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# Private Governance of Biodiversity and Ecosystem Services: Findings From Nordic Forest Companies

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This study examines the role of business organizations in co-governing biodiversity and ecosystem services (BES) using a phenomenon-based approach and bridging business management literature, ecosystem services literature and environmental governance literature. The empirical analysis includes twelve Nordic forest corporations considered market leaders in Finland, Sweden and Norway. Using content analysis of corporate sustainability reports and managerial interviews, we recorded 127 company-led measures addressing BES and we categorized them into seventeen types (e.g., land use planning and restoration, mobilization of financial resources for conservation, partner auditing, capacity building and consultation with stakeholders). For each BES measure, we also identified the BES issues being addressed (e.g., climate regulation, soil maintenance, cultural values); company motivation (i.e., compliance, strategic, profit-seeking); the stakeholders/beneficiaries involved (e.g., employees, forest owners, experts, local communities, public administration, NGOs); and the private governance instruments used for implementing the measure (i.e., regulatory, economic, information and rights-based instruments). The findings suggest that practices such as monetary valuation, biodiversity offsets and green bonds are emerging as profitable or strategically interesting options for Nordic forest companies. However, well-established practices, such as forest inventory, partner auditing and land sparing, continue to be the backbone of private BES governance among the leading companies examined. Although not directly motivated by compliance, private governance measures are largely nested in legislation. The contribution of this study includes reflections of relevance for both the scholarly and managerial realms. From a scholarly perspective, we further elaborate an understanding of BES management and governance from an organizational perspective. From a managerial perspective, we provide and discuss an overview of potential measures that forest companies can implement to address biodiversity and other socio-ecological issues at the land-use level.

**Keywords:** extended governance, corporate social responsibility, green economy, natural capital, strategic management, sustainability transformations

## INTRODUCTION

In our largely neoliberal world, corporations are increasingly relied upon, for better or worse, to govern public goods, such as biodiversity and ecosystem services (BES), among other sustainability issues. Through their value chains, business organizations have profound and global impacts and depend greatly on ecological systems, especially in land-use intensive sectors (Starik and Kanashiro, 2013; Winn and Pogutz, 2013). In principle, they can potentially contribute to addressing globally interlinked ecological and social challenges, such as biodiversity loss and ecosystem degradation, climate change, disruption of biogeochemical flows, freshwater scarcity and ocean acidification, prosperity, health, justice and equity (Folke et al., 2019).

Private-sector involvement in the co-governance of socio-ecological challenges has been called for at the political level (e.g., the UN Rio+20 and Agenda 2030 processes) and even by a number of scholars (e.g., Whiteman et al., 2013; Addison et al., 2018; Barbier et al., 2018). Simultaneously, BES and broader sustainability issues are becoming increasingly relevant for companies, especially resource-intensive ones such as the forest sector, in their efforts at managing multi-faceted risks and opportunities (TEEB, 2012; Winn and Pogutz, 2013). The knowledge and strategies for addressing BES issues are often held tacitly at the corporate managerial level (Jones and Solomon, 2013; Overbeek et al., 2013; D'Amato et al., 2018), although multi-stakeholder platforms exist to foster voluntary capacity building and disclosure (e.g., the Natural Capital Protocol, Carbon Disclosure Project and Task Force on Nature-related Financial Disclosures).

As governance capacity and responsibility shift from governments to corporations, it is becoming increasingly important to analyze private governance and the extent to which it supports and is interlinked with public governance. Knowledge on these issues is, for example, relevant for forthcoming European policies on corporate disclosure, such as the EU taxonomy for sustainable activities and Corporate Sustainability Reporting Directive.

As an emerging phenomenon, the role of business in acknowledging, managing and co-governing biodiversity loss and ecosystem degradation is to be explored at the interdisciplinary junction between business management literature, ecosystem services literature and environmental governance literature. With respect to the scholarly and gray literature on business sustainability and business management, a small cohort of foundational pieces has valuably described a range of company measures for managing biodiversity-related issues (e.g., Schaltegger and Beständig, 2010; Houdet et al., 2012; Boiral and Heras-Saizarbitoria, 2017a,b; Macellari et al., 2018), but this remains overall a scarcely investigated area of research (Hahn et al., 2017). Research on ecosystem services has largely overlooked organizational perspectives (as reported by van den Belt and Stevens, 2016), despite consistently highlighting the need to expand environmental governance beyond mere public policy and involve private and civil society actors. Additional developments in understanding how business actors

respond to BES issues in the context of extended governance can be produced using a phenomenon-based approach. By leveraging such an approach, this manuscript attempts to bridge interdisciplinary divides rather than provide a theoretical, intra-disciplinary contribution (von Krogh et al., 2012).

Based on these premises, we address five interdisciplinary research gaps. First, there is a need to further confirm and reinforce available analyses that have produced different lists or categories of BES measures implemented by companies [see Section BES Measures (RQa)]. Second, the available literature often analyses biodiversity measures without recognizing the more extensive set of biodiversity-dependent ecosystem services [see Section BES Issues (RQb)]. Third, little investigation has been done on company motives for engaging with BES measures [see Section Governance Instruments (RQe)]. Fourth, further insights are necessary on the role of company stakeholders as actors participating in implementing BES measures [see Section Company Motivations (RQc)]. Fifth, no analysis was published, to our knowledge, on the type of private governance instruments that companies engage their stakeholders with to implement BES measures and how such instruments relate to public governance issues [see Section Company Stakeholders (RQd)].

The forest sector represents an interesting backdrop for addressing these research gaps because companies operating in land-use intensive sectors have consistently been at the center of important local and global legitimacy issues regarding land and stakeholder management (Li and Toppinen, 2011; Boiral and Heras-Saizarbitoria, 2017b). The high level of corporate sustainability performance in the Nordic countries (Strand et al., 2015) provides further impetus for specifically focusing on this sector. We examine the role of Nordic forest companies in the management and co-governance of BES. Our research questions (RQ) mirror the identified gaps, and, as noted by Boiral and Heras-Saizarbitoria (2017c, p. 404), they “are inextricably linked and can hardly be analyzed in isolation”.

- a) What kind of BES measures do Nordic forest companies engage with?
- b) What are the targeted BES issues?
- c) What are the underlying company motives for engaging with BES measures?
- d) What kind of stakeholders are involved in implementing BES measures?
- e) What private governance instruments are used by the companies to implement BES measures in the context of their value chain environment?

While empirical findings from the qualitative research cannot be generalized beyond the Nordic forest sector, in the conceptual background and in the discussion we open up on the interdisciplinary phenomenon of corporate-led management and governance of BES. In particular, the novelty of this manuscript is the investigation of BES management and governance from an organizational perspective, also considering the value chain environment of companies. This is of particular relevance in light of the increasing emphasis placed in research and policy-making worldwide on organizations as central actors driving

sustainability, and the relative paucity of scientific research on the overall topic of organizational change management for sustainability (Lozano and Garcia, 2020). The conclusions highlight the implications for company managers, practitioners and scholars working in the context of business sustainability and extended governance.

## CONCEPTUAL BACKGROUND

To address our research questions (a-e), we use a framework (Section The Overall Framework) comprised of five components. Each component is respectively described in Sections BES measures (RQa), BES issues (RQb), Company motivations (RQc), Company stakeholders (RQd), and Governance instruments (RQe).

### BES Measures (RQa)

We refer to BES measures as company-led actions (whether mandatory or voluntary) addressing the management of BES. They have been referred to as “company practices”, “activities” or “actions” (e.g., Sloomweg, 2005; Boiral and Heras-Saizarbitoria, 2017c; Wolff et al., 2018). For example, Hickey et al. (2005) developed a checklist for sustainable forest management based on corporate disclosure material, highlighting four macro-areas: adaptive management, planning and inventory; forest environment and ecosystem protection; harvesting and inspection; and social and economic dimensions of forestry. Through content analysis of corporate reports, Boiral and Heras-Saizarbitoria (2017a) identified a number of biodiversity measures in mining and forest companies (e.g., programs for public awareness and education, donations and sponsorships, restoration and site rehabilitation). Wolff et al. (2018) identified almost 500 biodiversity-oriented practices based on corporate commitments to the French National Biodiversity Strategy and Action Plan; they included direct mitigation of biodiversity loss (e.g., impact avoidance, restoration, offset) and more indirect activities (awareness, communication, involvement in institutional policy processes). D'Amato et al. (2018) developed a framework for company assessment of and response to impacts/dependences on ecosystem services (e.g., mandatory instruments like the Environmental Impact Assessment and voluntary instruments like buffer zones, certification and carbon accounting). Based on company interviews, Macellari et al. (2018) also identified and discussed examples of BES measures, including inventories and monitoring, reintroducing native species and reforestation and deliberative landscape planning.

