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Organizational use of ecosystem service approaches: A critique from a systems theory perspective

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Abstract

Although corporate sustainability theory is well established, there is limited research on the use and understanding of the ecosystem service (ES) approaches based on an advanced conceptualization of the environment in organizational practice. This article analyzes the use of ES approaches in organizations using a system theory lens, conducting empirical research on the contribution of ES approaches to corporate environmental management. Drawing from 30 semistructured interviews with ES practitioners from private, policy, and third sector organizations, we find that ES approaches provide practitioners with an advanced understanding of the environment as a system, the interconnections between the organization and the environment, and a better awareness of temporal and physical attributes of the environment. Overemphasis on ecological systems, limited acknowledgment of the nesting of the social system within the ecological system, and limited detailed practitioner knowledge are barriers for advancing the use of the ES approaches in corporate sustainability practice.

KEYWORDS
corporate environmental management, ecosystem services, natural capital, socio-ecological systems, sustainable development, systems theory

1 | INTRODUCTION

Economic growth results in adverse environmental impacts such as the loss of biodiversity (Steffen et al., 2015). The global rate of species extinction is accelerating and the health of ecosystems on which humans and other species depend is deteriorating more rapidly than ever (Brondizio et al., 2019). Organizations play a key role in humanity's relationship with nature as the intermediaries that convert natural resources into usable products, and the productive resources of the economy (Sukhdev, 2012). Growing management literature is exploring sustainability for the Anthropocene (Etzion, 2007; Hoffman & Georg, 2018; Hoffman & Jennings, 2015; Williams et al., 2017). We seek to advance corporate environmental sustainability literature on biodiversity loss by examining the practitioner use of ES approaches through a systems theory lens:

> sustainability is a systems-based concept and, environmentally at least, only begins to make any sense at the level of ecosystems and is probably difficult to really conceptualize at anything below planetary and species levels. (Gray, 2010, p. 48)

While a range of corporate environmental sustainability approaches exist (Welford, 2016), few corporations positively influence the intertwined system of people and planet: the literature refers to this as the corporate-ecological disconnect (Ahlström et al., 2020; Hahn et al., 2017; Starik & Kanashiro, 2013; Whiteman et al., 2013).

Researchers have identified a need for a better understanding of the use of corporate environmental sustainability approaches in practice (Ahlström et al., 2020; Williams et al., 2019). This article examines the use of ecosystem service (ES) approaches in organizations and how they advance systems thinking in corporate environmental sustainability practice. We do this by conducting empirical research on experiences of representatives of organizations using ES approaches.

ES approaches make visible the benefits that people derive from nature (Costanza et al., 2017). They assess impacts on and dependencies between supporting, regulating, provisioning and cultural services which remain under-studied in management literature (Hahn et al., 2017). The concept of natural capital is linked to ESs as the environmental "stock" that yields a flow of ESs. We define natural capital as "the stock of properly functioning natural assets (such as forests, wetlands, rivers, coasts) that yield a flow of valuable goods and services into the future" (van den Belt & Blake, 2015, p. 668). Biodiversity (biological diversity) underpins both ESs and natural capital as the variability among living organisms from all sources including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part and it includes diversity within species, between species and of ecosystems (Convention on Biological Diversity [CBD], 1992). In what follows, we will use the term ES approaches to refer to both natural capital approaches (the environmental asset stock) and ES approaches (the flows of impacts and benefits received).

ES approaches are one of a number of ways to account for biodiversity, a growing stream of research in both accounting and management literature, other methods include: stewardship accounting (Jones & Solomon, 2013; Siddiqui, 2013; Skouloudis et al., 2019), certifiable standards (Boiral et al., 2018; Cuckston, 2018; Schaltegger & Beständig, 2010) corporate reporting (Atkins et al., 2014; Boiral et al., 2019), and offsetting (Cuckston, 2019; Gamarra et al., 2018; Tregidga, 2013). Roberts et al. (2021) conduct a systemic literature review of biodiversity and extinction accounting from 2013 to 2020 who find this a growing and essential area of work, with limited empirical research gathering primary data through depth interviews, a gap we seek to address. We contribute to the management literature and the established field of business and the natural environment (Hoffman & Georg, 2018; Hoffman & Jennings, 2021) seeking to better understand the corporate-ecological disconnect (Ahlström et al., 2020) and for this reason focus on ES approaches as a socio-ecological system (SES) through a systems theory lens for corporate sustainability.

ES approaches offer a widely accepted framing of nature as a system (Costanza et al., 2017) in which the environment is no longer considered in terms of discrete functions but rather as an interrelated system of services on which human well-being depends. Both organizations (Emery, 1981; Pratt et al., 2005) and the natural world (Griggs et al., 2014) can be considered open living systems. Management literature has sought to understand the nexus between the organization (a social system) and the environment (an ecological system) as a system (Starik & Rands, 1995; Williams et al., 2017). Seminal work by Katz and Kahn (1978) suggested that organizations are living open systems, often described as organizational ecosystems. Starik and Rands' (1995) multilevel, multisystems theory incorporated the environment in organizational systems thinking and is an important foundation for our research. More recently, Williams et al. (2017) conducted a systematic literature review on systems thinking and organizational sustainability, suggesting systems thinking provides an antidote to earlier scholarly silos. Framing organizations as open systems embedded in the environment helps reveal systemic limits to growth, including finite planetary resources and the dependency of organizations on the environment (Haffar & Searcy, 2018).

ES approaches conceptualize the environment as a SES. They are well established in the natural science literature with a range of methodologies and tools developed over the last two decades (Biggs et al., 2021; Potschin & Haines-Young, 2016; Sukhdev et al., 2010). Ahlström et al. (2020) note that SES research on corporate perspectives in management literature are mainly theoretical and lack empirical insights. This paper seeks to contribute to this literature by providing empirical knowledge on organizational use of ES approaches through an SES lens.

The contributions of our paper are twofold. First, we provide empirical evidence on the use of ES approaches in organizations and their contribution to corporate environmental sustainability. Second, we outline how this evidence fits within a theoretical framework aiming to advance systems thinking about SES in organizations.

We will first outline the literature on systems thinking for sustainability management, SESs, natural capital, and ESs approaches and outline our framework. Second, we present the methods and results from our empirical findings and discuss the implications of these findings in the context of the literature. Finally, we summarize our contributions, discuss limitations and future research, and conclude.

2 | LITERATURE REVIEW

2.1 | Systems thinking in organizations

Systems thinking helps understand the complexities of economic, social, and ecological systems (Holling, 2001) by portraying the world not as discretely compartmentalized units but rather as a network of overlapping and interrelated elements (Maon et al., 2008): "seeing interrelationships rather than things, […] seeing patterns of change rather than static snapshots" (Senge, 1990, p. 68). There is a large body of literature on systems thinking (Emery, 1981; Merali & Allen, 2011; Von Bertalanffy, 1972; Weinberg, 1975) which can be applied in many disciplines (Mingers & White, 2010), including to the role of corporations within social and ecological systems (Williams et al., 2017) as both organizations and nature are discrete open systems combining into a new system of organizational use of ESs.

Emery's (1981) work synthesizes earlier scholarship from the 1930s to the 1970s to suggest that human organizations are living "open systems" which are open to matter-energy exchanges with an environment. Angyal (1969) highlights the Gestalten properties of systems which suggest that a system is more than the sum of its parts.

