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Nexus Thinking in Business:
Analysing Corporate Responses to Interconnected Global Sustainability Challenges

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ABSTRACT

Nexus thinking represents a novel approach to managing sustainability challenges, but little is known about how and to what extent it is being employed by companies. By examining documents from 14 companies identified as “comprehensive-disclosers,” this paper reveals important insights into corporate responses to multiple, interconnected sustainability issues or “nexus challenges”. Using qualitative content analysis of companies’ responses to the CDP (formerly, Carbon Disclosure Project) climate change, water, forests and supply chain surveys as well as their sustainability reports, we find that while companies largely continue with silo-based approaches to addressing sustainable development challenges, some are beginning to employ more integrated approaches suggestive of embryonic “nexus thinking.” Our research provides the first empirical evidence of its kind and contributes to broader debates on the utility of the nexus concept in corporate environmental governance and policymaking.

Keywords: nexus; integrated thinking; sustainable development; corporate sustainability.

Nexus Thinking in Business:

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1. Introduction

Overcoming the “grand challenge” of sustainable development is hampered by the “complex and wicked” nature of many of the underlying problems (Blok et al., 2016; Eisenhardt et al., 2016). Concerns have been raised that political decision makers are not responding to the intertwined nature of sustainable development in an integrated manner (Folke et al., 2016; Olsson et al., 2017; Stafford-Smith et al., 2017; Walker et al., 2009; Williams et al., 2017). Similarly, in the context of companies adopting and integrating sustainable development into their strategies, there remains a lack of understanding of whether and how companies can (and should) reconcile multiple and connected corporate impacts on people, planet and prosperity (Kourula et al., 2017; Meurer et al., 2019; Whiteman et al., 2013).

Recent insights from the environmental, policy and social sciences highlight the growing importance of “nexus thinking” in tackling interconnected sustainability challenges (Biggs et al., 2015; Cairns and Krzywoszynska, 2016; Green et al., 2017; Portney et al., 2018; Leck et al., 2015; Liu et al., 2018). Nexus thinking is related to the notions of integrated and resilience thinking, management and governance (Allouche et al. 2014; Davis 2014; Hoff, 2011; Zhang et al., 2018) as well as integrated reporting in accounting practices (e.g., Adams, 2015; Stubbs and Higgins, 2014) in that it seeks to foster new cognitive approaches for responding to multiple sustainability issues by raising awareness of their complex systems nature, specifically by focusing on their interconnections (Williams et al., 2017). Originally devised for assessing the availability and use of energy, food and water across varying scales (Bazilian et al., 2011), the

growing nexus agenda pays attention to persistent linkages and inter-dependencies between different issues across space and time (Bansal et al., 2018a; Pahl-Wostl et al., 2018). It particularly recognizes socio-ecological synergies, tensions and potential trade-offs across multiple sectors (Pahl-Wostl, 2019) and there are increasing calls for nexus thinking to become recognized as a broader approach for encouraging inter- and transdisciplinary research, governance and practice (Bowen et al., 2017; Ghodsvali et al., 2019; Leck et al., 2015; Liu et al., 2018).

While there is a growing body of literature on the evolution of this concept as well as on its potential benefits and shortcomings, most of this research focuses on studying related governance arrangements and policies (Lebel and Lebel, 2018; Pahl-Wostl et al., 2018; Venghaus and Hake, 2018). Despite the obvious implications for global value chains and production networks, very little if anything is known about whether the concept of nexus thinking has also been adopted and applied by business, despite calls for more research on the interactions between environmental policy and private sector actors (Burch et al., 2019; Franz et al., 2018; Hoff, 2011).

Our research therefore aims to *investigate corporate responses to multiple, interconnected sustainability issues or “nexus challenges”*. Specifically, we examine whether companies are aware of this need for simultaneously addressing nexus challenges and how they express this awareness. While extant research suggests that businesses increasingly recognize the various economic and strategic benefits from managing “triple bottom line” impacts, such approaches are predominantly driven by corporate assessments of the “business case for sustainability”, rather than concerns for finding solutions to global challenges that may require departure from business as usual (Dyllick and Muff, 2016; Scheyvens et al., 2016). Moreover, an

extensive literature has studied how companies respond to various sustainability issues separately (Mura et al., 2018), yet there is very little research on whether they consider these issues systemically in an integrated manner (Halme et al., 2018; Whiteman et al., 2013). This raises the question whether the prevailing risk versus opportunity framing adopted in most businesses remains adequate for interpreting and responding to many of these complex socio-ecological issues. We also examine the extent to which insights from the private sector may offer new recommendations for sustainability policy and governance more broadly.