### BES Issues (RQb)

Since the Millennium Ecosystem Assessment (MA, 2005), the ecosystem services concept has gained increasing popularity (Costanza et al., 2017; Droste et al., 2018), not only in academia and policy-making but also in the corporate realms (TEEB, 2012; WBCSD, 2013; Natural Capital Coalition, 2016). The concept highlights the often-undervalued relevance of natural and semi-natural systems for social and economic wellbeing. Ecosystem services are local and global ecological processes enabled by biological diversity, which are considered useful for human

beings. They include, inter alia, provision of food, fibers and clean water; regulation of climate, nutrient flows and hydrogeology, pollination, natural hazards, diseases and pests; and contribution to cultural aspects of human life, such as recreation and tourism, spiritual experiences, education and science (MA, 2005). By fulfilling various tangible and intangible human needs, ecosystem services constitute an important, yet largely underestimated, enabler of human physical and psychological wellbeing both at the individual and the societal level. The available literature examining company-led measures related to ecological health have often focused on biodiversity (e.g., Sloomweg, 2005; Boiral and Heras-Saizarbitoria, 2017a,b,c; Wolff et al., 2018), with fewer studies examining a broader range of ecosystem services (e.g., Houdet et al., 2012; Macellari et al., 2018).

### Company Motivations (RQc)

The strategic management literature suggests that corporate sustainability, including BES issues, has become a crucial and timely issue for companies (Li and Toppinen, 2011; Aguinis and Glavas, 2012). The main rationales proposed for business engagement with sustainability measures include complying with or anticipating regulations, reducing costs and risks, acquiring competitive advantage, co-creating shared value with stakeholders and improving legitimacy at the local and broader level (Kurucz et al., 2009; Carroll and Shabana, 2010). In the specific context of BES management, company risks and opportunities have been categorized as follows: preventing and mitigating the effects of regulations or reputational damage (i.e., legitimacy, license to operate); improving organizational resilience; securing material resources and continuity of operations; and attracting sustainability-driven customers and financiers (TEEB, 2012; WBCSD, 2013). Similarly, Boiral and Heras-Saizarbitoria (2017b) suggest that the main drivers of corporate commitment to biodiversity include ethical concerns, improved stakeholder relations, economic opportunities, and compliance with legal or other requirements.

### Company Stakeholders (RQd)

Sustainability concerns are managed by business organizations in relation to a broad spectrum of stakeholders, defined as actors who influence, or are influenced by, the company. Stakeholders are traditionally categorized in the business literature as internal stakeholders (e.g., shareholders, employees, suppliers, managers, investors) and external stakeholders (e.g., local communities, political groups, civil society/NGOs, regulators and decision-makers, universities and research institutes, trade unions and media) (Freeman et al., 2004). Boiral and Heras-Saizarbitoria (2017a,c) identified a number of internal and external stakeholders relevant to the management of biodiversity issues, mainly NGOs, experts and scientists, public authorities, local communities, coalitions and industrial associations. In analyzing biodiversity-oriented commitment measures adopted by French companies, Wolff et al. (2018) identified stakeholders as actors in the value chain (e.g., suppliers, clients, partners), in the territorial system (e.g., local communities, experts) and in the institutional system (e.g., public institutions, NGOs, academic institutions and professional associations). Moreover, the authors



categorized stakeholders as either executors, supporters or targets of the biodiversity-oriented measures. The distinction between internal and external stakeholders can be blurry (Vos, 2003). For instance, forest owners are considered internal stakeholders if they are key suppliers or an important part of company ownership; they may otherwise be considered external stakeholders.

## Governance Instruments (RQe)

In private governance, the company can be understood as the main agent imposing/encouraging BES measures through a series of instruments. The company is governed by legislation, but it in turn attempts to govern itself and other actors in the whole value chain. This results in a nested framework in which private governance is embedded in and operates within the context of public policy (Marshall, 2007). In **Table 1**, we used the public policy instruments framework used by the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES, 2018) and we modified it by adding the corresponding private governance instruments, as well as a description of the relation between public and private governance. The framework consists of four types of instruments: legal and regulatory, economic and financial, social and information-based, and rights-based approaches.

Legal and regulatory instruments, in the context of private governance, can be interpreted as self-developed instruments, such as prohibitions, regulations, assessments or planning, as well as the voluntary granting of resource or land access rights to third parties (e.g., recreational hunting, fishing, ecotourism)<sup>1</sup>. The development of these instruments may be underpinned by the need to comply with or operationalize already existing government regulations and/or to respond to societal expectations and pressures from NGOs or other external stakeholders<sup>2</sup>. Companies may further impose their own internal standards, e.g., refusing unsustainably-sourced wood, on other stakeholders, such as suppliers and forest owners (Keskitalo and Liljenfeldt, 2014).

Economic and financial instruments implemented by companies are incentives to nudge or support more sustainable behavior among stakeholders, such as payments for ecosystem services (PES), offsetting/compensation schemes (e.g., carbon or habitat/biodiversity offsets), and green bonds issued to fund a company's own "green" activities. Forest companies are usually on the receiving end in such incentive schemes, but they can also provide monetary incentives to other stakeholders. Incentives may include, for example, paying a price premium to private the Forest Stewardship Council (FSC)-certified forest owners, suppliers and contractors who adopt similar practices or providing financial or other types of material support to third parties for conservation or innovation projects.

<sup>1</sup>Should hunting and fishing permits be negotiated and granted to indigenous or other communities on the basis of rights and claims, and not just business relations, this would be classified as rights-based instruments.

<sup>2</sup>For instance, forest regeneration is required by law in Sweden, Finland and Norway. While companies are obliged to comply, they may set their own standards on how this is achieved, including additional reforestation targets than just those they must respect by law.

Social and information-based instruments used by the companies to manage BES issues include processes such as certification, stakeholder agreements, capacity-building, education and deliberative decision-making. Such collaborative instruments aim to transform a company's own behavior or the behavior of other actors to achieve more desirable outcomes. For instance, companies may develop, negotiate and foster forest certification through dialogues with independent certification agencies (Boiral and Heras-Saizarbitoria, 2017a). They may also cooperate with national agencies or municipalities to improve recreation opportunities.

Finally, rights-based approaches and customary norms include dialogue and planning with specific stakeholder groups, for instance indigenous people like the Sámi in the Nordic countries and other local communities, while respecting customary rights or other claims. The FSC requires more extensive consultation over rights than what is legally mandatory for Nordic forest companies.

## The Overall Framework

The framework that results by combining the elements described in Sections BES Measures (RQa), BES Issues (RQb), Company Motivations (RQc), Company Stakeholders (RQd), and Governance Instruments (RQe) can be used to conceptualize and study private governance of BES in the context of our study (**Table 2**).

## METHODS

In Section Nordic Forests and the Forest Sector, we provide a concise overview of forestry and the forest sector in the Nordic countries. Details about the data collection process and analysis are described in Sections Data Collection and Analysis, respectively. For this study, we undertook an in-depth content analysis on two sources of data (**Figure 1**). First, information was extracted from the corporate reports of select Nordic companies (step 1) to identify all the BES initiatives, relevant stakeholders and instruments for their implementation. Second, interviews were conducted with company managers to validate the data and fill any eventual gaps; in addition, we inquired into the company motivations for adopting BES measures (step 2). Company reports and interview material were analyzed qualitatively, iteratively and abductively.

## Nordic Forests and the Forest Sector

Forests (largely coniferous) cover more than 50% of surface area in Finland and Sweden, and more than 30% in Norway. Aging and urbanized private smallholder forest ownership is typical (Kettunen et al., 2012). The countries are unique in Europe for guaranteeing "everyman's right" to access (even privately owned) land and extract resources other than timber, fish and game (Nichiforel et al., 2018). Such a legislative framework supports berry and mushroom picking and outdoor recreation activities, and it creates diverse claims by several stakeholders. Another unique feature is the presence of the indigenous Sámi people in the northern parts of the three countries. Reindeer husbandry, a

**TABLE 1** | Public policy instruments translated into instruments for private governance of BES (own elaboration, adapted from IPBES, 2018).