Emergy and Angyal note that a system has dimensional domains such as time and space on which we will elaborate later. Other early contributions include work on the open systems model (Katz & Kahn, 1978), social technical systems (Trist & Emery, 1973), and adaptive systems (Katz & Kahn, 1978).

Management scholars noted in the 1990s the need for corporate environmental sustainability research to adopt a systems lens and to integrate insights from the natural world (Starik & Rands, 1995). Starik and Rands (1995) developed a multisystem and multilevel theory which incorporated 10 common characteristics of open systems (Katz & Kahn, 1978) only seven of which the authors argued can be controlled. This theory introduced the consideration of ecological systems to corporate environmental sustainability literature, and it has been further developed by Aguilera et al. (2007), Wood (2010), Hahn et al. (2015) and Starik and Kanashiro (2013, 2020).

Williams et al. (2017) conducted a systematic literature review on systems thinking and organizational sustainability. They suggest that systems thinking offers a holistic lens to examine the role of corporations within ecological and social systems. Thus, when considering the use of ecosystems services by organizations, it is important to recognize the interconnections among the various parts of both ecological and social systems and to synthesize these into a cohesive view of the whole system (Anderson & Johnson, 1997). It is also important to recognize the bidirectional nature of the relationships between organizations and ecosystems. The interdependence between organizations and the natural environment is central to sustainability management as organizations depend on the natural environment for inputs and organizational actions directly impact the natural environment including through feedback loops (Ahlström et al., 2020; Starik & Kanashiro, 2013; Starik & Rands, 1995; Williams et al., 2017; Winn & Pogutz, 2013). One way to apply systems thinking in organization is through applying SESs theory, as we expand on below.

2.2 | Socio-ecological systems

SES literature is well established (Colding & Barthel, 2019) in environmental sciences and growing in the management sciences (Williams et al., 2017). We define SES as interdependent and linked systems of people and nature that are nested across scales, emphasizing that humans are part of, not apart from, nature (Bouamrane et al., 2016; Folke, 2006; Ostrom, 2009). Three SES frameworks dominate the literature (Colding & Barthel, 2019); the original framework (Folke et al., 1998), the robustness framework (Anderies et al., 2004), and the multitier framework (Ostrom, 2009). The multitier framework outlined by Ostrom (2009) is the broadest and most widely used theory offering a general framework for analyzing the sustainability of SESs (Baudoin & Arenas, 2020). With an emphasis on complexity and interdisciplinarity, it helps identify relevant variables for a single SES as well as providing a common set of variables for organizing research on similar SESs. Given the multitude of SES theories, Binder et al. (2013) developed a methodology for comparing SES frameworks, which we use to frame part of our empirical analysis.

2.3 | ES approaches as SES

Costanza et al. (2017) suggests that the terminology of "receiving services from nature" first appeared in literature in 1977. During the 1970s, ecosystem ecology and environmental and resource economics communities worked in parallel with limited contact and cross-fertilization (Costanza et al., 2017). The 1980s witnessed the emergence of "ecological economics" (Costanza, 1989; Jansson, 1994) which sought to bridge the gap between the two research communities and the notion of ESs was a key part of the solution (Costanza & Daly, 1992). Ecology and society were brought together through a systems lens and conceived as an SES. ES approaches are interdisciplinary; as Quintas-Soriano et al. (2018) note, ES approaches gained considerable traction as a way to communicate societal dependence on ecological life-support systems that integrates perspectives from both the natural and social sciences.

Costanza et al. (2014) have also critiqued some of the natural science literature for a view that ESs directly contribute to human well-being. They highlight that ecosystems services importantly interact with other forms of capital before contributing to human well-being. This interaction often happens in organizations, governmental, for profit, or not-for-profit.

2.4 | SES in management literature

In the management literature, ES approaches remain understudied. Winn and Pogutz (2013) discussed the contribution of ES approaches to corporate environmental literature and suggested a theory of corporate ecosystem embeddedness to highlight the impact businesses have on ESs. They (Winn & Pogutz, 2013) highlighted the lack of empirical research on ES approaches and called for improving the knowledge base on the contribution of ES approaches to corporate environmental management. Later, they employed an SES approach to examine the Italian multinational food company Barilla's use of sustainable agriculture (Pogutz & Winn, 2016). Vihervaara et al. (2010) explored the use of ES approaches in forestry organizations in Finland, finding that the adoption of ES approaches is increasing but that further stakeholder engagement is needed to mainstream them. D'Amato et al. (2018) considered ES approaches in the forestry sector of China, analyzing the impact-dependency-response process between organizations and ecosystems services. Thompson (2019) examined Payment for Ecosystem Services (PES) and corporate environmental management in Thailand, suggesting that the PES may be used as a tool for philanthropy, stakeholder engagement and gaining a license to operate.

2.5 | Advancing systems thinking in corporate sustainability through SES

There are multiple SES theories seeking to understand the nested interactions between society and nature which differ in terms of their

TABLE 1 Comparison of SES frameworks (content adapted from Binder et al., 2013)

	ES approaches	Socio-ecological systems framework (SESF)
Q1. How are the social and the ecological systems and their dynamics conceptualized?	**Conceptualization of the social systems and its dynamics**	
	The social system is conceptualized as human beings as the users of the ecological system and acting as valuing agents. They translate the basic ecological structures and processes into value-laden entities.	The social system is composed of resource users (actors) and the governance system that influences the actions of the users by defining rules as well as monitoring and sanctions mechanisms.
	a) Conceptualizes the hierarchical levels of the social system (e.g., individual, group, organization, society) only at the society level.	a) Conceptualizes the hierarchical levels of the social system (e.g., individual, group, organization, society) at all levels.
	b) The approach only considers interactions between levels at the macro scale (society level).	b) The approaches consider two-way interactions between all hierarchical levels.
	c) The approach does not consider social dynamics i.e., whether the framework explicitly conceptualize feedbacks within and between the social levels.	c) The approach considers social dynamics textually by including variables such as "information sharing," "deliberation processes," and "self-organization activities" grouped under the label "interaction."
	Conceptualization of the ecological system and its dynamics	
	The ecological system (ecosystem) is conceptualized from an ecocentric perspective focusing on ecosystem functions. To ensure the continued availability of ecosystem functions, the use of the associated goods and services should be limited to sustainable use levels.	The ecological system is conceptualized from an anthropocentric perspective as resource system, e.g., water, forest, with corresponding resource units, e.g., water quantity, trees etc.
	Spatial scale: Can be applied at any scale; but favors regional, national scale	Spatial scale: local, regional, and national scales
	No interactions between scales considered.	The ecological system could potentially be studied at any scale. Interactions between scales are named but not further conceptualized.
	Dynamics are not considered in the conceptualization.	The dynamics are considered by a number of variables (natural language descriptions) of the resource system and resource units such as growth rate, equilibrium properties, and productivity.
Q2. How are the interaction and the dynamics between the social and the ecological systems conceptualized?	The social system changes the services that can be provided by the ecological system.	The actors use resources impacting on the ecological system and may cause externalities in related SES. These externalities feedback to the social system in that the productivity of the system changes affecting the harvesting rates.
	a) Interaction type: the social system impacts the ecological system.	a) Interaction type: there is a reciprocity between the social and the ecological systems.
	b) Feedbacks between the systems are not considered.	b) Feedbacks between the resource conditions and the rules determining the harvesting rates of the resource.
Q3. To what extent are the social and the ecological systems treated equally with respect to analytical depth?	Degree of equal representation of social and ecological: Emphasizes the ecological system over the social system.	Degree of equal representation of social and ecological: has the most balanced conceptualization of the social and ecological systems.

goals, disciplinary background, applicability, temporal, social and spatial focus, and conceptualization of social and ecological systems. Binder et al. (2013) suggest a framework for analyzing SES theories by considering:

- How are social and the ecological systems and their dynamics conceptualized?
- How are interactions and dynamics between social and ecological systems conceptualized?
- To what extent are social and ecological systems treated with the same analytical depth?

