Business Review*, 41(1): 23-34.

Hart, S. L., & Milstein, M. B. 2003. Creating sustainable value. *Academy of Management*

Executive, 17 (2):56-69.

Henriques, I., & Sadorsky, P. 1996. The determinants of an environmentally responsive firm: An

empirical approach. *Journal of Environmental Economics and Management*, 30: 381-395.

Hoffman, A. 2000. *Competitive Environmental Strategy: A Guide to Changing the Business*

Landscape. Washington, DC: Island Press.

International Panel on Climate Change, 2005. Carbon Dioxide Capture and Storage, summary

for policymakers, a special report of working group III of the Intergovernmental Panel on

Climate Change. *IPCC Special Report*.

Johansson T. B., Kelly H., Reddy A. K. N., Williams, R. H. (eds.). 1993. *Renewable Energy:*

Sources for Fuels and Electricity. Washington, DC: Island Press

Jones, N., & Klassen, R. D. 2001. Management of pollution prevention: Integrating

environmental technologies in manufacturing. In Sarkis, J. (ed.), *Greener Manufacturing*

and Operations: From Design to Delivery to Takeback. Sheffield: Greenleaf Publishing, 56-68.

Kemp, R. 1994. Technology and the transition to environmental sustainability: The problem of technological regime shifts, *Futures*, 26(10): 1023-1046.

Kent, D. J. 2004. Status and trends of the HPV program in the USA and Europe. *Regulatory Affairs Bulletin*, 94: 1-7.

Klassen, R.D, Whybark D.C. 1999. The impact of environmental technologies on manufacturing performance. *Academy of Management Journal* 42: 599-615.

King, A., & Lenox, M. 2002. Exploring the locus of profitable pollution reduction. *Management Science*, 48(2): 289-299.

Larson, A. L. 2000. Sustainable innovation through an entrepreneurship lens. *Business Strategy and the Environment*, 9(5): 304-317.

London, T., Rondinelli, D.A., & O'Neill, H. 2005. Strange bedfellows: Alliances between corporations and nonprofits. In Shenkar, O. & Reuer, J. (Eds.), *Handbook of Strategic Alliances*: 353-366. Thousand Oaks, CA: Sage Publications.

Martin, J. G.2002: The Growing Use of Strategic Alliances in the Energy Industry. *Oil, Gas and Energy Law Journal*, 27 (1): 28-57

Meyer, J. W., & Rowan, B. 1977. Institutionalized organizations: Formal structure as myth and ceremony. *American Journal of Sociology*, 83: 340-363.

Mitchell, W., & Singh, K.. 1996. Survival of businesses using collaborative relationships to commercialize complex goods. *Strategic Management Journal*, 17(3): 169-195.

Morgan, R. M., & Hunt, S. D. 1994. The commitment-trust theory of relationship marketing. *Journal of Marketing*, 58(3): 20-38

Mowery, D. C., Oxley, J. E., & Silverman, B. S. Special issue: Knowledge and the firm.

   Strategic Management Journal, 17: 77-91.

Organisation for Economic Co-operation and Development. 1995. *Technologies for Cleaner*

   Production and Products. Paris: OECD.

Oliver, C. 1991. Strategic responses to institutional processes. *Academy of Management Review*,

   16: 145-179.

Osborn, R. N., & Hagedoorn, J. 1997. The institutionalization and evolutionary dynamics of

   interorganizational alliances and networks. *Academy of Management Journal,* 40: 261-

   278.

Pacala1, S., & Socolow, R. 2004. Stabilization wedges: Solving the climate problem for the next

   50 years with current technologies. *Science*, 305: 968-972 .

Prahalad, C. K., & Hamel, G. 1990. The core competence of the corporation. *Harvard Business*

   Review, 68(3): 79-91.

Reinhardt, F. L. 1998. Environmental product differentiation: Implications for corporate strategy.

   California Management Review, 40(4): 43.

Ring, P. S., & Van de Ven, A. H. 1992. Structuring cooperative relationships between

   organizations. *Strategic Management Journal*, 13(7): 483-498.