Public policy macro-categories and instruments (IPBES, 2018)		Corresponding private governance instruments	Relation between public and private governance
Legal and regulatory instruments	Ensure property and access rights	Within its own land, a company grants or sells access or resource use rights to third parties.	Company voluntarily re-allocates land/resource rights, determined by the public policy framework, to third parties.
	Standards and regulations	Company develops rules or quality standards for self-regulation.	Company rules or quality standards are established in compliance with, and in addition to, legal requirements.
	Land planning, including, e.g., protected areas	Company performs spatial planning or allocates set-asides.	Company land planning is in compliance with, and in addition to, legal requirements.
Economic and financial instruments	Reward desirable socio-economic measures	Company engages in payments for ecosystem services or offsetting schemes, as either buyer or seller.	Governmental agencies may set the legal and practical framework for biodiversity offsets and compensation schemes. Participation by the company as buyer or seller can be mandatory or voluntary (albeit encouraged by societal pressures), according to the country and ecosystem service of interest.
	Secure conservation financing	Company provides financial support (on a philanthropic or profit-oriented basis), such as grants or green bonds for its own projects or third parties.	Financial support provided by the company to third parties is generally done on a philanthropic basis. Both public and private investors can buy green bonds, supporting the company's sustainable investments.
	Foster technological/social innovation	Company provides R&D or other kinds of "innovation" support to third parties.	Projects can be co-financed by public and private entities. Generally, participation is voluntary (albeit it may be encouraged by societal pressures).
Social and information-based instruments	Promote eco-labeling and certification	Company adopts certification schemes and promotes them among forest owners, suppliers and contractors.	Certification is voluntary and often driven by market forces (e.g., social concerns for biodiversity and indigenous peoples).
	Promote agreements and partnerships	Company establishes agreements and partnerships with societal groups, e.g., partners, NGOs, local communities.	Formal relations with various actor groups are established on a mutual voluntary basis (often largely driven by societal pressures), exceeding legal requirements.
	Promote public participation and collaboration	Company engages in participation and collaboration with societal groups, e.g., partners, NGOs, local communities.	Informal relations with various actor groups are established on a mutual voluntary basis.
	Support desirable social norms and lifestyles	Internal value-based leadership.	Education, training and capacity-building. Integrated reporting and adoption of internationally relevant reporting and disclosure guidelines.
Rights-based approaches and customary norms	Strengthen use of indigenous and local knowledge practices	Matching of its own land-use plans with indigenous land-use plans (e.g., reindeer grazing plans by Sámi).	Company decisions on land use and management plans are adapted to ensure synergies and minimize trade-offs (e.g., with reindeer grazing needs of Sámi people).
	Promote recognition of the needs of indigenous people and local communities	Regular dialogues with indigenous communities.	Consultation before final felling is required by law, and some certification schemes reinforce this requirement.

key part of Sámi culture and livelihood, is practiced on 30–40% of the land in each country (Kettunen et al., 2012).

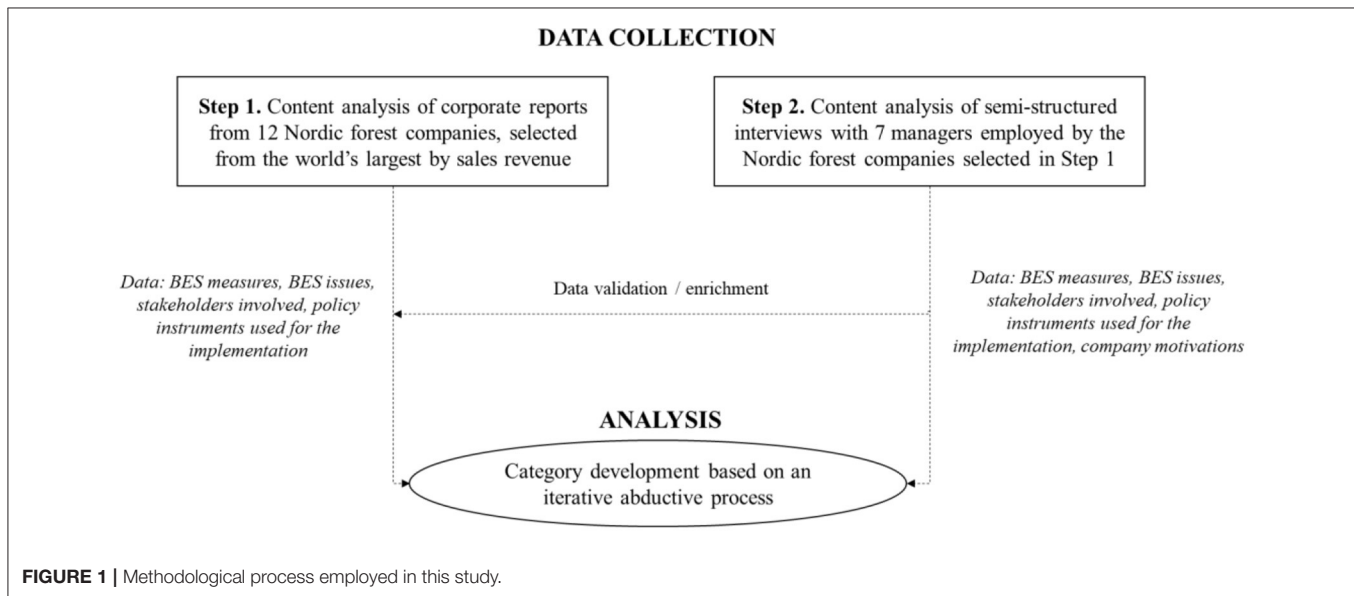
The use of forests for economic purposes has historically been an important part of the Nordic culture and economy. In 2016, Sweden and Finland accounted for 30% of all roundwood production among the EU28 (Eurostat, 2020). Even-aged management with clear-cutting is a common practice in all three countries, with considerable impacts on biodiversity and ecosystem services (Savilaakso et al., 2019).

In the past decade, there has been an increasing need for sectoral renewal. Economic and sustainability strategies at the EU and national levels have recently focused on the concept of a circular bioeconomy, emphasizing the potential social and environmental benefits of wood-based energy, materials, compounds and pharmaceuticals (Westholm et al., 2015).

BES issues in the forest sector are often context-dependent, but generally land-use-related challenges include

**TABLE 2** | An example of the framework at use in this study (for each BES measure), the framework displays the BES issues being targeted, company motivations, the stakeholders involved and the private governance instruments used for the implementation.

BES measures	BES issues targeted	Motivation	Stakeholders involved	Private governance instrument
Example: forest inventory and monitoring of ecological/cultural values	Example: carbon storage	Example: strategic	Example: partners demanding or supporting the calculations	Example: regulatory
Example: participation in offsetting/compensation schemes	Example: biodiversity	Example: profit	Example: buyers and brokers involved in the scheme	Example: economic



managing forest resources and stakeholder conflicts and expectations related to land, resources and development (e.g., trade-offs between timber provision and food production, nutrient and water cycles, biodiversity and habitat maintenance; conflicts with local livelihoods, traditional culture or recreational opportunities). Climate, biodiversity, recreation and cultural values are especially relevant in the management of Nordic forests (Kettunen et al., 2012; Häyrynen et al., 2017; Lindahl et al., 2017; Matthies et al., 2018). Livelihoods, water and soil, and biodiversity are critical in the context of intensive, large-scale plantation forestry in emerging economies, such as China and Uruguay (Mikkilä et al., 2005; Malkamäki et al., 2018), where some Nordic companies have established forestry and mills in the past decade.

### Data Collection

From a list of the 100 largest forest, paper and packaging companies in the world by sales revenue (PWC, 2016), we selected the ones with headquarters based in the Nordic countries. Our sample included 12 companies that are market leaders in Sweden, Norway and Finland (Table 3). Ten of the twelve companies owned forest land, two of which owned forest land in the Global South in addition to other locations.

Nine of the companies were combined forest owners and industries. We collected the most recent corporate sustainability reports published by each company and conducted a content analysis to answer our research questions. Based on that approach and the knowledge gaps identified, we created a semi-structured questionnaire to elicit the knowledge of company managers (Step 2). Interviews with seven companies were then performed during spring of 2019, while the remaining five companies decided not to participate. The managers were selected based on their role and knowledge about sustainability and BES issues in the company (e.g., sustainability officer, sustainability manager, forestry operations manager). The interviews were conducted with one manager from each of the seven companies, either face to face or via phone (which are both acceptable approaches for qualitative interviews; see Sturges and Hanrahan, 2004). The managers were asked to verify, edit and complement the data collected through our analysis of the sustainability reports, with particular emphasis on missing information regarding BES measures, the BES issues being addressed and the stakeholders involved. The interviewees were also asked to explain the company's motivations for adopting each measure and provide any comments or insights on the overall company vision for addressing BES.

**TABLE 3** | Data sources for the study, including disclosure material and managerial interviews with representatives of the 12 Nordic forestry companies featured among the 100 largest forest, paper and packaging companies in the world by sales revenue (PWC, 2016).

Company ID	Country	Report analyzed	Managerial interview
A	Finland	Annual report 2017	Face to face
B	Finland	Sustainability report 2017	Face to face
C	Finland	Integrated (annual + sustainability) report 2017	Face to face
D	Finland	Sustainability report 2017	n/a
E	Sweden	Integrated (annual + sustainability) report 2017	n/a
F	Sweden	Integrated (annual + sustainability) report 2017	n/a
G	Sweden	Sustainability report 2017	n/a
H	Sweden	Integrated (annual + sustainability) report 2017	Phone
I	Sweden	Annual report 2017	Phone
L	Sweden	Integrated (annual + sustainability) report 2017	Face to face
M	Norway	Annual report 2016	n/a
N	Norway	Annual report 2017	Phone

## Analysis

Company reports and interview material were thoroughly read, and qualitative content analysis was performed using manual coding with Atlas.ti. Based on the joint analysis of corporate reports and interviews, for each BES measure led by the companies (RQa), we collected the following information: (RQb) the environmental and social problems being addressed (e.g., biodiversity, carbon, recreation), (RQc) the companies' motivation(s), (RQd) the stakeholders involved in or benefitting from the measures (e.g., suppliers, partners, local communities), and (RQe) the governance instruments being employed by the companies to enforce/solicit the measure in coordination with the stakeholders (regulatory, economic, information-based, rights-based).