In the next section we provide further details on our theoretical background. We then outline our methodological approach before presenting our findings and discussing them in light of extant theory, the limitations of our research, and its implications for scholars and practitioners.

2. Theoretical background

2.1 The need for nexus thinking

Achieving “development that meets the needs of the present while safeguarding Earth’s life-support system, on which the welfare of current and future generations depends” (Griggs et al., 2013: 306) continues to be a significant global challenge. Particularly in light of population growth and increasing urbanisation, the adequate provision of food, energy, water and health services creates complex governance and management problems that can only be addressed in an integrated manner (Folke et al., 2016; Olsson et al., 2017; Stafford-Smith et al., 2017; Walker et al., 2009; Weitz et al., 2017; Williams et al., 2017). The need for “nexus thinking” has been invoked to focus on understanding the connections, synergies and trade-offs between interconnected sustainability challenges, and increasingly also beyond those traditionally

associated with the energy-food-water nexus (Cairns and Krzywoszynska, 2016; Ghodsvali et al., 2019; Green et al., 2017; Portney et al., 2018; Leck et al., 2015).

Liu et al. define the nexus as “linkages between multiple distinct entities among sectors, scales and regions”, and specifically call for an expansion of nexus frameworks beyond energy-food-water sectors and to other scales “to overcome traditional ‘silo’ approaches by specialized institutions and agencies” (2018: 466). They offer an integrated framework of metacoupling to map socioeconomic and environmental interactions across space. Specifically, nexus thinking is argued to offer a more neutral way of addressing sustainability issues from a multi-centric rather than sector-specific perspective (Liu et al., 2017), as it requires the consideration of “interactions within a system (intracoupling) or place (e.g., country, state, city, county)” as well as “interactions between adjacent systems (pericoupling) and between distant systems (telecoupling)” (Liu, 2018: 12). The focus of much of this nexus literature, however, remains on policy and governance with very little knowledge on whether companies are aware of this need for more integrated, systemic thinking in designing their organizational responses to such complex challenges.

2.2 Corporate responses to sustainability issues

Extant literature suggests the ways in which companies pay attention to issues determine whether and how they respond. For example, research suggests that companies’ selective, situated, and structured attention processes have a distinctive influence on how they consider adaptation measures for coping with the physical impacts from climate change. However, these measures mainly rely on routine responses that appear to be unsuitable and insufficient given the complex nature of climate change (Pinkse and Gasbarro, 2019). While adaptation clearly plays a

significant role in the context of a changing biosphere, pressure is growing on companies to focus their attention on proactive mitigation efforts across a variety of sustainability issues in the coupled socio-ecological system (Bansal et al., 2018a; Burch et al., 2019; Lim et al., 2018).

More theoretical approaches towards understanding how companies respond to multiple sustainability challenges have drawn on cognitive framing perspectives and stressed the need for companies to manage tensions and paradox (Fleming et al., 2015; Hahn et al., 2014; 2016; 2018). Unlike efforts to focus on win-win outcomes based on the principle of creating shared value (Porter and Cramer, 2011; Crane et al., 2014), or a rational acceptance of certain trade-offs between different sustainability outcomes (Angus-Leppan et al., 2010; Bowen et al., 2017), the paradox perspective on corporate sustainability explicitly acknowledges tensions among different desirable, yet interdependent and, at times, conflicting sustainability objectives, such as environmental protection and social well-being (Hahn et al., 2016). By simultaneously addressing these objectives and regarding sustainable development as an end in itself rather than only a means to profit maximization, scholars have noted that the paradox approach allows business leaders to make greater contributions to addressing social and environmental challenges (Hahn et al., 2018). But in order to do so, they must accept the presence of tensions as normal, even positive, and to develop cognitive response mechanisms which draw on creativity, agility and reflexivity (Smith and Lewis, 2011; Ivory and Brooks, 2018).