Binder et al. (2013) examines 10 SES theories including the ES approaches and Ostrom's (2009) multitier framework. We have summarized the analysis in Table 1 which suggests that the ES approaches are conceptually stronger for ecological systems than for social systems. For example, ES approaches currently fail to adopt a multilevel approach to social systems (Small et al., In Press). This limits the understanding of the dynamics and feedbacks between these levels when only one level (society) is considered. ES approaches have a stronger focus on the impacts of the social system on the ecological system and are weaker in acknowledging the reciprocity between the social and ecological systems as well as the feedbacks between these systems. Finally, ES approaches emphasize the ecological system over the social system. Ostrom's SESF framework is more advanced than ES approaches in light of this framework.

In what follows, we will first present common themes from practitioner experiences to shine a light on the use of ES approaches in corporate environmental sustainability practice and the perceived changes the ES approaches have led to in practice. We then delve deeper into these empirical findings using the analytical framework of Table 1 through the lens of SES theory, analyzing how our findings support or contradict SES theoretical approaches for corporate environmental sustainability and how this relates to advances in systems thinking for corporate environmental sustainability.

3 | METHODS

3.1 | Research design

We sought to analyze the ES approaches in organizational settings and to explore employee narratives on how its use advances environmental management practice. A qualitative approach was adopted to understand individual experiences from the use of ES approaches in organizations (Tracy, 2012). We sampled participants from different types of organizations and provide further information on the method, sample and data analysis below.

3.1.1 | Key informant interviews

Two key informant interviews were held to aid the development of the interview protocol for the semistructured interviews. Key informants should be experienced, savvy in the scene, and articulate stories and explanations that others would not (Tracy, 2012). Our selection criteria for key informants included the following: seniority in the field (director or above), years of relevant experience (15 years or above), and prominence in the field (had contributed to expert industry guidance or conference). Informants were engaged through professional networks and selected from different types of organizations, one from for-profit and one from a third sector organization.

3.1.2 | Participants

Referral sampling was used to recruit participants. Participants were initially recruited through industry networks and based on the lead author's attendance at industry conferences on ES approaches between May 2018 and February 2019. Following the initial contacts, participants were asked to suggest further practitioners who might be interested in taking part. An overview of the participants is provided in Table 2. Twenty-six interviews were conducted face-to-face, two via video conferencing and two via telephone. Participants had an average of 16 years industry experience and over half of the respondents were director level or above. Participants were recruited from over 20 organizations which included for example Lafarge Holcium, PWC, Yorkshire Water, UK Forestry Commission, WBCSD, and AECOM. Interviews took place between October 2018 and February 2019 at participants' place of employment. Participants either directly worked on ES approaches, advised other on how to use ES approaches, or managed teams who worked with ES approaches.

3.1.3 | Procedure

Participation was voluntary and normal ethical procedures were followed. The interviews lasted on average 56 min, with the shortest being 32 min and the longest 73 min. The participants were first asked to introduce themselves and talk about their role in their

TABLE 2 Participant information (units = count)

Organization type		Discipline		Seniority		Education level	
Private (for profit)	8	Economist	8	Director	16	Doctorate	7
Consultancy (for profit)	8	Environment	19	Senior	11	Postgraduate	16
Public	7	Engineering	2	Junior	3	Undergraduate	7
Third sector	7	Law	1				

organization, then questions were asked on participants' definitions of ESs and natural capital and their understanding of both. Following this, participants were asked about the opportunities and barriers of using ES approaches for both the employee and organization; the changes they have experienced, specifically asking if using ES approaches had changed the way they think about the environment, and if so, how? The interview ended with a discussion on future use of ES approaches. The interview proforma is included in the Supporting Information.

3.2 | Data analysis

The interviews were transcribed, read through, and on a second read, a short synopsis was produced to summarize "what strikes me as a researcher?" and "what is happening here?" (Creswell et al., 2007, p. 153). Once all interviews were completed and transcribed, the primary cycle coding began using NVivo 12. Coding is "the active process of identifying data as belonging to, or representing, some type of phenomenon" (Tracy, 2012, p. 209). Primary-cycle coding involved multiple reviews of material and assigning words or phrases that capture its essence (Supporting Information). Throughout the coding process, the constant comparative method (Charmaz, 2006) was used to compare the data to each code and either adjust the code or divide the codes into two new ones. Secondary-cycle coding moved beyond descriptive codes to analytical codes: reflections identified the themes of time, systems, and physical risk as prevalent. Following a second review of the literature, a third phase of coding was undertaken, using the analytical framework included in Table 1. To structure the analysis of our empirical findings, data analysis first took the form free coding through primary and secondary cycle coding, identifying themes. Another literature review was subsequently undertaken reflecting on our empirical data and then analyzed using our analytical framework in Table 1 to glean further insight through the SES systems thinking lens. In what follows, we first report our results and then relate them in discussion to the literature to establish the contribution of ES approaches in advancing knowledge on systems thinking in corporate environmental sustainability practice.

4 | RESULTS

The participants were encouraged to consider the use of ES approaches at the individual and organizational level in a series of open questions to shed light on the use of ES approaches and the difference it is perceived to make. In what follows, we will first present the themes which illustrate practitioner perceptions. Second, we reflect on the empirical data analysis applying the theoretical frame in Table 1; this allows us to analyze our findings through an SES lens for systems thinking in sustainability management.

4.1 | Empirical findings—Practitioner experiences

Four interesting themes emerged from the empirical analysis of practitioner experiences of using ES approaches: ES approaches changed practitioner understanding of "the environment", highlighted the physicality of the environment, introduced a time dimension into management, and provided the basis for a systems overview of how their organization related to the natural environment.

4.1.1 | Changed understanding of the environment

Two thirds of the participants suggested that the use of ES approaches had changed their understanding of the environment. This is illustrated by a quote from a director of a global management consultancy:

> [Organizations are] thinking about what their place is in the future. And whether they use the language of natural capital, or whatever, they are recognizing […] it's no longer an option for them to create enormous negative environmental impacts. And if they have, really major dependencies, if they interact really closely with the environment on a day-to-day basis, then […] they need to be acutely aware of whether that environment is still we are going to be there to provide for them in the future. (Participant 28)

This highlights a greater awareness of the connections between the organization and the environment in terms of both impacts and dependencies, as well as an heightened awareness of the temporal nature of the environment. The use of the ES approaches also raises awareness of the finite limits and boundaries of the environment and the environment as a "flow" (rather than as a "stock"), although the participant goes on to suggest that further research is required to understand what this means for corporate environmental practice.