The information collected for RQa, RQb, and RQd was reduced to categories through an iterative, abductive process, and the codes were repeatedly modified and refined to achieve a satisfactory balance between information representativeness and synthesis. An abductive approach implies that categories are developed based on the data, while at the same time drawing from existing theories or conceptualizations. Classification of various measures adopted by the companies (RQa) was informed by Hickey et al. (2005), Houdet et al. (2012), and Boiral and Heras-Saizarbitoria (2017a). BES issues (RQb) were classified based on the concept of ecosystem services (MA, 2005). Stakeholders (RQd) were classified based on stakeholder theory (Freeman et al., 2004; see also Boiral and Heras-Saizarbitoria, 2017a). Types of governance instruments and company motivations (RQc, RQe) were deductively informed by existing literature. The categories devised for company motivations (compliance, strategic, profit-seeking) were based on TEEB (2012) (see also Kurucz et al., 2009; Carroll and Shabana, 2010). Private governance instruments (regulatory, economic, and information/rights-based) were classified based on an adaptation of public policy instruments (IPBES, 2018).

## Limitations

Even when implemented in the light of international guidelines, corporate sustainability disclosure can be narrow and partial. Companies have often focused on reporting issues such as energy consumption, water and raw material abstraction, emissions and waste, thus largely responding with technological measures aimed at improving efficiency and eco-innovation (Málovics et al., 2008; Lozano and Huisingh, 2011; Meuer et al., 2019). On the other hand, their disclosure of details related to BES issues is often fragmented, rhetorical or limited (Jones and Solomon, 2013; Lähtinen et al., 2016; Addison et al., 2018). Company disclosure material often refers to international voluntary guidelines, such as the ones issued by the Global Reporting Initiative (GRI), the International Organization for Standardization (ISO) and the Organization for Economic Co-operation and Development (OECD). Another multi-stakeholder initiative is the Carbon Disclosure Project (CDP), which collects, inter alia, forest-related information. In addition, the UN Sustainable Development Goals have recently become a benchmark reference for corporate sustainability, where, for instance, the SDG 15 is particularly relevant for forest companies (Scheyvens et al., 2016; Vildåsen et al., 2017).

Companies in the forest sector tend to be more proactive in disclosing information on biodiversity and nature conservation compared to other land-use intensive sectors (D'Amato et al., 2019), and generally, the Nordic countries exhibit a high level of corporate sustainability performance (Strand et al., 2015). Our study focused on twelve forest sector leaders in the Nordic countries, which is considered an appropriate sample size for qualitative research. We coupled extensive analysis of corporate sustainability reports with interviews of company managers to best mitigate the limitations related to the content availability of corporate reports. This allowed us to clarify and enrich the data. It is possible that certain types of information was more actively disclosed in reports or during the interviews than others because such information was more traditionally associated with company sustainability management and was



thus routinely disclosed in written reports or well known by the interviewees or else because it was less confidential and “cutting edge” in terms of strategic management. The interviews represented the only means for eliciting in-depth information, so motivations were not recorded for the five companies unavailable for interviews. Despite the physiological challenges in collecting qualitative research data, we are confident that we reached a satisfactory level of data saturation. In this study we did not aim at evaluating company performance or effectiveness in addressing BES. Therefore, we did not need to assess the veracity and effectiveness of the implemented measures by means of triangulation with information from sources external to the companies.

## RESULTS

We recorded a total of 127 BES measures based on the analysis of company reports and managerial interviews, i.e., more than ten per company on average. The measures were further classified into seventeen types (Table 4). We identified thirteen types of BES issues, and 41 types of stakeholders involved. Types of governance instruments and company motivations included four types each.

The most common BES issues targeted by the 127 measures were biodiversity, sustainable forestry, carbon climate, water, recreation (berry picking, fishing, hunting), cultural value, soil and local livelihood (one measure could target multiple issues). According to the managers, many of the measures were largely driven by strategic and profit-seeking motivations, whereas they mentioned compliance less often. Notably, they often grouped all three motivations together, e.g., for practices such as land sparing, stakeholder dialogue/deliberative decision-making and monetary valuation of ecosystem services. The most common internal stakeholders involved or benefiting from the measures include forest owners, suppliers, customers, contractors and harvesting operators. The most common external stakeholder were third-party certifiers, global/national communities, local communities and indigenous people, NGOs, non-profits and environmental organizations, universities and research institutes, and public authorities and administration. Approximately 62% of all BES measures were implemented through private regulation mechanisms by the company, 26% were information- or rights-based; ca. 6% were economic; and ca. 5% were mixed instruments (Figure 2). Note that the company is the main agent imposing/encouraging such private governance instruments. The measures may or may not be required by the public policy framework.

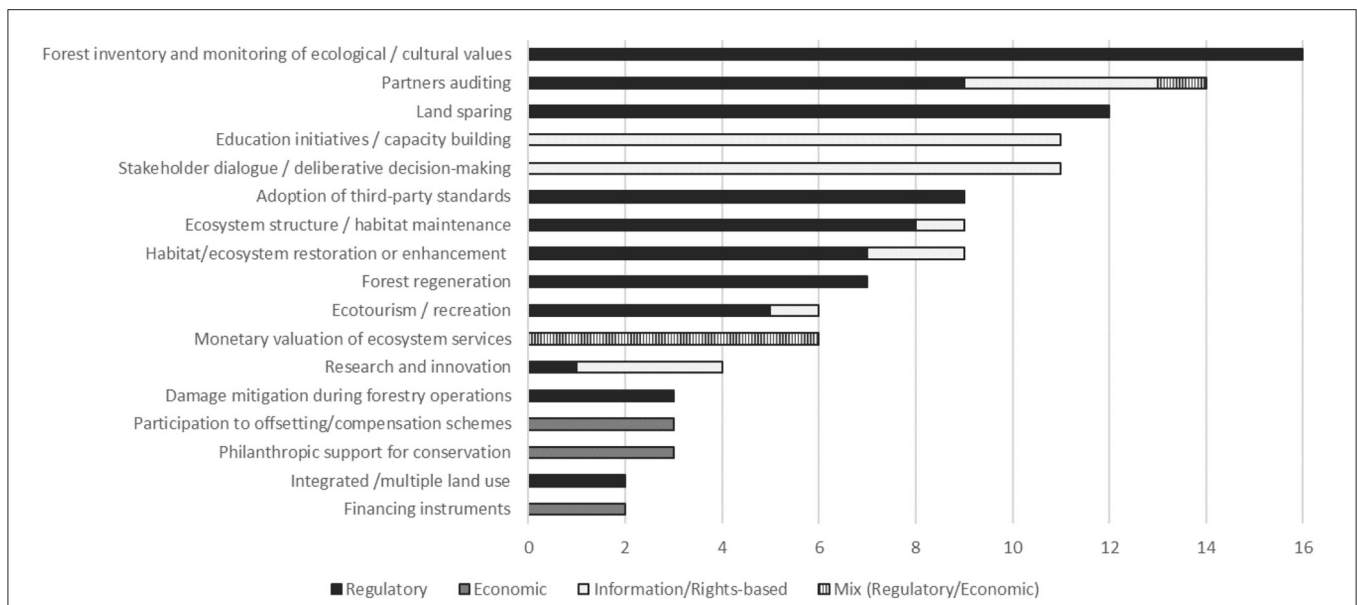
1. *Forest inventory and monitoring of ecological/cultural values* ( $N = 16$ ) were implemented as a company-set rule; this included data related to timber stock, biodiversity (e.g., ecologically relevant or endangered species), carbon sequestration, soil, water and cultural values. The issues addressed by such measures thus included sustainable forestry as well as fibers, biodiversity, carbon storage, water, soil and cultural values. The stakeholders involved were partners demanding or supporting the measures as well as

beneficiaries of the measures: research institutes, forest and environmental organizations, NGOs, public authorities, local, national and global communities, recreationalists, contractors and customers. Compliance, strategic and profit motivations were all mentioned as relevant by the company managers, with a focus on profit and strategic reasons.

