

Integrating Environmental Science into Business Sustainability Models and Best Practices

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Abstract

Over the past few decades, there has been a global effort to make society and its institutions, including business, sustainable. As sustainability has become further defined and refined, there appears to be a general consensus that it comprises at least environmental, social, and economic aspects. The green business and organizational sustainability literature strongly suggest that the most developed of these three is environmental sustainability. Although several scholars posit that environmental sustainability has received more attention than economic sustainability and social sustainability, sustainable development has generally been approached somewhat simplistically. One of the main shortcomings of environmental sustainability models and best practices has been their lack of more than a cursory reliance on environmental science concepts and practices. With few exceptions, most business sustainability models and best practices have been developed without a firm grounding in environmental science. This paper explores the need to more deeply integrate environmental science into corporate environmental sustainability discourse, models, and best practices. Furthermore, it suggests ways in which this can be accomplished through an interdisciplinary, transdisciplinary approach to corporate environmental sustainability known as business ecology.

Introduction

Over the past few decades, there has been a global effort to make society and its institutions, including business, sustainable. As sustainability has become further defined and refined, there appears to be a general consensus that it comprises at least environmental, social, and economic aspects [1,2]. The green business and organizational sustainability literature strongly suggest that the most developed of these three is environmental sustainability. The literature indicates that most sustainability models either address the environment, alone, or the environment, society, and economy [3]. Even the literature that addresses all three aspects tends to place greater attention on the environmental aspect of sustainability than, say, the social aspect [4]. In fact, several scholars have cited the relative inattention to the social dimension of sustainability [1, 3, 5].

Although scholars have posited that environmental sustainability has received more attention than its economic sustainability and social sustainability counterparts [1], sustainable development has generally been approached somewhat simplistically – as an environmental issue

that simply requires the integration of environmental interests into economic decision-making [5]. Furthermore, the best practices typically associated with corporate environmental sustainability have failed to result in sustainable corporations.

This paper suggests that corporate environmental sustainability needs a more robust, holistic, science-based approach, illustrating the need to integrate environmental science concepts and practices into corporate environmental sustainability discourse, models, and best practices. Finally, it examines business ecology, a relatively new conceptual model for corporate environmental sustainability.

Discussion and research questions

Regardless of the relative attention that environmental sustainability has received over its social and economic counterparts, a number of scholars and practitioners have noted problems inherent in the best practices that are used by organizations in their efforts to achieve environmental sustainability [6, 7, 8, 9, 10]. These problems have ranged from the generally anthropocentric view of business in which human interests are seen as central [11, 12, 13] to the failure of corporations and other human organizations to take a long-range systems view of the relationships between corporations and the environment [14]. Environmental issues are often viewed and addressed as single issues [11] rather than symptoms of deeper systems issues caused by interactions between people (in this case businesses) and the natural world. As such, solutions to issues are often planned and implemented separately rather than in concert with one another.

Companies in a multitude of industries have embraced some degree of environmental sustainability practice or strategy; yet, numerous scholars have noted that most best practices associated with corporate environmental sustainability have not led to businesses that can be characterized as being environmentally sustainable [6, 7, 10, 15]. As academics and practitioners have moved environmental sustainability rhetoric and best practices from the periphery (e.g., Deep Ecology) into the mainstream corporate world, much of the rhetoric and best practices have lost their environmental grounding. For instance, some scholars have suggested that the rhetoric surrounding corporate environmental management programs typically leans toward what is best for the company rather than what is best for the environment [16].

There has long been a significant disconnect between companies and the very real environments in which they are embedded and upon which they wholly rely. Companies that have sought to reduce their negative impacts upon the natural environment have been only partially successful. Nearly two decades ago, Hutchinson [17] wrote that few companies had integrated their environmental policies and business strategies. This continues to be a problem as Ranganathan [18] recently espoused when she wrote that companies are continuing to fail at integrating sustainability into their core business strategies and that they lack the tools to do so. While there are more sophisticated computer models and corporate sustainability software programs than ever, companies still struggle to integrate sustainable thinking and concepts into their activities and to integrate themselves sustainably into the natural world.