> It is actually around real environments thresholds and limits, and how do we integrate those into our thinking about natural capital and […] we sort of assume that those future flows will happen and not worry nearly enough about what thresholds and environmental change mean for those future flows. (Participant 28)

4.1.2 | Physicality of nature

Over half of the respondents considered that using ES approaches helped manage the risks associated with dependency on the physicality of the natural environment. These risks included an awareness of the geographical location of the environment as noted by two participants:

> It leads one down the pathway of understanding where that natural capital is, what it's condition is and then by extension the ecosystem services. (Participant 7)

> ...looking not only at your impacts, but also your dependencies on the environment, and how those vary across different geographies is a thought process that's not written into any other business process. (Participant 27)

The physical location of the environment on which organizations are dependent is made more explicit by the use of ES approaches. This includes "de-risking your supply chain" (Participant 24) when using ES approaches. Another participant noted that "there are serious business risks in everything we do, where we don't store and protect natural capital" (Participant 18). The ES approaches thus improve awareness of the dependency of the organization on the physical environment and the potential risks associated with it.

4.1.3 | Time

Over half of the respondents brought up greater awareness of the need for long-term thinking; it is "about long termism rather than short termism" (Participant 20). Another participant noted:

> It's a human flaw is not it that we would pursue short term gain and we then damage the long term. [..] that's why we use the rebuilding of natural capital. (Participant 6)

Participants offered examples of greater awareness of the temporal aspects of the environment as a result of using ES approaches. First is the realization of the error of considering environmental impacts as externalities: "if you're looking, with a long-term timeframe, in reality, nothing is ever truly an externality" (Participant 2). Second, the intergenerational tensions become visible when considering nature over a long timeframe: "our grandchildren and our great grandchildren may want something different out of that same environment" (Participant 13). Third, the urgency or lack of time to take action to keep within potential environmental thresholds: "there's a pending threat that we're reaching thresholds with regards to the environment that are totally irreversible" (Participant 17). This suggests that the use of ES approaches raised the participants' awareness of the temporal dimensions of the environment, including the need to consider longer time horizons.

4.1.4 | Systems overview

Over half of the participants noted greater awareness of the environment as a system or of the relationship between the organization and the environment being a further "interlinked system" (Participant 6). Participant 6 went on to suggest that "It's the idea of, the multiple benefits coming out and actually kind of reinforcing each other. And actually, I don't think I fully appreciated the contribution the environment makes." Another participant noted that the use of ES approaches "really changed the way that people think about the systems and the processes" (Participant 10). Furthermore, Participant 2 noted "it's all about systems, holistic approach, rather than just looking at these key things [...] and missing out on opportunities to link it up with other areas." Finally, one participant notes the systems attributes throughout the supply chain:

> The aggregate natural capital rule - and so whatever, wherever you are in your supply chain, or your business model, you are using natural capital, you have to have something somewhere that puts it back and restores itself, so the balance is correct. (Participant 18)

The use of the ES approaches in an organizational context thus increases the awareness of the systemic attributes both of the environment and the organization's relationship with it.

Next, we analyze the material in light of the framework communicated in Table 1 to establish how our findings compare to theoretical advances in SES use in corporate environmental sustainability.

4.2 | Empirical findings as they relate to theoretical advances

A further four themes emerge when we examine what our empirical data offers to advance understanding of social and the ecological systems and how their dynamics are conceptualized. These are as follows: a greater understanding of the ecological system at multiple levels, a limited understanding of the social system, and a limited understanding of the relationship, nested nature, and reciprocity between the social and ecological system.

4.2.1 | Understanding of the ecological system

ES approaches conceptualize ecological systems from an ecocentric perspective focusing on ecosystem functions that provide goods and services. Analysis of the ecological system can be undertaken at any scale, but the national scale is most often considered without giving attention to interactions between scales. In contrast, the SESF conceptualizes the ecological system from an anthropocentric perspective acknowledging all scales and feedbacks between them. Below we report participant's understanding of the ecological systems, multiple scales, and feedbacks.

Participants were aware of nature as a system as they highlighted the "interconnectedness of the environment" (Participant 20) stating they did not realize how a "piece of land and the natural environment

can be such a multi-tasker" (Participant 6). Participant 11 noted that "we are modelling all the underlying biological cycles [….] and we did that before and after, so we can see what it was doing."

Some participants were also aware of the need to consider the ecological system at different scales. Participant 13 for example noted that different organizational interventions could lead to "different levels or different types or qualities of goods and services." Participant 11 in turn noted that "on a national scale …. [natural capital] could promote the green economy …. But ultimately, I think it creates opportunity for everyone whether it is at a very personal level through health and wellbeing."

Participants also raised the theme of feedbacks and dynamics. Participant 13 noted that "understanding the ecology sufficiently that you can tweak a little something to get out the ecosystem services you want, you don't destroy the system, but you understand the system to the extent that you can modify." Participant 18's comment noted in Section 4.1 above also provides an example of participants' concern with the theme of feedbacks and dynamics. These participants acknowledge the dynamics within the ecological system as well as the interactions between the ecological and social system.

Our findings suggest that most participants understood the ecological systems and whilst theoretically using ES approaches, there should be limited knowledge of multiple levels and the feedbacks across these levels; our findings suggests that some practitioners using ES approaches did report an awareness of multiple levels and potential feedbacks within the ecological system.

4.2.2 | Understanding of the social system

ES approaches conceptualize the social system of human beings as users of the ecological system and acting as valuing agents. They conceptualize the hierarchical levels of the social system (e.g., individual, organization, and society) without consideration of the dynamics between levels. In contrast, SESF conceptualizes the social system as a series of actors and the governance system that influences their actions. It considers the social systems to have a multilevel structure and acknowledges the two-way interactions between these levels. Fewer participants manifested an understanding of the social systems. But one participant suggested that:

> We have to think more strategically, as agencies, political government agencies, I think we need to think more strategically society and business to look at the systems using natural capital and ecosystem services, as a system and collective. (Participant 14)

This participant had an embryonic understanding of the social dynamics, noting "don't just look at your business, what are all of the other businesses within your sector? And what about all of the other businesses across sectors that are having the impact?"

Our empirical findings of ES approaches in use supports the theoretical proposition that social systems are less well conceptualized in ES approaches and that in practice less well acknowledged or understood, with only one of our 30 participants explicitly discussing the social systems. The participant acknowledged the multilevel properties of the social system and potential for feedbacks, identifying need for future research to advance SES within corporate environmental sustainability.

4.2.3 | Understanding of interaction and the dynamics between the social and the ecological systems

The ES approaches understand that the social system is impacting on the ecological system without considering the reciprocity of interactions between the two systems unlike the SESF. The majority of the participants did not have firm views on whether the social system impacted the ecological system or whether there is a reciprocity between the two systems; they just considered that there was a connection. Participant 14 noted "how the various systems connect and how people connect to those systems." Participant 6 noted that the use of ES approaches leads for better decision making because of better understanding of the links between social and ecological systems:

> Really difficult to make good decisions about things that are very interlinked, like with, you know, so many of the decisions we have to make are kind of at the intersection of finance and society and the environment [….] it can be really, really complicated. And so, I like the idea of being able to make well informed decisions.