2. *Partner auditing* ( $N = 14$ ) was mainly implemented as company-set rules or information-based processes, according to which partners (e.g., forest owners, suppliers, contractors) were expected or invited to adhere to certain quality standards (in one case, a premium was paid for certified raw material, although suppliers still needed to comply with a number of requirements). Such standards could be either formalized by third-party certified schemes (e.g., FSC, PEFC) or implemented internally as codes of conduct, with the aim of informing customers. For example, the companies promoted group certification among suppliers, including in emerging economy countries in, for instance, South America and Southeast Asia. These measures generally addressed biodiversity and sustainable forestry as a bundle of issues. The companies tended to focus on strategic and profit-seeking reasons.
3. *Land sparing* ( $N = 12$ ) refers to the measure of directly establishing conservation areas or banning purchasing of wood harvested illegally from genetically modified plants or from ecologically/culturally sensitive and valuable land. The stakeholders regarded as relevant were largely external, including local and global communities, local authorities, indigenous peoples, recreationalists, managers and employees of protected areas, researchers, and forest and environmental organizations. Internal stakeholders include suppliers and company teams doing quality checks. Motivations were mentioned as a bundle, with strategic motivations being particularly relevant. Land sparing can be required by law and is also demanded in the context of voluntary certification schemes, and this provides the framework for a forest company to design its own regulations.
4. *Education initiatives/capacity building* ( $N = 11$ ) were promoted by the companies through information-based instruments. They included: the training of harvesting operators, field workers, contractors and other employees to improve practices related to the sustainability of forestry operations, biodiversity, water and cultural values; programs that develop local livelihoods in emerging economy countries and address livelihoods, crops and fisheries; and information and infrastructure for the general public and recreationalists (e.g., parks, environmental and education centers) addressing issues of education and recreation. All motivations were mentioned, especially strategic and profit motivations.
5. *Stakeholder dialogue/deliberative decision-making* ( $N = 11$ ) was implemented by the companies through information- and rights-based instruments, including participation in further developing multi-stakeholder certification schemes and other nature conservation processes, communication with stakeholders affected by forestry operations (including indigenous Sámi people) and discussion/lobbying activities in the realm of international policy-making. Three companies in

**TABLE 4 |** The framework used in this study to investigate private governance of BES.

Components of the framework	Categories identified based on the data
BES measures	Adoption of third-party standards; damage mitigation during forestry operations; ecosystem structure/habitat maintenance; ecotourism/recreation; education initiatives/capacity building; financing instruments; forest inventory and monitoring of ecological/cultural values; forest regeneration; habitat/ecosystem restoration or enhancement; integrated/multiple land use; land sparing; monetary valuation of ecosystem services; participation in offsetting/compensation schemes; partners auditing; philanthropic support for conservation; research and innovation; stakeholder dialogue/deliberative decision-making.
BES issues	Biodiversity/habitat; carbon storage/climate regulation; cultural value (indigenous); energy; fibers; local livelihood; pollination; public health; recreation (e.g., berry picking, hunting, recreation); scientific/educational; soil maintenance; Sustainable forestry (i.e., bundle); water purification and regulation.
Company motivations	Compliance (respecting or anticipating regulatory processes); strategic (meeting societal expectations, reducing reputational risks, securing resources and continuity of operations); profit (reducing costs, attracting new customers or financing opportunities).
Stakeholders or beneficiaries	Authorities; beekeepers; bond buyers; contractors; customers; emission; certification sellers; employees; equipment manufacturers; experts; field workers; fishermen; forest and environmental organizations; forest owners; forest owners associations; general public; global community; harvesting operators; hunters; implementation people; indigenous people (Sami); industry representatives; local communities; partners; manufacturers; mining company; national public authority; national public authority; NGOs; non-profit organizations; protected areas managers and employees; public administration; quality checking team; recreationists; researchers and university; R&D teams; seasonal workers; shareholders; society; suppliers; value chain actors.
Private governance instruments	Regulatory (e.g., self-developed quality standards, spatial planning, granted access or use rights to other stakeholders); economic (e.g., markets for ES, philanthropic financial support to conservation); information-based (certification, partnerships, collaboration); rights-based (e.g., dialogue with indigenous people); mix.



**FIGURE 2 |** Seventeen types of BES measures ( $N = 127$ ) were used by the Nordic companies investigated in this study; implementation for each BES measure type was done through four types of private governance instruments (regulatory, economic, information/right-based, and a mix of regulatory and economic).

particular highlighted dialogue with Sámi people. In addition to sustainable forestry in general, the issues addressed were biodiversity, climate, energy, recreation, local livelihoods and cultural values. Stakeholders included forest owners and related associations, third-party certifiers, forest and environmental organizations, industry representatives, recreationalists, local communities, NGOs, indigenous peoples, public administrations and researchers. All three

motivations were mentioned as relevant by the company managers. It should be noted that the FSC and existing legislation (e.g., in Sweden) provide a substratum of basic requirements for consultation with Sámi people.

6. *Adoption of third-party standards* ( $N = 9$ ) included adopting certifications, such as FSC and PEFC, or otherwise principles such as the Food and Agriculture Organization’s (FAO) Voluntary Guidelines on Planted Forests. Note that measures

- 2 and 3 also relate to standard setting. In our analysis, we classified the adoption of standards as company rules (i.e., a regulatory instrument) because the companies have adopted them as a minimum quality level to comply with. In one case, a company had created its own trademark for sustainable products. Sustainable forestry (as a bundle of elements) was the main issue addressed, but biodiversity/habitat were also mentioned. Stakeholders of relevance included third-party certifiers, forest owners, suppliers, customers, NGOs and authorities. The company motivations focused on strategic and profit reasons.
7. *Forest structure/habitat maintenance* ( $N = 9$ ) concerns measures, such as deadwood retention, selective cutting, controlled fires and buffer zones aimed at conserving/improving biodiversity, water and soil at forestry operation sites. Stakeholders involved or benefitting from the measures included forest owners and the local, national and global community. Although generally implemented as a rule, one company provided the option for suppliers (forest owners) to include biodiversity measures on their own forest lands; we considered such a case to be an information-based instrument because it was made voluntary for the forest owners. The company motivations had to do with strategic purposes and matters of compliance.
  8. *Habitat/ecosystem restoration or enhancement* ( $N = 9$ ) are measures conducted elsewhere than at forestry operation sites, including in valuable natural areas, to improve biodiversity, water, soil, recreation, local livelihoods and pollination. They included, for instance, beach cleaning, establishing insect or wildlife corridors, and adopting measures for improving the availability and quality of water for domestic purposes. They were implemented as a mixture of company rules and information-based instruments (in one case, for example, measures to protect threatened species were implemented together with the county administrative boards). In addition to forest owners, other stakeholders were mainly external, including partners, local communities and administrations, recreationalists, forest and NGOs, as well as the national and global communities. The motivation were strategic.
  9. *Forest regeneration* ( $N = 7$ ) after tree harvesting was conducted according to company rules and mainly targeted issues related to fiber production and carbon storage, and it involved authorities and implementation professionals, forest owners, contractors, customers and local and global communities. The company managers mentioned all three motivations, though a profit-driven motivation (such as fast-growing tree varieties) and compliance appeared more relevant. It should be noted that forest regeneration is required by law in Sweden, Finland and Norway. While companies are obliged to comply, they may set their own standards for how this is achieved, including additional reforestation targets than those they must respect by law.
  10. *Ecotourism/recreation* ( $N = 6$ ) activities were implemented by the companies mainly as regulatory instruments, which included developing and maintaining recreation areas within or outside forestry operation sites and selling hunting and fishing licenses. At some level, information-based instruments were also put into place, e.g., a case of cooperation with municipalities and NGOs to develop a recreation area. The main issues addressed by these measures included biodiversity and recreation (hunting), and they involved stakeholders such as public administrations, NGOs, hunters, fishermen, recreationalists and forest owners. The interviewees listed strategic and profit-oriented motivations.
  11. *Monetary valuation* ( $N = 6$ ) included estimates of economic value were calculated for carbon sink services, the recreational use of forests, and raw material used as fibers, and biodiversity. Such estimates varied widely, presumably due to different valuation methods. This kind of exercise is used by the company internally for decision-making purposes related both to planning (regulatory) and propaedeutic to setting up economic instruments, such as markets for ecosystem services. Stakeholders deemed relevant were shareholders and value chain actors as well as conservationists, recreationalists and the global community. The interviewees mentioned all three motivations.
  12. *Research and innovation* ( $N = 4$ ) included company rules or information-based instruments aimed at improving forestry or studying climate change impacts on business. Such measures addressed soil, water, climate or fiber-production issues. Stakeholders considered relevant as partners or beneficiaries included R&D teams, manufacturers and operators, suppliers, industry actors, researchers, public administrations, forest and environmental organizations, and the national and global community. The motivations were profit-related.
  13. *Damage mitigation during forestry operations* ( $N = 3$ ) involved measures implemented as company rules to address soil and water quality (e.g., temporary bridges, improved harvesting methods). They required involving harvesting operators as the main stakeholders. Such measures were motivated by a mix of strategic and profit-oriented reasons.
  14. *Participation in offsetting/compensation schemes* ( $N = 3$ ) were classified as economic instruments. They included two possible scenarios: the company as a buyer (beneficiary) or as a seller (producer) of ecosystem services. The first case (buyer) included a hypothetical market situation, simulating the potential costs of carbon emissions. The second case (seller) included two actual market transactions, the delivery and "sale" of both a biodiversity offset and a carbon offset. The motivations suggested by the respondents were strategic, although a profit-making component for sellers was involved.
  15. *Philanthropic support for conservation* ( $N = 3$ ) included funding for innovation provided by the companies to nature conservation societies or scientific projects; the issues addressed were thus biodiversity and scientific research, and relevant stakeholders were identified as the receiving organizations, including non-profit organizations and research institutes, but also local communities or recreationalists benefitting from the projects. All motivations were mentioned.
  16. *Integrated/multiple land use* ( $N = 2$ ) were implemented as a rights-based instrument. One company granted access to land or resources to support local livelihoods related to farming or beekeeping in the context of emerging economy countries;

another company supported the multipurpose use of forests in Nordic contexts, including aspects of human wellbeing and recreation. Local communities, recreationalists and forest owners were mentioned as the stakeholders involved, while the company motivation was strategic.