Daily and Walker [19] expounded on the disconnect between business and environmental science more than a decade ago, stating, "There is an urgent need, and a strong basis, for partnership between businesses and environmental scientists" and that "The transition to

sustainability requires active cooperation between business and environmental science” (p. 243). They posited that the alignment of sustainability with corporate profit-seeking requires at least four things – “a scientifically based vision of a ‘sustainable’ business enterprise; an understanding of the competitive advantage in achieving the vision; effective communication of the vision; and a means of incremental implementation” [19, p. 244]. They suggest that environmental science can contribute most greatly in the first of these areas [19].

They indicate that environmental science can provide important information about trends in order to more accurately predict potential environmental changes often far in advance of governments and media outlets [19]. The effects of climate change on the insurance industry is one example. Knowing about such trends and changes in advance could be helpful not only to some businesses but to entire industries. Among other things, environmental science also can help the public adapt to genuine environmental problems and surprises and can assist businesses in developing inventive ways to address them[19].

Regardless of the benefits that environmental science could bring to corporate environmental sustainability efforts, little has been done to integrate the specificities and rigors of environmental science into business concepts and practice aside from the field of ecological economics. Some forward-thinking companies have used concepts like biomimicry, thereby looking to products or processes from nature in order to conceptualize new products or improve existing ones [20]. However, few have sought to “green” themselves in their entirety based on environmental science concepts or in accordance with the specificities of and data from the places that they inhabit, use for resources, and affect via their business activities.

With few exceptions (e.g., The Natural Step), most corporate environmental sustainability models and best practices have been developed without a true understanding of or grounding in environmental science. Thus, one of the main shortcomings of environmental sustainability models and best practices has been and continues to be the lack of reliance on more than a few general environmental concepts, such as the need to reduce resource use, reduce the production of toxins, and eliminate the concept of waste [7, 10]. Furthermore, little has been done to integrate business into the environment in a manner that benefits both organizations and ecosystems[7, 10].

Resolving this problem is important since, among other reasons, social and economic health and well-being rely on the healthy functioning of the natural world for resources and other benefits [21, 22, 23]. With a human population of more than seven billion living on a single planet with finite resources, there is a need for businesses that do better than simply reduce their damage to ecosystems. The cumulative harm done to global systems has been significant [7], and it is now time to take seriously the idea of ecological regeneration. Given their direct interaction with and impact upon the natural world through resource use, pollution, and other activities, the notion of increasing ecological resilience [10], by which ecosystems are healthy enough to withstand various stresses, and rebuilding natural capital, which is the value that nature provides to the human economy, is well within the purview of business.

This paper emerged from a multi-year study that sought to answer three research questions: 1) What is the current state of green business? 2) What are the strengths and weaknesses of green business best practices? 3) What do businesses need to do in order to become ecologically sustainable? In order to answer the first question, the author undertook an

assessment of green business best practices. This was followed up by a critique of those best practices in addition to research into environmental science concepts and practices. The final result was the development of the business ecology conceptual model.

Methodology

The research questions called for a qualitative approach, which allowed for the emergence of patterns that could prove useful in creating new hypotheses or adding to existing ones [24, 25]. An extensive literature review was conducted of the fields of corporate environmental sustainability and environmental science. The literature included books, peer-reviewed journals, non-peer-reviewed periodicals (e.g., green business magazines, newspaper articles), Internet articles (both peer-reviewed and non-peer-reviewed), and web sites. The literature used in this study came from a broad array of fields, including green business, industrial ecology, green architecture, green landscape design, environmental science, ecology, systems science, ecosystem management, adaptive management, permaculture, environmental anthropology, and ecological economics.