Participant 9 considered that "it's not only important to understand the relationship with your business directly, and the environment, but also indirectly via society." These findings suggest there is an embryonic awareness that the two systems are linked; for example, the social and ecological system are linked; however, practitioner understanding of the whole systems of the organization and nature is limited—this supports the literature on corporate-ecological disconnect. The potential exists through ES approaches to make the impacts of the social system on the ecological systems more prevalent or in the optimum the reciprocity between these two systems. Our findings produce limited evidence that practitioners are thinking or aware of the interaction and dynamics between the two systems.

4.2.4 | Understanding of the equity between the two systems

As there was a limited depth in the awareness of the social and ecological systems interacting, no participants explicitly considered the importance of balance between consideration of the social and ecological systems. This suggests there are limits to practitioner understanding of ES approaches, practitioners are aware the two systems

exists, and that there is an interaction between these systems; however, there is limited consideration of how this new system operates and the equity between these systems. Having presented the empirical results, we will now discuss our findings in relation to the literature on ES approaches in corporate environmental sustainability and SESs from a systems thinking sustainability management perspective.

5 | DISCUSSION

We found that practitioners using ES approaches had an awareness that environmental benefits and impacts were associated with a specific geography and that there is a need to consider temporal and systemic aspects of both the environment and the organization. Our findings resonate with theoretical propositions that ES uses advance knowledge of space and time attributes of nature and provides empirical support for this. Each of these advances is discussed below.

5.1 | Space and physical attributes

Our empirical findings of a greater awareness of the physical attributes of the environment provides empirical evidence advances in sustainability systems theory (Bansal & Knox-Hayes, 2013) and ES in corporate environmental management theory (van den Belt & Blake, 2015). Furthermore, these findings support Whiteman et al. (2013), who argue that a greater awareness of the spatial attributes of the environment raises the awareness of the global nature of environmental problems and the risks as a finite physical object with planetary boundaries. Our empirical findings support this proposition—the participants' awareness of the physicality lead them to be aware of planetary limits of "real environmental thresholds and limits" (Participant 28). This evidence of an awareness of the physicality of nature suggests that ES approaches in corporate environmental sustainability can translate theory into practice and advance the impact and progress on corporate environmental sustainability operating within planetary boundaries.

This is a knowledge gap in the literature linking planetary boundary work with corporate environmental sustainability practice. For example, Whiteman et al. (2013) and Haffar and Searcy (2018) argue that there is little organizational scholarship focusing on the application of environmental thresholds and limits. Haffar and Searcy (2018) highlight that environmental target setting is organization centric in its framing with little recognition for ecological thresholds. Our findings suggest that the use of ES approaches could address this issue as it raises awareness of ecocentric boundaries as ES approaches have a stronger focus on the ecological system compared to other SES.

5.2 | Time

The consideration of time is well established in the corporate environmental sustainability literature but remains a core challenge in corporate practice (Kim et al., 2019; Slawinski & Bansal, 2015). Greater awareness of the dynamism of nature acknowledges that the environment is not static. Whilst impacts and dependencies may be understood at one point in time, they may change over a longer timeframe. This dynamism is difficult to build into corporate environmental management (see Kim et al., 2019). Our findings suggest that there is a greater awareness of both time and space as domains of systems theory (Angyal, 1969; see Emery, 1981). We suggest these are fundamental concepts to advancing sustainability systems theory as the ecological system holds a physicality. Through this physicality, there is an awareness of the finite nature of the physical attribute within the planetary system. This finality raise important issues of planetary boundaries (Haffar & Searcy, 2018; Mace et al., 2014; Whiteman et al., 2013) and time (incorporating intergenerational equality and urgency of action) (Bansal & Knox-Hayes, 2013; Kim et al., 2019; Slawinski & Bansal, 2012). A greater awareness of the temporal attributes of the environment highlights the consequence of not having time, for example, appreciating that half of the world's species has been made extinct through human influence since the 1970s (Brondizio et al., 2019). We suggest that use of ES approaches can highlight the urgency of addressing the unsustainable relationships in the corporate ecological disconnect.

5.3 | System attributes

Our research provides evidence that ES approaches increase systems thinking in corporate environmental sustainability practice. The enhanced systems thinking is important in supporting corporate environmental sustainability, acknowledging it is complex and interventions or changes in any one system (e.g., the organization, the environment, or the organization–environment system) may result in unintended feedbacks and dynamics—potentially creating a system not within planetary boundaries.

Sustainable organizational systems literature (e.g., Williams et al., 2017, 2019) has suggested the potential for advances in corporate sustainability by using ES approaches (Pogutz & Winn, 2016; Winn & Pogutz, 2013) and the importance of embracing SESs thinking (Baudoin & Arenas, 2020), but a gap persists in both of these areas with regard to empirical research (Ahlström et al., 2020). We sought to provide empirical insights into organizational use of ES approaches and its potential contribution to corporate environmental sustainability. Our empirical insights illustrate a raised awareness of the environment and the relationship between the organization and the environment as systems (with limited depth in this understanding). Our research further emphasizes this advance in systems thinking as time and space are the fundamental dimensional attributes in a system (see Emery, 1981), and understanding these dimensional attributes is a foundation to understanding the system attributes.

Next, we delve deeper into these empirical findings using the analysis framework of Table 1 to view the empirical data through the lens of SES theory, analyzing how our findings support or contradict SES theoretical approaches for corporate environmental

sustainability and how this relates to advances in systems thinking for corporate environmental sustainability.

5.4 | ES approaches as they relate to SES theory

With our SES analytic framework, we can understand in more detail how our practitioners understand the social and the ecological systems and their dynamics. Our findings supported the theoretical proposition that ES approaches are ecocentric, and there is an embryonic awareness of the social and ecological system being connected. However, applying our theoretical framework, our empirical findings suggest a number of limitations of ES approaches which hinder the advancement of SESs thinking for sustainable organizations. The limitations are threefold: bias of ES approaches to ecological systems over social systems; limited understanding of the whole system, feedbacks, dynamics, and the nested nature of the social systems within the ecological system; and practitioner knowledge of theory in implementation.

5.4.1 | Ecocentric

The practitioners indicated that ES approaches are ecocentric discussing in detail the ecological system and its framing as opposed to the whole SES. This bias in ES approaches is important for practitioners to be aware of in implementation, in that additional compatible social system approaches are needed for a holistic corporate sustainability strategy. ES approaches should be used in corporate *environmental* sustainability and its ecocentric nature should be understood. This finding contributes to corporate environmental sustainability literature, for example, Haffar and Searcy (2018), who critique target setting in organizations toward planetary boundaries as being too organization centric. Using an ES frame can conceptualize the organization–environment system with a stronger bias toward the ecological system.