In sum, while a few empirical and theoretical contributions provide early insights into how companies might respond to multiple, connected sustainability challenges, our research is specifically designed to examine whether the concept of nexus thinking can contribute to our understanding more generally given the complexities and trade-offs underlying sustainable development.

3. Method

3.1 Data and sample

Our research was driven by a desire to investigate the extent to which companies express awareness of or attend to the need for responding to multiple sustainability issues in an interlinked, simultaneous manner, as implied by the concept of nexus thinking. We therefore used qualitative content analysis to uncover the socially constructed nature of companies' responses to nexus challenges (Bansal et al., 2018b; Venghaus and Hake, 2018).

In this paper we draw on two rich secondary data sources: First, data available from the annual survey of CDP (formerly the Carbon Disclosure Project) collected in 2014 and second, companies' latest CSR/sustainability reports (as of August 2017) (Bansal et al., 2018b; Eisenhardt et al., 2016; Pinkse and Gasbarro, 2019). Data from the annual survey is provided by the CDP, a charity representing over \$100 trillion of investors and purchasers which has increasingly become a legitimate standard of sustainability disclosure and which has variously been analysed using different methods (e.g., Dahlmann et al., 2017; Pinkse and Gasbarro, 2019). While secondary data has its limitations, the breadth and relevance of this particular data source provided us with comprehensive access to an unparalleled range and detail of companies from different countries and industries to examine the “messiness” involved in tackling grand challenges (Eisenhardt et al., 2016).

For our sample, we focused our analysis on a set of 14 large companies that we identified as “extreme cases” (Eisenhardt et al., 2016) because they were the only companies that responded to all four CDP survey requests on climate change, water, forests and supply chains in 2014. The focus of these four surveys therefore reflected company information which, albeit

imperfectly, mirrored challenges posed by the more traditional notion of the energy-food-water nexus as well as potentially other sustainability issues.

Our theoretical sampling strategy was designed to capture a specific set of companies that shared a commitment to voluntarily disclose a wide range of sustainability information to their investors. We therefore anticipated that studying these “comprehensive-disclosers” had the potential to unearth unique and rich insights into cutting-edge corporate sustainability responses, rather than serve as an attempt to produce statistical generalizability (Eisenhardt et al., 2016).

A priori, we surmised that companies proactively responding to all four CDP surveys either reflected their strong positive engagement with a variety of important and connected sustainability issues for their businesses, or alternatively served as an exercise to increase stakeholder legitimacy due to significant underlying sustainability concerns (e.g., Aragon-Correa et al., 2016). A third possibility was that only the fourteen companies found the issues covered by the four CDP surveys to be material for their operations and worth reporting on (Durand et al., 2019).

Regardless of their true motivations, however, our research was driven by an interest in the degree to which companies not only responded to and reported on specific issues separately, but more importantly, whether there was evidence to suggest an awareness of and engagement with sustainability concerns in a more systemic, holistic and integrated manner (Griggs et al., 2014). As such, rather than examining companies’ actual sustainability performance or the veracity of their claims, we primarily sought to explore the language used to describe the sustainability approaches of these 14 companies. Using qualitative inductive research (Bansal et al., 2018b), our aim was to increase our understanding of whether and how “comprehensive-

disclosers” communicate the need to simultaneously manage several sustainability imperatives.

Table 1 provides basic sample details.

Table 1: Descriptive sample details of “comprehensive disclosers”

Company Name	Country of HQ	Industry sector
Associated British Foods	UK	Packaged foods & meats
Catalyst Paper Corporation	Canada	Paper products
Kellogg Company	US	Packaged foods & meats
Kimberly-Clark Corporation	US	Household products
L'Oréal	France	Personal products
PepsiCo, Inc.	US	Soft drinks
Reed Elsevier Group	UK	Publishing
Saint-Gobain	France	Building products
Smurfit Kappa Group PLC	Ireland	Paper packaging
Stanley Black & Decker, Inc.	US	Industrial machinery
The Hershey Company	US	Packaged foods & meats
Unilever plc	UK	Packaged foods & meats
Quanta Computer	Taiwan	Computer hardware
Hewlett-Packard	US	Computer hardware

3.2 Data analysis

Initially, we extracted all qualitative responses for these fourteen companies to all four CDP surveys in 2014. This resulted in 4,981 rows of data in an MS-Excel spreadsheet or 664 single-spaced pages in MS-Word with more than 330,000 words of text. Additionally, we downloaded their most recent CSR/sustainability reports. Data were uploaded and coded separately using MS Excel, MaxQDA 11 (for the annual sustainability reports), and NVivo 11.4.3 software (for the CDP data).