The literature review was conducted using a multidisciplinary topical analysis and metapattern search (MTAMS). The topic of green business was studied across several disciplines while broad patterns or themes both within individual disciplines and across disciplines were sought. The MTAMS approach relied on the following three key stages: 1) identify and analyze literature that is relevant to the particular green business topic being studied, 2) identify gaps in the green business literature, and 3) identify metapatterns within and across the literature. Using the MTAMS approach to data analysis, the author sought to build on the many strengths of the existing green business literature while navigating around some of the gaps.

Results

Identify and analyze relevant literature: Using the MTAMS approach, the author identified several fields of study that were relevant to the topic of green business and to the research questions. These fields were mentioned in the “Procedures for collecting data” section.

Identify gaps in green business literature: Given the newness of the fields of sustainable development and its more relevant field of corporate environmental sustainability, four types of gap were identified in the literature. They were deep, shallow, intradisciplinary, and interdisciplinary. Each of these is described in the table below.

Identify metapatterns within and across the literature: Metapatterns, a term coined by Gregory Bateson, have been defined in a number of ways, including as “patterns that connect” [Bateson in 26, p. vii] and as “patterns of patterns” [26, p. vii]. In this study, metapatterns were identified and, then, compared and contrasted in order to identify where they overlapped and did not overlap (patterns of presence and patterns of gap, respectively).

Identifying gaps and metapatterns, the author discovered that most of the models and best practices associated with corporate environmental sustainability share several shortcomings. For example, the best practices associated with environmentally sustainable business are rarely holistic, tending to focus only on parts of the company rather than the entire organization. The author has addressed this topic previously [7, 27, 9, 10]. Another shortcoming of most corporate environmental sustainability practices is that they rely almost exclusively on

Table 1. Gap Typology Matrix

	Intradisciplinary	Interdisciplinary
Shallow	Topics relevant to green business that are addressed only partially in green business literature and/or practice (e.g., need for green workplaces)	Topics relevant to green business that are addressed only partially in green business literature and/or practice <i>and</i> that are more fully discussed in the literature and/or practice of one or more disciplines (e.g., need for greener workplaces – addressed by the green architecture field)
Deep	Topics relevant to green business that are not addressed at all in green business literature and/or practice (e.g., need for businesses to green in their entirety as defined in this study)	Topics relevant to green business that are not addressed at all in the green business literature and/or practice but that are addressed in the literature and/or practice of one or more disciplines (e.g., need for place-based approach – addressed in some ecological design literature)

[7, p. 11]

quantitative measures of sustainability while ignoring qualitative ones, such as quality of life, social equity, and human-ecological relationships [8, 9, 10]. A third major issue is that few corporate environmental sustainability best practices are informed deeply by or grounded in environmental science [8, 10]. As a result, most corporate environmental sustainability best practices....

- 1) Provide little to no means for specific ecological feedback beyond kilowatts of energy conserved, gallons of water saved, and so on.
- 2) Rely mostly on reduction and replacement strategies, which seek to reduce resource use and replace harmful or toxic products with less harmful ones, rather than focusing on increasing ecological resilience and rebuilding natural capital.
- 3) Focus on single scales in time and space while natural and human systems operate on multiple scales simultaneously.
- 4) Use generic, context-free approaches to greening that miss out on the unique opportunities and constraints inherent in real-world sites.
- 5) Do not use multidisciplinary (from individual disciplines), interdisciplinary (from combine disciplines), or transdisciplinary (moving beyond individual disciplines) approaches to sustainability.
- 6) Provide no means for obtaining and responding to detailed ecological feedback or adapting to ecological change.
- 7) Seek to integrate environmental concerns into the business rather than identifying ways to beneficially integrate the business into the natural environment. Therefore, they establish the business as the baseline rather than the other way around.

Each of these issues could be addressed if corporate environmental sustainability models and best practices were informed by environmental science. With few exceptions, the Natural Step being the most prominent, it is ironic that most corporate environmental sustainability models and best practices have been developed without a basis in environmental science [7, 19]. That might be attributable to the fact that these models and best practices have been cobbled

together from a diverse array of fields (e.g., green building, industrial ecology, green landscape design) in order to address a broad array of environmental concerns, such as the efficient use of energy and production of clean energy; use and protection of clean water; support and enhancement of native biological diversity; reduction of carbon footprint; reducing or eliminating waste; development of comprehensive recycling programs; elimination of toxins in manufacturing processes; and others.