The conceptual bias toward ecological systems in ES approaches is not well understood by practitioners. Our empirical findings found limited awareness among our participants of the social systems. All bar one participants were not aware of the multiple levels of the social system or the interactions between these levels. There is no consideration of the governance of the social system in ES approaches (a core component of SESF), and our empirical findings suggest practitioners are not aware of this. This gap resonates with Costanza et al.'s (2014) criticism of ES approaches lacking of consideration of interactions with other systems such as social systems. The ES approaches are a corporate environmental sustainability method with an ecocentric framing. Additional complimentary corporate social sustainability methods should be used in tandem and then consideration how these two methods mesh together to form a new SES. This is theoretically challenging and an SES such as Elinor Ostrom's SESF provides a much stronger platform to consider social and ecological systems. Speaking to the systems literature defining the difference between SESs and social ecological systems, our empirical evidence supports the discussion that ES approaches are SESs (see Berkes, 2017, p. 3), emphasizing the ecological systems over the social system. Further work is needed to advance SES for systems thinking within sustainability management to advance both theory and practice in this area.

5.4.2 | Links between the social and ecological systems

The use of the ES approaches does increase the practitioner knowledge of the interlinkedness of social and ecological systems: there is limited understanding of the complex relationships between the two systems. This decreases the likelihood that practitioners understand that the organization depends upon the ecological system which underpins the society. The interdependence between organizations and the natural environment is central to a systemic sustainability management given that organizations depend on the natural environment for inputs and organizational actions directly impact the natural environment through feedback loops (Starik & Kanashiro, 2013; Williams et al., 2017). Awareness of the bidirectional nature of the interaction between the two systems is not evident among participants. This bidirectionality proposed in Ostrom (2009) is necessary to understand that the organization and ecological system itself creates a new system with feedbacks, dynamics, and gestalt properties. Whilst sustainability systems literature and SES literature have both considered the theoretical implications of this organization–environment system, the use of ES approaches have limited impact on practitioner knowledge of this co-dependency. This suggests that ES approaches may not advance corporate environmental sustainability in practice.

Our findings also suggest that there is limited systems thinking in practice, particularly that social systems are nested within the ecological systems. Whilst some participants acknowledge there may be environmental thresholds and limits, most participants lack a deeper understanding of the embeddedness of social systems within the ecological system or that the social system is dependent on and constrained by the capacity, health, and functioning of the ecological system (see Haffar & Searcy, 2018).

5.4.3 | Implementing theory

The details in the conceptualization of ES approaches as an SES for corporate environmental sustainability are missed by practitioners in implementation. No practitioner stated an awareness that using ES approaches had a stronger focus on the ecological system or the need to consider multiple levels, feedbacks, and dynamics within and across the system. These attributes of ES approaches as an SES in corporate environmental management are fundamental to advance practitioner understanding and progress toward correcting the corporate-ecological disconnect. Furthermore, the lack of detailed understanding offers the potential for ES approaches to be misused and inform decisions with a bias. This would be an interesting research enquiry

exploring how the bias toward the ecological system in this SES influences the decision and outcome in corporate environmental sustainability use.

ES approaches offer both advancements and limitations in corporate environmental sustainability emphasizing the time, space, and systems attributes. Viewed through an SES lens, the limitations of ES approaches are prevalent, highlighting the bias of ES approaches, poor conceptualization of the social systems being nested within the ecological system, and practitioner knowledge of theory.

6 | CONCLUSION

We sought to explore the potential of the ES approaches to advance corporate sustainability by using a systems theory lens. The contributions of our paper are twofold. First, we provide empirical evidence on the use of ES approaches in organizations regarding their contribution to corporate environmental sustainability. Second, we outline how this evidence fits within a theoretical framework aiming to advance systems thinking about SES in organizations.

Our findings suggest that the ES approaches do raise the awareness of the environment as a system, the need to consider the social and the environment as two systems interacting, and the dynamism and physicality of the systems. However, our findings also suggest threefold limitations in ES approaches: the bias of ES approaches to ecological systems over social systems, poor conceptualization of the social systems as being nested within the ecological system, and practitioner knowledge of theory. Our research has improved the understanding of the benefits of the ES approaches and challenges of its implementation by analyzing theoretical SES propositions against empirical evidence of ES practitioners finding the detail on ES conceptualizations can be lost in implementation.

A limitation of our research is that it is based on self-reporting—a longitudinal study to explore the changes that result from the adoption of ES approaches over time would help address the limitation. We also considered ES approaches as a whole. Yet different tools and methods relative to stocks and flows have their own strengths and weaknesses. A critical analysis of specific examples of the existing tools would improve the evidence base to inform the "how" to implement ES approaches as an SES to inform corporate sustainability. Research could consider the use of ES approaches at the individual, organization, societal, and global level to provide more insight into levels of organizational change that occurs due to ES approach use. Furthermore, research exploring how the bias toward the ecological system in this SES influences the decision and outcome could advance corporate environmental sustainability both in theory and in practice.

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REFERENCES

Aguilera, R. V., Rupp, D. E., Williams, C. A., & Ganapathi, J. (2007). Putting the S back in corporate social responsibility: A multilevel theory of social change in organizations. *Academy of Management Review*, *32*(3), 836–863.

Ahlström, H., Williams, A., & Vildåsen, S. S. (2020). Enhancing systems thinking in corporate sustainability through a transdisciplinary research process. *Journal of Cleaner Production*, *256*, 120691. https://doi.org/10.1016/j.jclepro.2020.120691

Anderies, J. M., Janssen, M. A., & Ostrom, E. (2004). A framework to analyze the robustness of social-ecological systems from an institutional perspective. *Ecology and Society*, *9*(1), 18. https://doi.org/10.5751/ES-00610-090118

Anderson, V., & Johnson, L. (1997). *Systems thinking basics*. Cambridge, MA: Pegasus Communications.

Angyal, A. (1969). A logic of systems, reprinted in Emery, FE Systems Thinking. Harmondsworth Penguin.

Atkins, J., Gräbsch, C., & Jones, M. (2014). *Corporate biodiversity reporting* (pp. 215–244). Routledge, London: Accounting for Biodiversity.

Bansal, P., & Knox-Hayes, J. (2013). The time and space of materiality in organizations and the natural environment. *Organization & Environment*, *26*(1), 61–82. https://doi.org/10.1177/1086026612475069

Baudoin, L., & Arenas, D. (2020). From raindrops to a common stream: Using the social-ecological systems framework for research on sustainable water management. *Organization & Environment*, *33*(1), 126–148. https://doi.org/10.1177/1086026618794376

Berkes, F. (2017). Environmental governance for the anthropocene? Social-ecological systems, resilience, and collaborative learning. *Sustainability*, *9*(7), 1232. https://doi.org/10.3390/su9071232

Biggs, R., de Vos, A., Preiser, R., Clements, H., Maciejewski, K., & Schlüter, M. (2021). *The Routledge handbook of research methods for social-ecological systems*. Taylor & Francis. https://doi.org/10.4324/9781003021339

Binder, C. R., Hinkel, J., Bots, P. W. G., & Pahl-Wostl, C. (2013). Comparison of frameworks for analyzing social-ecological systems. *Ecology and Society*, *18*(4), 26. https://doi.org/10.5751/ES-05551-180426

Boiral, O., Heras-Saizarbitoria, I., & Brotherton, M. (2018). Corporate biodiversity management through certifiable standards. *Business Strategy and the Environment*, *27*(3), 389–402. https://doi.org/10.1002/bse.2005

Boiral, O., Heras-Saizarbitoria, I., & Brotherton, M. (2019). Improving corporate biodiversity management through employee involvement. *Business Strategy and the Environment.*, *28*, 688–698. https://doi.org/10.1002/bse.2273

Bouamrane, M., Spierenburg, M., Agrawal, A., Boureima, A., Cormier-Salem, M.-C., Etienne, M., le Page, C., Levrel, H., & Mathevet, R. (2016). Stakeholder engagement and biodiversity conservation challenges in social-ecological systems: Some insights from biosphere reserves in western Africa and France. *Ecology and Society*, *21*(4), 25. https://doi.org/10.5751/ES-08812-210425

Brondizio, E. S., Settele, J., Díaz, S., & Ngo, H. T. (2019). Global Assessment on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Service.