Our analysis proceeded first by examining companies’ responses to the four CDP surveys before investigating their more recent sustainability reports. In both stages, the authors

individually read through and coded responses based on our research question, *how do companies respond to multiple, interconnected sustainability issues or “nexus challenges”?* Specifically, we were interested in any kind of expression that might hint at both companies’ awareness and responses. Consequently, we were looking for statements of framing interconnected challenges as well as self-declared organisational actions and practices to better understand and characterise their engagement.

We also primarily coded data on the basis of companies making statements about how they actively affected or sought to mitigate broad and interconnected sustainability considerations, i.e. both environmental and social concerns from their products and processes. Here we were open to combinations of different types of environmental challenges, as well as interlinkages and effects on social issues such as employment, health, welfare and safety. We primarily sought to gain an overview of the extent to which companies actively recognized the interlinkages between multiple sustainability issues.

We then used inductive coding of these passages of text to analyse how exactly companies articulated the attention they paid to their multiple and simultaneous impacts on people, planet and profit. For this process we employed the commonly used Gioia method which proceeds through three steps: First, we created a set of codes that closely adhered to respondent terms, working with in-vivo codes to let the data speak for themselves; second, we summarised and abstracted these to second order codes on the basis of similarities and differences; and third, we distilled these into aggregate themes (Gioia et al, 2013). Together, they form the data structures presented in our findings tables. Importantly, this process (unlike other deductive or quantitative methods) does not demand interrater reliability and instead actively encourages the researchers to adjudicate differences in opinion through discussion (Gioia et al, 2013).

Similarly, in our analysis focusing on companies' sustainability reports, we first developed short, in-vivo quotes and summaries of companies' statements, which we then shortened and abstracted as second order codes. In this stage, we specifically focused on clear examples of actions by identifying ongoing organisational processes and achievements, rather than intentions. The first order codes were sorted and organised through a pivot table. From this pivot table we generated a list of 28 second level codes, which we further classified into four aggregate themes to summarise how companies engaged with multiple connected sustainability challenges. These themes were generated by carefully examining and connecting the content of the second level codes.

4. Findings

4.1 Organisational awareness of nexus challenges

We begin by presenting insights from our analysis of corporate responses to the four CDP surveys. Generally, we observe vague suggestions of companies beginning to manage interconnections between energy, food and water concerns, yet the term nexus itself is never used in any of our data. Unsurprisingly, most sustainability challenges refer to addressing issues of climate change through the development of clean energy processes and products, reducing impacts on forestry and biodiversity, as well as managing water risks and sanitation concerns. Companies primarily highlight efficiency drives, capital expenditure and investment, fuel switching, target setting, and incentivizing as important measures. We also find numerous examples of supply chain engagement and collaboration with industry, NGOs, academia and government as well as references to green and responsible innovation projects as part of companies' responses.

Yet while companies generally recognize and describe the interlinked impacts of different sustainability issues on their business (either as risks or opportunities), more explicit references to linkages between or spill-over effects from addressing multiple sustainability issues are rare. Responses usually reflect a predominantly “siloes approach” in which each sustainability issue is given specific but ultimately isolated attention. Partly, this may be due to the CDP’s siloes survey structure. Certainly during the time of the 2014 CDP surveys, a detailed corporate understanding of and responses to the holistic and interlinked nature of sustainability challenges appears uncommon among these companies.