Addressing such a broad array of concerns that straddle business and the environment requires a multidisciplinary [11] and, even, a transdisciplinary approach [28, 10]. Such an approach would combine the strengths of business and environmental science while transcending their limitations in order to develop more a robust corporate environmental sustainability discourse, models, and best practices. Although some companies have made great strides in reducing or eliminating their pollution and waste and becoming more resource efficient, those interested in corporate ecological sustainability will need to embrace a more holistic and robust set of best practices grounded in environmental science. They will need to revisit fundamental questions around what it means to start and run a business.

For some time, scholars have understood the need to alter the current non-sustainable business paradigm [6]. Hart [29] indicated that strategic management needs a paradigm shift because the fundamental nature of current economic activity endangers ecosystem health. Jennings and Zandenbergen have indicated that business must make “sweeping changes” in the ways it approaches strategy, operations, and business learning systems [21, p. 1020]. Dobers and Wolff have proposed the need “to re-invent our modes of production and consumption” [30, p. 44].

Gladwin, Kennelly, and Krause wrote, “Modern management theory is constricted by a fractured epistemology, which separates humanity from nature and truth from morality” [12, p. 874]. They suggested that management theory and research are often conducted “as if organizations lack biophysical foundations” and argued for a “sustaincentric” approach to business [12, p. 875]. They suggested that management theorists ask “how do we wish to live and what is the role of organizations in such living?” [Ibid.]. Almost twenty years later, Muff et al. have asked the same questions and called for a complete renovation of business as we know it, suggesting “that the mainstream approach to the triple bottom line of environmental, social and economic problems was inadequate to address the global challenges of social justice and environmental sustainability” [28, p. xvii].

This research resulted in the development of a conceptual model and the most basic of methodological underpinnings for the nascent field of business ecology. Business ecology is being developed further at the Business Ecology Institute to meet the need for a science-based approach for corporate environmental sustainability. It calls for companies to use environmental science to inform everything from their purpose and priorities to their policies and processes. Although the term “business ecology” has been used in the literature, it has typically referred to “tightly knit, inter-company relationships or ‘business ecosystems’” [31] or the effects that companies have on the environment [10, p. 87]. A review of the literature has indicated that the term “business ecology” has historically used “ecology” more as a metaphor for interrelated systems than as a reference to the scientific study and practice.

Rooted within the environmental sciences, ecology is the scientific study of organisms and their environments and includes both biotic (living) and abiotic (non-living) features. In the context of this paper, business ecology is the study of the relationship between businesses and ecosystems. The goal of business ecology is the complete ecological synchronization and integration of an organization with the places that it inhabits through its facilities, uses for its resources, and affects through its activities. These are known as the primary, secondary, and tertiary sites, respectively [7, 8, 9, 10].

This definition has deep implications for businesses and their relationships with the natural world. First, “complete ecological synchronization” indicates that all company practices and activities would be informed by the opportunities and constraints of its sites. Given that most companies “green” only part of themselves, this holistic approach to corporate environmental sustainability would be a departure from the norm. Moreover, companies typically try to force nature to synchronize with their production schedules – by engineering faster-growing trees or cows that produce milk continuously for example – rather than matching their production schedules to ecosystem schedules. In the business ecology model, the issues of corporate versus environmental pace, cycles, and rhythms will need to be acknowledged and addressed. Rather than forcing nature to meet corporate schedules, companies following the business ecology model would look for ways to match their schedules with those of the ecosystems on which they rely. Therefore, nature would be recognized as the basis of all business and is treated as such [7, 8, 9, 10].

In the business ecology model, companies will intentionally become place-based, integrating with their primary, secondary, and tertiary sites. A site is not only a geographic location; it is a unique place defined by “a suite of simultaneous, overlapping, and multi-scaled relationships among biotic and abiotic ecological components that occur within a spatial-temporal framework. In any site, some of these relationships fall within and some extend beyond the site’s conceptually constructed boundaries” [10, pp. 88-89].