17. *Financing instruments* ( $N = 2$ ) are intended as instruments set up by companies to self-finance sustainability-oriented projects. Two of the companies in the sample issued green bonds. Projects considered eligible for being financed by the bonds included sustainable forestry as well as innovation or management related to production, water, energy and waste resources. Due to the diverse nature of the projects financed, it is difficult to pinpoint all the stakeholders involved, beyond bond buyers. The interviewees explained the motivations as being strategic and profit-oriented.

Finally, land ownership emerged as a cross-cutting theme in the interviews, foundational to many BES issues. Some of the interviewees suggested that greater control over decision-making at the forest stand and landscape levels improved opportunities for management and novel sources of income. Three respondents representing forest industries discussed these issues during the interviews, indicating the belief that ownership of forests provides more operative flexibility and control for BES decision-making.

## DISCUSSION

In addressing the relation between corporate social responsibility and public policy (Albareda et al., 2008), the business literature typically views company-led measures as voluntary and as additional contributions to public efforts, whereas the government is the main agent responsible for promoting sustainability and for prompting, mediating and facilitating other actors' contributions (Wolff et al., 2018). Governance scholars question whether increasing the emphasis placed on non-governmental actors may result in antagonizing, complementing, substituting or reinforcing the role of government (Klijn and Skelcher, 2007). While extended governance is called for to maintain common goods, including most ecosystem services (Muradian and Rival, 2013), an intense academic debate exists regarding its risks (Klijn and Skelcher, 2007).

In particular, the mobilization of financial resources from the private (including the forest) sector (e.g., through carbon/biodiversity offsetting and payments for ecosystem services) has been extensively promoted in the past decade by international initiatives, scholars and practitioners worldwide as a potential avenue for business engagement with BES issues (Forest Trends, 2008; EFTEC, 2011; Barbier, 2012; Brand, 2012; TEEB, 2012; OECD, 2013; Matzdorf et al., 2019). However, the monetization of ecosystem services and the use of market-based policy instruments (such as payments for ecosystem services or offsetting schemes) are seen by several experts as a form of nature commodification which is detrimental to, rather than supportive of, nature conservation (Hrabanski, 2017). A global process of progressive nature commodification would mean that nature is increasingly framed as a mere provider of benefits to

human wellbeing, eroding relational, non-instrumental values associated with nature. Such concerns have generated debates and conflicts in the research and policy communities, especially when such strategies are used as silver bullets and "adopted without wider consideration of [...] relevance, acceptability—or possible dangers" (Tregidga, 2013, p. 827). At any rate, most of the existing market-like schemes for ecosystem services have gathered little private engagement capital and remain publicly funded (Froger et al., 2015; Hahn et al., 2015). Moreover, the involvement of the private sector in such schemes is influenced and shaped by national legal frameworks, which is a further indication of the crucial role of government (Koh et al., 2019).

Our study confirms that although instruments related to the mobilization of financial resources for conservation are emerging as profitable or strategically interesting opportunities for forest companies (Houdet et al., 2012), more traditional instruments, which are deeply embedded into public legislation (e.g., forest inventories, regeneration and set-asides, partners auditing) continue to be the core of corporate BES governance. In total, by analyzing the 12 companies, we found 127 BES measures, which we categorized in seventeen different types. The most innovative measures implemented by the companies included integrated land use, monetary valuation, green bonds, biodiversity offsets, granting rights to hunters and eco-tourists, and other types of formal and informal collaborations with civil society groups. Such innovative measures were accompanied by a company vision of value creation from forests managed for multiple non-timber ecosystem services. Importantly, land ownership emerged from some interviews as an enabler in engaging with certain BES measures, especially in relation to novel forest values and opportunities. During the last decade, timberland in Europe has increasingly been considered an alternative real asset for investment diversification (Korhonen et al., 2016). However, not all forestry companies have pursued a land acquisition (or re-acquisition) strategy to the same extent, and this has implications for how they approach BES strategy and implementation today.

The measures often addressed BES issues as a bundle (i.e., sustainable forestry), but other times were more specifically focused on either fibers, biodiversity, carbon storage, water, soil and cultural values. The stakeholders included a diverse array: research institutes, forest and environmental organizations, NGOs, public authorities, local, national and global communities, recreationalists, contractors and customers.

Although the interviewed managers often grouped the three motivations together when discussing BES measures, they more often focused on profit-seeking and strategic motivations. While market-driven certification acted as an umbrella for many of the voluntary measures that the companies have engaged in, legitimacy and reputational issues were also concrete strategic motivators for companies (as also noted by, e.g., Smith et al., 2019). Compliance was not often explicitly mentioned in the interviews, but several measures implemented by the companies are nested in public policy (legislation and governmental regulations). For the same reason, it is difficult to evaluate the level of additionality created by voluntary measures: many of the rules and standards currently embedded in the companies'



voluntary sustainability measures were developed as a response to government regulations or national targets, and in some cases, voluntary sector responsibility has replaced detailed legal national regulations (e.g., since 1993 the Forest Act in Sweden has been based on a “freedom with responsibility” principle, which compels forest owners to develop voluntary approaches to achieve national environmental targets) (Lindahl et al., 2017).

## CONCLUSIONS

Using an interdisciplinary and phenomenon-based approach, our study has addressed the role of business organizations in managing and co-governing biodiversity and related ecosystems, focusing particularly on Nordic forest companies. Companies can be understood as agents imposing/encouraging a range of BES measures (e.g., habitat restoration, partner auditing, stakeholder dialogue, monetary valuation, offsetting schemes) through private governance instruments (regulatory, economic, information/rights-based instruments) in coordination with internal and external stakeholders (e.g., employees, forest owners, experts, local communities, public administration, NGOs) and in light of multiple external and/or internal motivations (e.g., compliance, strategic, profit-seeking). The contribution of this study includes reflections of relevance for both the scholarly, policy and managerial realms.

From a research perspective, this study addressed the need to further develop an understanding of BES management and governance from an organizational perspective. There is room to further analyze the extent to which BES measures are integrated into core company activities, the level of embeddedness, ambition and additionality of voluntary targets/objectives in relation to legislative requirements, and the breadth/depth of action in relation to a full overview of sustainable development goals. Relevant topics for future research also include further investigating the role of company motivations in the development of innovative measures. Alternative units of analysis include companies beyond the Nordic forest sector as well as the complementary perspectives of key stakeholder groups.

From a policy perspective, our study suggests that private governance in the Nordic countries is nested in public policy and representative democracy, so that legislation and other formal institutions still form the backbone of governance. The advantage of such a nested governance model is that responsibility and innovation are fostered, regardless of whether the measures developed by companies are proactive or reactive. It remains to be seen how the increasingly technical framework for corporate disclosures (e.g., the forthcoming EU taxonomy for sustainable activities and the Corporate Sustainability Reporting Directive) may drive changes in BES private governance, and, on the other hand, how purely voluntary sector-wide agreements (e.g., Equator Principles) may support or pre-empt government regulations.

From a managerial perspective, we have provided an overview of potential measures that forest companies can implement to address biodiversity and other socio-ecological issues at the

land-use level. In addition to well-established practices, such as forest resource management, partners auditing or land sparing, some of the Nordic European companies examined in this study are now beginning to explore new measures considered profitable or strategically interesting. They include the monetary valuation of ecosystem services, integrated land-use planning, biodiversity/carbon offsetting and the use of green bonds. Notably, these practices have generally been adopted along with a company perspective that views forests as a source of multiple (timber and non-timber) values for a diverse range of societal actors, and where land ownership has determined the studied companies' ability to engage with the full spectrum of possible BES measures.

We suggest that the effectiveness and appropriateness of the various BES measures should be evaluated by the companies against the broader panorama of socio-ecological issues to be addressed; the stakeholders involved; the national legal framework and other institutional settings, including global and local societal expectations; and the mitigation hierarchy approach. Prudence is advisable when engaging with monetary valuation and markets for ecosystem services due to stakeholders' concerns regarding such measures.

This study ultimately shows that the potential for business organizations to co-govern BES issues occurs through multiple processes and extends well beyond markets for ecosystem services, although these latter have been in the past decade the focus of much of the emphasis and expectations by the international research/practitioner community.

## DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

## AUTHOR CONTRIBUTIONS

DD'A: research design and analysis. DD'A, TH, and BM: data collection. DD'A, TH, BM, and AT: manuscript development. All authors contributed to the article and approved the submitted version.