Many sustainability issues reflect either concerns about risk exposure (both physical and regulatory), reputational damage, financial consequences or strategic business opportunities from product and service innovation, market development, competitive advantage, or industry leadership. Employee education, supplier and customer engagement, and other outreach initiatives are the most frequently cited examples of attempts to raise awareness of the interconnectedness of various sustainability issues. In terms of socioeconomic-environmental interactions, companies cite impacts on people, livelihoods and communities, particularly when discussing their natural resource-based supply chains. There appears to be very little recognition of the need for a more circular approach to business management (except the occasional reference to the circular economy, life-cycle assessments, whole-life cycle design, and recycling). While companies are clearly distinguishing their efforts and impacts between sustainable sourcing, production and consumption, there is no clear indication on how they seek to “close the loop”.

Next, we turn our attention to the way in which companies describe, explain and justify their engagement whenever they refer to multiple sustainability challenges. As Table 2

summarises, our findings suggest that companies employ a variety of framings. More specifically, companies make sense of and respond to multiple sustainability challenges in two main ways: first, responses in the form of *managerial devices* appear to be designed to claim that the company is already dealing with interconnected sustainability actions through real corporate action in the form of existing policies, partnerships, strategies, plans and processes. The focus here is very much on the past and present by emphasising achievements and ongoing activities. Examples include various forms of stakeholder partnerships and supply chain engagement; improvements in eco-efficiency and sustainability performance management; initiatives to enhance corporate affairs and public relations; managing and adapting a changing physical environment; and seeking out commercial opportunities and competitive advantage for the business by capturing emerging market opportunities from changing product demand and regulatory incentives.

For instance, a clear theme among companies is the greater need for managing the physical environment. While this entails to some extent the development of risk mitigation processes to reduce likely cost and reputational impacts, there is also an explicit recognition of organizational and societal dependence on healthy ecosystems. Companies specifically identify a changing natural environment as a clear source of concern for the long-term viability of their business, but also anticipate future commercial opportunities by preparing to address them.

The second category include organizational responses as *rhetorical devices* that seem to express awareness, understanding, and interpretation of the interconnections between multiple issues and therefore the need for integrated forward-looking intentions. This is done through the expression of long-term strategies, targets and aspirations that the business is aiming for, as well as through implicit and explicit acknowledgements of the interconnectedness of various

sustainability challenges. Importantly, in this latter category there are increased references to systemic barriers, achieving market transformation, and a recognition that addressing multiple connected sustainability challenges entails both opportunities and trade-offs, potentially reflecting a paradoxical approach.

For example, the theme of long-term strategy and aspiration covers statements from companies about integrating greater efforts to account for the wider societal and ecological costs and benefits of their products and operations. There are calls to embrace the ethical nature of these sustainability issues and a desire to adopt global leadership and stewardship roles to ensure both long-term corporate and planetary survival. Within this context, companies identify connected sustainability issues as significant organizational challenges, but also as a source of new strategic aspiration and ambition, for example, by aiming to make a significant positive contribution to society.

Similarly, we also find examples of some companies highlighting a need for better understanding the systemic nature and interlinkages between various complex sustainability challenges. Some focus on achieving triple bottom line progress, while others believe in the necessity of developing sustainable solutions and large-scale global improvements. To implement these ideals, companies suggest they are planning to change industry perceptions, driving market transformation and steering policy-makers towards sustainable interventions. Many of the statements relating to rhetorical responses explicitly include terms such as interconnected, systemic, holistic, life-cycle, simultaneously, recognize, realize, aware, conscious, solution, transformational, circular, role, vision, and responsibility, all of which are suggestive of a more integrative form of sense-making around the complexities of addressing sustainability challenges. Although these statements are primarily forward-looking and

aspirational, from a broader attention-based perspective they reflect at least a base level of awareness which is necessary for companies to move towards action (Pinkse and Gasbarro, 2019) (see table 3 for illustrative quotes).

At the same time, there is very little evidence of how exactly companies seek to achieve these aspirations. This result was one of the motivations for our analysis of CSR/sustainability reports, as described below. Whereas managerial devices appear to revolve around the classic risk/problem versus opportunity framing, the rhetorical responses category to nexus challenges is primarily aspirational but also embraces more holistic sustainability frames. Some companies at least appear to claim to be paying attention to a wider range of sustainability issues and considering their interlinkages. In part, they seem to achieve this through “issue bundling” (Dutton et al., 2001), and particularly by referring to non-organizational scales or entities. This broad categorization therefore appears to mirror the conceptual premise of companies using *procedural and communication channels* as situational contexts for attentional processing and decision making (Ocasio, 1997).