CBD. (1992). Convention on Biological Diversity. CBD. https://www.cbd.int/convention/articles/?a=cbd-02

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Sage.

Colding, J., & Barthel, S. (2019). Exploring the social-ecological systems discourse 20 years later. *Ecology and Society*, *24*(1), 2. https://doi.org/10.5751/ES-10598-240102

Costanza, R. (1989). What is ecological economics? *Ecological Economics*, *1*(1), 1–7. https://doi.org/10.1016/0921-8009(89)90020-7

Costanza, R., & Daly, H. E. (1992). Natural capital and sustainable development. *Conservation Biology*, *6*(1), 37–46. https://doi.org/10.1046/j.1523-1739.1992.610037.x

Costanza, R., de Groot, R., Braat, L., Kubiszewski, I., Fioramonti, L., Sutton, P., Farber, S., & Grasso, M. (2017). Twenty years of ecosystem services: How far have we come and how far do we still need to go? *Ecosystem Services*, *28*, 1–16. https://doi.org/10.1016/j.ecoser.2017.09.008

Costanza, R., de Groot, R., Sutton, P., van der Ploeg, S., Anderson, S. J., Kubiszewski, I., Farber, S., & Turner, R. K. (2014). Changes in the global value of ecosystem services. *Global Environmental Change*, *26*, 152–158. https://doi.org/10.1016/j.gloenvcha.2014.04.002

Creswell, J. W., Plano Clark, V. L., Gutmann, M. L., & Hanson, W. E. (2007). Advanced mixed methods research designs. *Handbook of Mixed Methods in Social and Behavioral Research* (pp. 209–240).

Cuckston, T. (2018). Making extinction calculable. *Accounting, Auditing & Accountability Journal*, *31*, 849–874. https://doi.org/10.1108/AAAJ-10-2015-2264

Cuckston, T. (2019). Seeking an ecologically defensible calculation of net loss/gain of biodiversity. *Accounting, Auditing & Accountability Journal*, *32*, 1358–1383. https://doi.org/10.1108/AAAJ-01-2018-3339

D'Amato, D., Wan, M., Li, N., Rekola, M., & Toppinen, A. (2018). Managerial views of corporate impacts and dependencies on ecosystem services: A case of international and domestic forestry companies in China. *Journal of Business Ethics*, *150*(4), 1011–1028. https://doi.org/10.1007/s10551-016-3169-8

Emery, F. E. (1981). *Systems thinking: Selected readings*. Penguin Books.

Etzion, D. (2007). Research on organizations and the natural environment, 1992-present: A review. *Journal of Management*, *33*(4), 637–664. https://doi.org/10.1177/0149206307302553

Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change*, *16*(3), 253–267. https://doi.org/10.1016/j.gloenvcha.2006.04.002

Folke, C., Berkes, F., & Colding, J. (1998). Ecological practices and social mechanisms for building resilience and sustainability. In *Linking social and ecological systems: Management practices and social mechanisms for building resilience* (pp. 414–436). Cambridge University Press.

Gamarra, M. J. C., Lassoie, J. P., & Milder, J. (2018). Accounting for no net loss: A critical assessment of biodiversity offsetting metrics and methods. *Journal of Environmental Management*, *220*, 36–43. https://doi.org/10.1016/j.jenvman.2018.05.008

Gray, R. (2010). Is accounting for sustainability actually accounting for sustainability … and how would we know? An exploration of narratives of organisations and the planet. *Accounting, Organizations and Society*, *35*(1), 47–62. https://doi.org/10.1016/j.aos.2009.04.006

Griggs, D., Stafford Smith, M., Rockström, J., Öhman, M. C., Gaffney, O., Glaser, G., Kanie, N., Noble, I., Steffen, W., & Shyamsundar, P. (2014). An integrated framework for sustainable development goals. *Ecology and Society*, *19*, 49. https://doi.org/10.5751/ES-07082-190449

Haffar, M., & Searcy, C. (2018). Target-setting for ecological resilience: Are companies setting environmental sustainability targets in line with planetary thresholds? *Business Strategy and the Environment*, *27*(7), 1079–1092. https://doi.org/10.1002/bse.2053

Hahn, T., Figge, F., Aragón-Correa, J. A., & Sharma, S. (2017). Advancing research on corporate sustainability: Off to pastures new or back to the roots? *Business & Society*, *56*(2), 155–185. https://doi.org/10.1177/0007650315576152

Hahn, T., Pinkse, J., Preuss, L., & Figge, F. (2015). Tensions in corporate sustainability: Towards an integrative framework. *Journal of Business Ethics*, *127*(2), 297–316. https://doi.org/10.1007/s10551-014-2047-5

Hoffman, A. J., & Georg, S. (2018). *Business and the natural environment: A research overview*. Routledge Focus. https://doi.org/10.4324/9781351238946

Hoffman, A. J., & Jennings, P. D. (2015). Institutional theory and the natural environment: Research in (and on) the Anthropocene. *Organization & Environment*, *28*(1), 8–31. https://doi.org/10.1177/1086026615575331

Hoffman, A. J., & Jennings, P. D. (2021). Institutional-political scenarios for Anthropocene society. *Business & Society*, *60*(1), 57–94. https://doi.org/10.1177/0007650318816468

Holling, C. S. (2001). Understanding the complexity of economic, ecological, and social systems. *Ecosystems*, *4*(5), 390–405. https://doi.org/10.1007/s10021-001-0101-5

Jansson, A. (1994). *Investing in natural capital: The ecological economics approach to sustainability*. Island Press.

Jones, M. J., & Solomon, J. F. (2013). Problematising accounting for biodiversity. *Accounting, Auditing & Accountability Journal*, *26*, 668–687. https://doi.org/10.1108/AAAJ-03-2013-1255

Katz, D., & Kahn, R. L. (1978). *The social psychology of organizations* (Vol. 2). New York: Wiley.

Kim, A., Bansal, P., & Haugh, H. (2019). No time like the present: How a present time perspective can foster sustainable development. *Academy of Management Journal*, *62*(2), 607–634. https://doi.org/10.5465/amj.2015.1295

Mace, G. M., Reyers, B., Alkemade, R., Biggs, R., Chapin, F. S. III, Cornell, S. E., Mumby, P. J., Purvis, A., Scholes, R. J., Seddon, A. W. R., Solan, M., Steffen, S., & Woodward, G. (2014). Approaches to defining a planetary boundary for biodiversity. *Global Environmental Change*, *28*, 289–297. https://doi.org/10.1016/j.gloenvcha.2014.07.009

Maon, F., Lindgreen, A., & Swaen, V. (2008). Thinking of the organization as a system: The role of managerial perceptions in developing a corporate social responsibility strategic agenda. *Systems Research and Behavioral Science*, *25*(3), 413–426. https://doi.org/10.1002/sres.900

Merali, Y., & Allen, P. (2011). Complexity and systems thinking. In *The SAGE handbook of complexity and management* (pp. 31–52). Sage Publications.