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## REFERENCES

- Addison, P. F. E., Bull, J. W., and Milner-Gulland, E. J. (2018). Using conservation science to advance corporate biodiversity accountability. *Conserv. Biol.* 33, 307–318. doi: 10.1111/cobi.13190
- Aguinis, H., and Glavas, A. (2012). What we know and don't know about corporate social responsibility: a review and research agenda. *J. Mang. Stud.* 38, 932–968. doi: 10.1177/0149206311436079
- Albareda, L., Lozano, J. M., Tencati, A., Midttun, A., and Perrini, F. (2008). The changing role of governments in corporate social responsibility: drivers and responses. *Bus. Ethics Eur. Rev.* 17, 347–363. doi: 10.1111/j.1467-8608.2008.00539.x
- Barbier, E. (2012). The green economy post Rio+20. *Science* 338, 887–888. doi: 10.1126/science.1227360
- Barbier, E. B., Burgess, J. C., and Dean, T. J. (2018). How to pay for saving biodiversity. *Science* 360, 486–488. doi: 10.1126/science.aar3454
- Boiral, O., and Heras-Saizarbitoria, I. (2017a). Best practices for corporate commitment to biodiversity: an organizing framework from GRI reports. *Environ. Sci. Policy* 77, 77–85. doi: 10.1016/j.envsci.2017.07.012
- Boiral, O., and Heras-Saizarbitoria, I. (2017b). Corporate commitment to biodiversity in mining and forestry: identifying drivers from GRI reports. *J. Clean. Prod.* 162, 153–161. doi: 10.1016/j.jclepro.2017.06.037
- Boiral, O., and Heras-Saizarbitoria, I. (2017c). Managing biodiversity through stakeholder involvement: why, who, and for what initiatives? *J. Bus. Ethics* 140, 403–421. doi: 10.1007/s10551-015-2668-3
- Brand, U. (2012). Green economy – the next oxymoron? *GAIA* 21, 28–32. doi: 10.14512/gaia.21.1.9
- Carroll, A. B., and Shabana, K. M. (2010). The business case for corporate social responsibility: a review of concepts, research and practice. *Int. J. Manag. Rev.* 12, 85–105. doi: 10.1111/j.1468-2370.2009.00275.x
- Costanza, R., de Groot, R., Braat, L., Kubiszewski, I., Fioramonti, L., Sutton, P., et al. (2017). Twenty years of ecosystem services: how far have we come and how far do we still need to go? *Ecosyst. Serv.* 28, 1–16. doi: 10.1016/j.ecoser.2017.09.008
- D'Amato, D., Korhonen, J., and Toppinen, A. (2019). Circular, green, and bio economy: how do companies in land-use intensive sectors align with sustainability concepts? *Ecol. Econ.* 158, 116–133. doi: 10.1016/j.ecolecon.2018.026
- D'Amato, D., Rekola, M., Li, N., and Toppinen, A. (2018). Managerial views of corporate impacts and dependencies on ecosystem services: a case of international and domestic forestry companies in China. *J. Bus. Ethics* 150, 1011–1028. doi: 10.1007/s10551-016-3169-8
- Droste, N., D'Amato, D., and Goddard, J. J. (2018). Where communities intermingle, diversity grows – the evolution of topics in ecosystem service research. *PLoS ONE* 13, e0204749. doi: 10.1371/journal.pone.0204749
- EFTEC (2011). Innovative use of financial instruments and approaches to enhance private sector finance of biodiversity. *Final Summary Report to European Commission Directorate-General Environment. 070307/2010/581922/ETU/F1*. Available online at: [https://ec.europa.eu/environment/enveco/biodiversity/pdf/BD\\_Finance\\_summary-300312.pdf](https://ec.europa.eu/environment/enveco/biodiversity/pdf/BD_Finance_summary-300312.pdf) (accessed June 20, 2022).
- Eurostat (2020). Wood products - production and trade. *Change in Roundwood Production in the EU 2010-2020*. Available online at: [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Wood\\_products\\_-\\_production\\_and\\_trade&oldid=550077](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Wood_products_-_production_and_trade&oldid=550077) (accessed June 20, 2022).
- Folke, C., Österblom, H., Jouffray, J. B., Lambin, E. F., Adger, W. N., Scheffer, M., et al. (2019). Transnational corporations and the challenge of biosphere stewardship. *Nat. Ecol. Evol.* 3, 1396–1403. doi: 10.1038/s41559-019-0978-z
- Forest Trends, The Katoomba Group, and UNEP (2008). *Payments for Ecosystem Services: Getting Started*. A Primer. Available online at: [https://wedocs.unep.org/bitstream/handle/20.500.11822/9150/payment\\_ecosystem.pdf?sequence=1&isAllowed=y](https://wedocs.unep.org/bitstream/handle/20.500.11822/9150/payment_ecosystem.pdf?sequence=1&isAllowed=y) (accessed June 20, 2022).
- Freeman, R. E., Wicks, A. C., and Parmar, B. (2004). Stakeholder theory and 'the corporate objective revisited'. *Organ. Sci.* 15, 364–369. doi: 10.1287/orsc.1040.0066
- Froger, G., Boisvert, V., Méral, P., Le Coq, J. F., Caron, A., and Aznar, O. (2015). Market-based instruments for ecosystem services between discourse and reality: an economic and narrative analysis. *Sustainability* 7, 11595–11611. doi: 10.3390/su70911595
- Hahn, T., Figge, F., Aragón-Correa, J. A., and Sharma, S. (2017). Advancing research on corporate sustainability: off to pastures new or back to the roots? *Bus. Soc.* 56, 155–185. doi: 10.1177/0007650315576152
- Hahn, T., McDermott, C., Ituarte-Lima, C., Schultz, M., Green, T., and Tuvendal, M. (2015). Purposes and degrees of commodification: economic instruments for biodiversity and ecosystem services need not rely on markets or monetary valuation. *Ecosyst. Serv.* 16, 74–82. doi: 10.1016/j.ecoser.2015.10.012
- Häyriäinen, L., Mattila, O., Berghäll, S., Närhi, M., and Toppinen, A. (2017). Exploring the future use of forests: perceptions from non-industrial private forest owners in Finland. *Scand. J. For. Res.* 29, 327–337. doi: 10.1080/02827581.2016.1227472
- Hickey, G. M., Innes, J. L., Kozak, R. A., Bull, G. Q., and Vertinsky, I. (2005). Monitoring and information reporting for sustainable forest management: An international multiple case study analysis. *For. Ecol. Manag.* 209, 237–259. doi: 10.1016/j.foreco.2005.02.005
- Houdet, J., Trommetter, M., and Weber, J. (2012). Understanding changes in business strategies regarding biodiversity and ecosystem services. *Ecol. Econ.* 73, 37–46. doi: 10.1016/j.ecolecon.2011.10.013
- Hrabanski, M. (2017). Private sector involvement in the millennium ecosystem assessment: using a UN platform to promote market-based instruments for ecosystem services. *Environ. Policy Gov.* 27, 605–618. doi: 10.1002/eet.1780
- IPBES (2018). "Summary for policymakers of the regional assessment report on biodiversity and ecosystem services for Europe and Central Asia of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services," eds M. Fischer, M. Rounsevell, A. Torre-Marín Rando, A. Mader, A. Church, M. Elbakidze, eds. (Bonn: IPBES Secretariat). Table SPM 4, XLVI–XLVII. Available online at: <https://www.ipbes.net/assessment-reports/eca> (accessed June 20, 2022).
- Jones, M. J., and Solomon, F. J. (2013). Problematising accounting for biodiversity. *Account. Audit. Account. J.* 26, 668–687. doi: 10.1108/AAAJ-03-2013-1255
- Keskitalo, E. C. H., and Liljenfeldt, J. (2014). Implementation of forest certification in Sweden: an issue of organisation and communication. *Scand. J. For. Res.* 29, 473–484. doi: 10.1080/02827581.2014.919355
- Kettunen, M., Vihervaara, P., Kinnunen, S., D'Amato, D., Badura, T., Argimon, M., et al. (2012). *Socio-Economic Importance of Ecosystem Services in the Nordic Countries: Synthesis in the Context of the Economics of Ecosystems and Biodiversity*. Copenhagen: Nordic Council of Ministers Secretariat.
- Klijin, E. H., and Skelcher, C. (2007). Democracy and governance networks: compatible or not. *Public Adm.* 85, 587–608. doi: 10.1111/j.1467-9299.2007.00662.x
- Koh, N. S., Hahn, T., and Boonstra, W. J. (2019). How much of a market is involved in a biodiversity offset? A typology of biodiversity offset policies. *J. Environ. Manage.* 232, 679–691. doi: 10.1016/j.jenvman.2018.11.080
- Korhonen, J., Zhang, Y., and Toppinen, A. (2016). Examining timberland ownership and control strategies in the global forest sector. *For. Policy Econ.* 70, 39–46. doi: 10.1016/j.forpol.2016.05.015
- Kurucz, E. C., Colbert, B. A., and Wheeler, D. (2009). "The business case for corporate social responsibility," in *The Oxford Handbook of Corporate Social Responsibility*, eds A. Crane, D. Matten, A. McWilliams, J. Moon, and D. S. Siegel. (Oxford: Oxford University Press).
- Lähtinen, K., Guan, Y., Li, N., and Toppinen, A. (2016). Biodiversity and ecosystem services in supply chain management in the global forest industry. *Ecosyst. Serv.* 21, 130–140. doi: 10.1016/j.ecoser.2016.07.006
- Li, N., and Toppinen, A. (2011). Corporate responsibility and sustainable competitive advantage in forest-based industry: complementary or