Table 2: Data structure for different examples of general engagement with multiple sustainability challenges in CDP climate change, water, forests and supply chain surveys

First order codes	Second order codes	Aggregate themes
<ul style="list-style-type: none"> • Joining industry-sector sustainability initiatives • Public-private sector partnerships • Working collaboratively with supply and value chain • NGO/project sponsorship 	<p><i>Stakeholder & supply chain engagement, partnerships</i></p>	<p>Managerial devices (risks vs. opportunity framing)</p>
<ul style="list-style-type: none"> • Investing in energy efficient technologies, renewable energies and fuel switching • Reducing number of plants • Providing incentives for performance improvements • R&D and product innovation • Changing employee behaviours • Measuring environmental footprints • Conducting impact assessments 	<p><i>Eco-efficiency & sustainability performance management</i></p>	
<ul style="list-style-type: none"> • Compliance with laws and regulations • Supporting sustainability legislation • Responding to changes in legislation • Survey and track reputation and consumer behaviours • Promoting sustainability credentials 	<p><i>Corporate affairs and public relations</i></p>	
<ul style="list-style-type: none"> • identifying and recognising risks and impacts from climate change and other changes in the environment • developing organisational responses and product solutions • carrying out risk assessment and due diligence • engaging in conservation efforts • conducting scenario planning • adapting supply chains • promoting access to water within communities 	<p><i>Physical risk management</i></p>	
<ul style="list-style-type: none"> • Improved efficiency enables renewable energy production • Carbon taxation creates additional financial incentives • Developing energy efficient alternatives to capture growing market opportunities 	<p><i>Commercial opportunities and competitive advantage</i></p>	

<ul style="list-style-type: none"> • working towards becoming ‘Net Positive’ • encouraging ethical business and doing the right thing • establishing short and long term sustainability goals and targets • leading by example • position the company as sustainability leader • develop policies and long term strategy with sustainability aspirations • advancing global stewardship 	<p><i>Long-term strategies and aspiration</i></p>	
<ul style="list-style-type: none"> • creating systemic, positive environmental change • removing systemic barriers • simultaneously drive human, economic and environmental progress • secure benefits for the long-term future of people and planet • recognize the complex challenges • accept responsibility to attain a deeper understanding of our impact on the world • drive market transformation • engage in more holistic landscape-level planning • assessing the potential win-wins and acknowledging trade-offs 	<p><i>Implicit and explicit acknowledgements of the interconnectedness of various sustainability challenges</i></p>	<p>Rhetorical device (holistic framing)</p>

Table 3: Illustrative quotes for rhetorical responses to addressing multiple sustainability challenges

<i>Long-term strategies and aspiration</i>	[Our company] “considers its work in sustainable agriculture to be an essential investment in our long-term future (and the health of the planet), because to operate successfully for another century, we need a continuous, steady supply of high-quality grains. Helping to promote sustainable agricultural practices today will help ensure that the growers, and the grains they nurture, are available tomorrow.”
	“We have set ourselves the challenge of working towards having a ‘Net Positive’ impact on the British countryside. Through this ‘Net Positive’ standard we commit to have a restorative impact on all aspects of our rural British supply chain.”
	“The most important components of the long term strategy that have been influenced by climate change (2-10+ years) are linked to the opportunity for us to continue to develop our low carbon business and mitigate risks associated with a higher cost of carbon.”
<i>Implicit and explicit acknowledgements of the interconnectedness of various sustainability challenges</i>	“The programme aims to bring about systemic, positive environmental change for the Bangladesh textile wet processing sector, its workers and surrounding communities and to contribute to the sector’s long term competitiveness.”
	“Our approach to simultaneously driving [<i>sic</i>] human, economic and environmental progress. This means we consider the human, economic and environmental impacts as we develop our products, manage our operations, and interact with our customers, employees and communities.”
	“As a global company, we are committing to cultivating a fair, respectful and engaging work environment that inspires our diverse global team to thrive professionally and contribute to the communities where we operate. We also have a responsibility to attain a deeper understanding of our impact on the world. When consumers purchase our instantly recognizable brands, they also help make the world a better place.”
	“We will encourage the development of life-cycle thinking throughout the supply chain and try to remove systemic barriers to improving resource efficiency, from the sourcing of raw materials to the disposal of post-consumer waste.”
	“Historically the paper industry was an industry associated with ‘cutting trees’ in natural forests. With the climate change moves this issue more to the centre of public debate, more and more interest groups realize that the paper industry is one of the parties needed to combat global warming as it is clearly a ‘tree planting’ industry. There could still be a loss of reputation with various interest groups that continue to perceive the industry as ‘tree cutters’.”
	“Our new policy is designed to drive market transformation by working with key suppliers and the industry with a commitment to stopping deforestation and development on peat land, as well as to bring about positive economic and social benefits for people and local communities. [We] recognised [our company] could make a bigger difference to some of the world’s major social, environmental and economic issues if we leverage our scale, influence and resources to create ‘transformational change’. We mean fundamental change to whole systems, not simply incremental improvements.”
	“Consider the potential win-wins and trade-offs between energy and other resources implicit in discussions about the move to a more circular economy.”