Rondinelli, D. A., & London, T. 2003. How corporations and environmental groups cooperate:

   Assessing cross-sector alliances and collaborations. *Academy of Management Executives*,

   17(1): 61-76.

Roome, N. 1992. Developing environmental management strategies. *Business Strategy and the*

   Environment, 1: 11-24.

Sharma, S., & Henriques, I. 2005. Stakeholder influences on sustainability practices in the

Canadian forest products industry. *Strategic Management Journal*, 26(2): 159-180.

Sharma, S. & Vredenburg, H. 1998. Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities. *Strategic Management Journal*, 19: 729-753.

Shrivastava, P. 1995. Environmental technologies and competitive advantage. *Strategic Management Journal*, 18: 183-200.

Wade-Benzoni, K. A., Hoffman, A. J., Thompson, L. L, Moore, D. A., & James, J., 2002. Barriers to resolution in ideologically based negotiations: The role of values and institutions. *Academy of Management Review*, 27(1): 41-57.

Figure 1: Corporate environmental strategies that mitigate climate change

Pollution Control	**Pollution Prevention**	**Product Stewardship**	**Clean Technology**
• Carbon capture and storage • Waste to electricity	• Decarbonization from coal to gas and hydrogen • Improve fuel economy • Cogeneration • Green building • Efficient power plants • Improve packaging/ recycle/ reuse	• Smart Design for energy savings • Life cycle assessment • Stakeholder management • Closed loops • Supply chain management	• Genomics • Biomimicry • Information technology • Nanotechnology • Renewable energy (e.g. geothermal, solar, wind, tide)

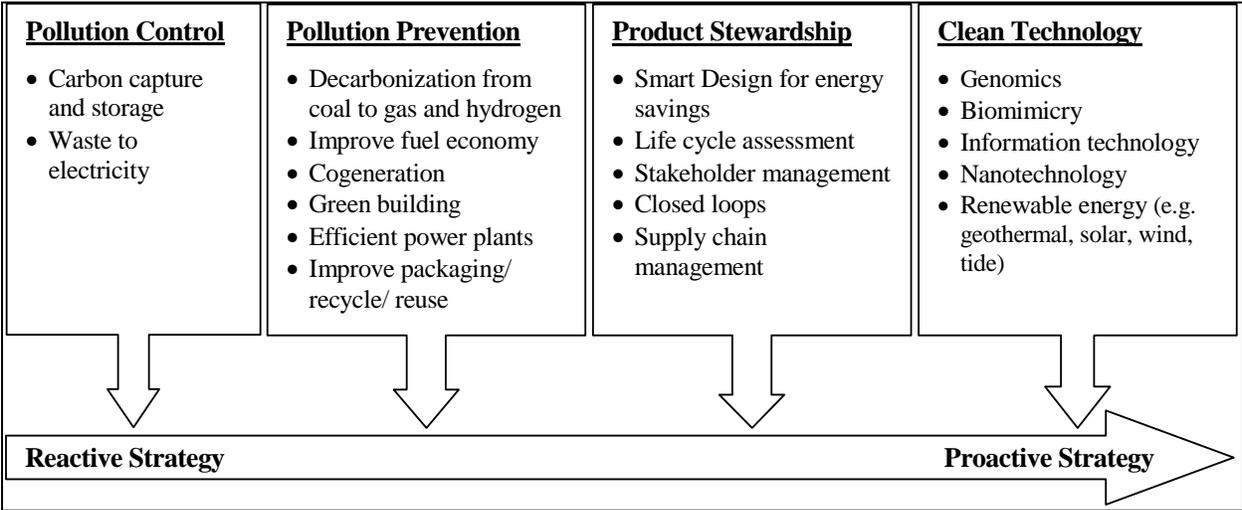**Reactive Strategy** → **Proactive Strategy**

Figure 2: Relationship between firms' motivations to participate in a strategic alliance and subsequent choice of environmental strategy

Motivation	Alliance Choice	Environmental Strategy Choice
Competency Motivation	Competency-oriented Alliances	Reactive Environmental Strategy
Legitimacy Motivation	Legitimacy-oriented Alliances	Proactive Environmental Strategy

.