Mingers, J., & White, L. (2010). A review of the recent contribution of systems thinking to operational research and management science. *European Journal of Operational Research*, *207*(3), 1147–1161. https://doi.org/10.1016/j.ejor.2009.12.019

Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. *Science*, *325*(5939), 419–422. https://doi.org/10.1126/science.1172133

Pogutz, S., & Winn, M. I. (2016). Cultivating ecological knowledge for corporate sustainability: Barilla's innovative approach to sustainable farming. *Business Strategy and the Environment*, *25*(6), 435–448. https://doi.org/10.1002/bse.1916

Potschin, M., & Haines-Young, R. (2016). Defining and measuring ecosystem services. In M. Potschin, R. Haines-Young, R. Fish, & R. K. Turner (Eds.), *Routledge handbook of ecosystem services* (pp. 25–44). London and New York: Routledge.

Pratt, J., Gordon, P., & Plamping, D. (2005). *Working whole systems: Putting theory into practice in organisations*. Radcliffe Publishing.

Quintas-Soriano, C., Brandt, J. S., Running, K., Baxter, C. V., Gibson, D. M., Narducci, J., & Castro, A. J. (2018). Social-ecological systems influence ecosystem service perception. *Ecology and Society*, *23*(3), 3. https://doi.org/10.5751/ES-10226-230303

Roberts, L., Hassan, A., Elamer, A., & Nandy, M. (2021). Biodiversity and extinction accounting for sustainable development: A systematic literature review and future research directions. *Business Strategy and the Environment*, *30*(1), 705–720. https://doi.org/10.1002/bse.2649

Schaltegger, S., & Beständig, U. (2010). *Corporate biodiversity management handbook. A guide for practical implementation*. Berlin: Federal Ministry

for the Environment and Nuclear Safety (BMBF) (Ed.), GTZ, & CSM-Leuphana University Lüneburg.

Senge, P. (1990). *The fifth discipline: The art and science of the learning organization*. New York: Currency Doubleday.

Siddiqui, J. (2013). Mainstreaming biodiversity accounting: Potential implications for a developing economy. *Accounting, Auditing & Accountability Journal*, *26*, 779–805.

Skouloudis, A., Malesios, C., & Dimitrakopoulos, P. G. (2019). Corporate biodiversity accounting and reporting in mega-diverse countries: An examination of indicators disclosed in sustainability reports. *Ecological Indicators*, *98*, 888–901. https://doi.org/10.1016/j.ecolind.2018.11.060

Slawinski, N., & Bansal, P. (2012). A matter of time: The temporal perspectives of organizational responses to climate change. *Organization Studies*, *33*(11), 1537–1563. https://doi.org/10.1177/0170840612463319

Slawinski, N., & Bansal, P. (2015). Short on time: Intertemporal tensions in business sustainability. *Organization Science*, *26*(2), 531–549. https://doi.org/10.1287/orsc.2014.0960

Small, A., Owen, A., & Paavola, J. (In Press). Multi-level Natural Capital Implementation Within Planetary Boundaries, Business Strategy and Environment.

Starik, M., & Kanashiro, P. (2013). Toward a theory of sustainability management: Uncovering and integrating the nearly obvious. *Organization & Environment*, *26*(1), 7–30. https://doi.org/10.1177/1086026612474958

Starik, M., & Kanashiro, P. (2020). Advancing a multi-level sustainability management theory. In *Sustainability*. Emerald Publishing Limited. https://doi.org/10.1108/S2514-175920200000004003

Starik, M., & Rands, G. P. (1995). Weaving an integrated web: Multilevel and multisystem perspectives of ecologically sustainable organizations. *Academy of Management Review*, *20*(4), 908–935. https://doi.org/10.5465/amr.1995.9512280025

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., de Vries, W., de Wit, C. A., Folke, C., Gerten, D., Heinke, J., Mace, G. M., Persson, L. M., Ramanathan, V., Reyers, B., & Sörlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science*, *347*(6223), 1259855. https://doi.org/10.1126/science.1259855

Sukhdev, P. (2012). *Corporation 2020: Transforming business for tomorrow's world*. Island Press.

Sukhdev, W., Schröter-Schlaack, H., Nesshöver, C., Bishop, C., & Brink, J. (2010). *The economics of ecosystems and biodiversity: Mainstreaming the economics of nature: A synthesis of the approach, conclusions and recommendations of TEEB*. Ginebra (Suiza): UNEP.

Thompson, B. S. (2019). Payments for ecosystem services and corporate social responsibility: Perspectives on sustainable production, stakeholder relations, and philanthropy in Thailand. *Business Strategy and the Environment*, *28*(4), 497–511. https://doi.org/10.1002/bse.2260

Tracy, S. J. (2012). *Qualitative research methods: Collecting evidence, crafting analysis, communicating impact*. John Wiley & Sons.

Tregidga, H. (2013). Biodiversity offsetting: Problematisation of an emerging governance regime. *Accounting, Auditing & Accountability Journal*, *26*, 806–832.

Trist, E., & Emery, F. (1973). *Towards a social ecology*. New York: Plenum.

van den Belt, M., & Blake, D. (2015). Investing in natural capital and getting returns: An ecosystem service approach. *Business Strategy and the Environment*, *24*(7), 667–677. https://doi.org/10.1002/bse.1895

Vihervaara, P., Kumpula, T., Tanskanen, A., & Burkhard, B. (2010). Ecosystem services—A tool for sustainable management of human–environment systems. Case study Finnish Forest Lapland. *Ecological Complexity*, *7*(3), 410–420. https://doi.org/10.1016/j.ecocom.2009.12.002

Von Bertalanffy, L. (1972). The history and status of general systems theory. *Academy of Management Journal*, *15*(4), 407–426.

Weinberg, G. M. (1975). *An introduction to general systems thinking*. New York: Wiley.

Welford, R. (2016). *Corporate environmental management 1: Systems and strategies*. Routledge. https://doi.org/10.4324/9781315825120

Whiteman, G., Walker, B., & Perego, P. (2013). Planetary boundaries: Ecological foundations for corporate sustainability. *Journal of Management Studies*, *50*(2), 307–336. https://doi.org/10.1111/j.1467-6486.2012.01073.x

Williams, A., Kennedy, S., Philipp, F., & Whiteman, G. (2017). Systems thinking: A review of sustainability management research. *Journal of Cleaner Production*, *148*, 866–881. https://doi.org/10.1016/j.jclepro.2017.02.002

Williams, A., Whiteman, G., & Kennedy, S. (2019). Cross-scale systemic resilience: Implications for organization studies. *Business & Society*, *60*, 95–124.

Winn, M. I., & Pogutz, S. (2013). Business, ecosystems, and biodiversity: New horizons for management research. *Organization & Environment*, *26*(2), 203–229. https://doi.org/10.1177/1086026613490173

Wood, D. J. (2010). Measuring corporate social performance: A review. *International Journal of Management Reviews*, *12*(1), 50–84. https://doi.org/10.1111/j.1468-2370.2009.00274.x

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