There has been an increased recognition of the “placeless character” of corporate environmental sustainability best practices and a call to reconnect sustainability efforts to place [32]. After all, business activities occur in specific places, yet corporate environmental sustainability best practices generally fail to address this reality. In business ecology, a company’s integration with its primary, secondary, and tertiary sites would be driven by the specific characteristics of those sites rather than a set of non-place-based business values, priorities, and activities. Thus, the company would be informed and respond not only to the economic market but also to the ecological constraints and opportunities of its sites.

Ultimately, the goal of business ecology is the regeneration of natural capital for the benefit of humans and other species. Since every business activity is tied to ecosystems, business ecology calls for that relationship to become explicit rather than implicit, mutually beneficial rather than self-serving. This will require companies to become ecologically literate, learning all they can about their sites so that they can work to regenerate them rather than reducing harm.

Conclusion

Given that it focuses on the ongoing relationship between human organizations and ecological systems, the move to corporate environmental sustainability will require well-

integrated, multi-level efforts in order to be successful. Nothing short of a full paradigm shift will be needed in order to make corporate environmental sustainability a reality. It will require far more than companies embracing environmental management. In effect, companies will need to manage their own activities and develop mutually beneficial relationships with their primary, secondary, and tertiary sites.

The main goal of the business ecology model discussed herein is the creation of mutually beneficial business-ecological relationships. Its primary focus is to move beyond merely doing less environmental harm to restoring and regenerating ecosystems for the long-term benefit of human organizations and Earth's ecosystems. The model comprises the normative and substantive, the "what" and "how" of business-ecological sustainability, in an effort to provide useful approaches to sustainability rather than high-level concepts that are difficult for practitioners to implement.

Only by becoming environmentally literate and working intentionally with both economic and ecological "markets" and realities can companies hope to secure long-term viability and increase the evolutionary opportunities of themselves, humanity, and the rest of the natural world.

International and managerial implications

The concept and practice of business ecology has a number of international and managerial implications. Organizations that use a business ecology approach would need to fundamentally change their business paradigm, thereby embracing ecological resilience and the regeneration of natural capital. This would require a "new contract" between business, government, and society – a "radical rather than incremental environmental improvement over the long term, to work to reduce global inequalities and to be responsible employers and community members" [33, p. 244].

If the world's societies are truly interested in long-term survival on a healthy planet, there are several issues that are worth considering:

1. Can we wait years for firms to become ecologically sustainable... and to do so voluntarily?
2. Will the anthropocentric worldviews held by many companies reduce their ability to become ecologically regenerative?
3. Are companies' products and services worth the tradeoff in lost ecosystem services as well as the very real expense of later attempts at ecological renewal?
4. Will corporate charters be provided only to ecologically regenerative companies? If so, who makes that determination and by using which criteria?
5. Should firms that pollute or use resources non-sustainably lose their corporate charters?
6. Who in the company will be responsible for ensuring that the company is environmentally sustainable, regenerative?
7. How can we prevent early corporate adopters of business ecology from incurring the greatest costs of ecological regeneration and the redevelopment of natural capital while preventing free riders from taking advantage of the existence of more natural resources?
8. Should inherently non-sustainable products and services be barred from production, consumption, and disposal in the U.S. and elsewhere?

9. What economic, cultural, governmental, and other changes will be required to support the regeneration of ecosystem health while discouraging non-sustainable ones?
10. Until such changes are made, will environmentally regenerative companies find themselves more or less able to survive, or will there be no difference?
11. In what ways might business ecology concepts and best practices inform other interdisciplinary fields, such as environmental anthropology, adaptive management, and ecological economics?

Clearly, there are several potential implications that need to be addressed and the need for additional research on a variety of issues. Nonetheless, only by addressing the complex systems issues that underlie corporate environmental sustainability will we make significant inroads to creating organizations that do more good than harm.

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