- conflicting goals? *For. Policy Econ.* 13, 113–123. doi: 10.1016/j.forpol.2010.06.002
- Lindahl, K. B., Sténs, A., Sandström, C., Johansson, J., Lidskog, R., Ranius, T., et al. (2017). The Swedish forestry model: more of everything? *For. Policy Econ.* 77, 44–55. doi: 10.1016/j.forpol.2015.10.012
- Lozano, R., and Garcia, I. (2020). Scrutinizing sustainability change and its institutionalization in organizations. *Front. Sustain.* 1, 1. doi: 10.3389/frsus.2020.00001
- Lozano, R., and Huisingh, D. (2011). Inter-linking issues and dimensions in sustainability reporting. *J. Clean. Prod.* 19, 99–107. doi: 10.1016/j.jclepro.2010.01.004
- MA (2005). “Millennium ecosystem assessment synthesis report,” in *Millennium Ecosystem Assessment*. Available online at: <http://www.millenniumassessment.org/en/Synthesis.html> (accessed June 20, 2022).
- Macellari, M., Gusmerotti, N. M., Frey, M., and Testa, F. (2018). Embedding biodiversity and ecosystem services in corporate sustainability: a strategy to enable sustainable development goals. *Bus. Strategy Dev.* 1, 244–255. doi: 10.1002/bsd2.34
- Malkamäki, A., D'Amato, D., Hogarth, N. J., Kanninen, M., Pirard, R., Toppinen, A., et al. (2018). A systematic review of the socio-economic impacts of large-scale tree plantations, worldwide. *Glob. Environ. Change* 53, 90–103. doi: 10.1016/j.gloenvcha.2018.09.001
- Málovics, G., Csígen, N. N., and Kraus, S. (2008). The role of corporate social responsibility in strong sustainability. *J. Socioecon.* 37, 907–918. doi: 10.1016/j.socec.2006.12.061
- Marshall, G. (2007). Nesting, subsidiarity, and community-based environmental governance beyond the local scale. *Int. J. Commons* 2, 75–97. doi: 10.18352/ijc.50
- Matthies, B. D., Vainio, A., and D'Amato, D. (2018). Not so biocentric – environmental benefits and harm associated with the acceptance of forest management objectives by future environmental professionals. *Ecosyst. Serv.* 29, 128–136. doi: 10.1016/j.ecoser.2017.12.003
- Matzdorf, B., Biederman, C., and Loft, L. (2019). “Payments for ecosystem services: private and public funding to avoid risks to ecosystem services: drivers, risks, and societal responses,” in *Atlas of Ecosystem Services*, eds M. Schröter, A. Bonn, S. Klotz, R. Seppelt, and C. Baessler. (Cham: Springer International Publishing).
- Meuer, J., Koebel, J., and Hoggmann, V. H. (2019). On the nature of corporate sustainability. *O E* 3, 1–23. doi: 10.1177/1086026619850180
- Mikkilä, M., Kolehmainen, O., and Pukkala, T. (2005). Multi-attribute assessment of acceptability of operations in the pulp and paper industries. *For. Policy Econ.* 7, 227–243. doi: 10.1016/S1389-9341(03)00062-5
- Muradian, R., and Rival, L. (2013). “Ecosystem services and environmental governance: some concluding remarks,” in *Governing the Provision of Ecosystem Services. Studies in Ecological Economics*. Vol. 4, eds R. Muradian L. Rival (Dordrecht: Springer).
- Natural Capital Coalition. (2016). *Natural Capital Protocol*. Available online at: [www.naturalcapitalcoalition.org/protocol](http://www.naturalcapitalcoalition.org/protocol) (accessed June 20, 2022).
- Nichiforel, L., Keary, K., Deuffic, P., Weiss, G., Thorsen, B. J., Winkel, G., et al. (2018). How private are Europe's private forests? A comparative property rights analysis. *Land Use Policy* 73, 535–552. doi: 10.1016/j.landusepol.2018.02.034
- OECD (2013). *Scaling-Up Finance Mechanisms for Biodiversity*. Paris: OECD Publishing.
- Overbeek, G., Harms, B., and Van Den Burg, S. (2013). Biodiversity and the corporate social responsibility agenda. *J. Sustain. Dev.* 6, 1–11. doi: 10.5539/jsd.v6n9p1
- PWC (2016). *19th Annual Global Forest, Paper & Packaging Industry Survey*. PricewaterhouseCoopers LLP. Available online at: <https://www.pwc.com/gx/en/industries/assets/pwc-annual-fpp-industry-survey-2016-10.pdf> (accessed June 20, 2022).
- Savilaakso, S., Häkkinen, M., Johansson, A., Uusitalo, A., Sandgren, T., Mönkkönen, M., et al. (2019). What are the effects of even-aged and uneven-aged forest management on boreal forest biodiversity in Fennoscandia and European Russia? A systematic review protocol. *Environ. Evid.* 8, 17. doi: 10.1186/s13750-019-0160-8
- Schaltegger, S., and Beständig, U. (2010). *Corporate Biodiversity Management Handbook*. A guide for practical implementation. Berlin/Eschborn/Lüneburg, Bundesumweltministerium (German Federal Ministry for the Environment) (Ed.) GTZ/CSM-Leuphana University Lüneburg.
- Scheyvens, R., Banks, G., and Hughes, E. (2016). The private sector and the sdgs: the need to move beyond ‘business as usual.’ *Sustain. Dev.* 24, 371–382. doi: 10.1002/sd.1623
- Slootweg, R. (2005). Biodiversity assessment framework: making biodiversity part of corporate social responsibility. *Impact Assess. Proj. Apprais.* 23, 37–46. doi: 10.3152/147154605781765742
- Smith, T., Paavola, J., and Holmes, G. (2019). Corporate reporting and conservation realities: understanding differences in what businesses say and do regarding biodiversity. *Environ. Policy Gov.* 29, 3–13. doi: 10.1002/eet.1839
- Starik, M., and Kanashiro, P. (2013). Toward a theory of sustainability management: uncovering and integrating the nearly obvious. *O E* 26, 7–30. doi: 10.1177/1086026612474958
- Strand, R., Freeman, R. E., and Hockerts, K. (2015). Corporate social responsibility and sustainability in scandinavia: an overview. *J. Bus. Ethics* 127, 1–15. doi: 10.1007/s10551-014-2224-6
- Sturges, J. E., and Hanrahan, K. J. (2004). Comparing telephone and face-to-face qualitative interviewing: a research note. *Qual. Res. J.* 27, 71–91. doi: 10.1177/1468794104041110
- TEEB (2012). *The Economics of Ecosystems and Biodiversity in Business and Enterprise*. London; New York, NY: Earthscan.
- Tregidga, H. (2013). Biodiversity offsetting: problematisation of an emerging governance regime. *Account. Audit. Account. J.* 26, 806–832. doi: 10.1108/AAA-02-2013-1234
- van den Belt, M., and Stevens, S. M. (2016). Transformative agenda, or lost in the translation? A review of top-cited articles in the first four years of ecosystem services. *Ecosyst. Serv.* 22, 60–72. doi: 10.1016/j.ecoser.2016.09.006
- Vildåsen, S. S., Keitsch, M., and Fet, A. M. (2017). Clarifying the epistemology of corporate sustainability. *Ecol. Econ.* 138, 40–46. doi: 10.1016/j.ecolecon.2017.03.029
- von Krogh, G., Rossi-Lamastra, C., and Haefliger, S. (2012). Phenomenon-based research in management and organisation science: when is it rigorous and does it matter? *LRP* 45, 277–298. doi: 10.1016/j.lrp.2012.05.001
- Vos, J. F. J. (2003). Corporate social responsibility and the identification of stakeholders. *Corp. Soc. Responsib. Environ. Manag.* 10, 141–152. doi: 10.1002/csr.39
- WBCSD (2013). *The Corporate Ecosystem Services Review: Guidelines for Identifying Business Risks and Opportunities Arising From Ecosystem Change*. Geneva: World Business Council for Sustainable Development.
- Westholm, E., Lindahl, K. B., and Kraxner, F. (2015). *The Future Use of Nordic Forests*. New York, NY: Springer.
- Whiteman, G., Walker, B., and Perego, P. (2013). Planetary boundaries: ecological foundations for corporate sustainability. *J. Manag. Stud.* 50, 307–336. doi: 10.1111/j.1467-6486.2012.01073.x
- Winn, M. I., and Pogutz, S. (2013). Business, ecosystems, and biodiversity: new horizons for management research. *O E* 26, 203–229. doi: 10.1177/1086026613490173
- Wolff, A., Gondran, N., and Brodhag, C. (2018). Integrating corporate social responsibility into conservation policy: the example of business commitments to contribute to the French National Biodiversity Strategy. *Environ. Sci. and Policy* 86, 106–114. doi: 10.1016/j.envsci.2018.05.007

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