4.2 Organisational responses to nexus challenges

In our second stage of analysis, we concentrated on companies' CSR/sustainability reports published in either 2016 or 2017. We chose these reports because they focus more on the overall sustainability of the firm than the more narrowly-defined CDP responses and may be more likely to highlight corporate actions that demonstrate nexus thinking. While limited, our analysis of these reports suggests that the actions these companies have taken to respond to multiple sustainability challenges fall into four categories: 1) Governance and Management, 2) Internal Processes and Products, 3) External Engagement, and 4) Metrics and Assurance. Table 4 shows our first and second order codes and the associated aggregated themes.

Table 4: Data structure of different examples of specific policies and actions associated with multiple sustainability issues as identified in CSR/sustainability reports

First order codes	Second order codes	Aggregate themes
<ul style="list-style-type: none"> • Zero Deforestation • 100% Renewable Electricity • Reduction of GHG Intensity 	<i>Goals</i>	Governance and Management
<ul style="list-style-type: none"> • Solutions developed and distributed that encourage sustainable brand promise 	<i>Brand and Mission Promise</i>	
<ul style="list-style-type: none"> • Operational structure • Board of Directors policy framework 	<i>Corporate Governance</i>	
<ul style="list-style-type: none"> • Seven focus areas • Five strategic priorities • five-year goal of reducing by 50 percent the GHG emissions and water use 	<i>Focus on Multiple Sustainability Issues</i>	
<ul style="list-style-type: none"> • Biodiversity risk assessment 	<i>Risk Management</i>	Internal Processes and Products
<ul style="list-style-type: none"> • Operational eco-efficiency • Pipe insulation and valve modification • program to halve water and energy needed to grow potatoes • efficiency projects 	<i>Efficiency</i>	
<ul style="list-style-type: none"> • Sustainable landscaping features 	<i>Facility Management</i>	
<ul style="list-style-type: none"> • Switching to lower carbon emitting fuels 	<i>Fuel Switching</i>	
<ul style="list-style-type: none"> • Environmental challenge prizes 	<i>Prizes</i>	
<ul style="list-style-type: none"> • Sustainable paper purchasing 	<i>Procurement</i>	
<ul style="list-style-type: none"> • Ground-breaking technology • Energy efficient sliding automatic door that meets stringent air infiltration testing standards • Eco-innovation approach • Green policies in product development • Portfolio transformation • Product design 	<i>Product Innovation</i>	
<ul style="list-style-type: none"> • Solar projects • Renewable, carbon-neutral energy • Renewable energy 	<i>Renewable Energy</i>	
<ul style="list-style-type: none"> • Responsible Advertising to Children Policy 	<i>Responsible Marketing</i>	
<ul style="list-style-type: none"> • Sustainable management of plantations and forests 	<i>Supply Chain Management</i>	

<ul style="list-style-type: none"> • Reduction of production impacts • Fight against forced labor across the whole of its value chain • Supplier Code • Sustainable Farming Initiative • Structuring the production and sourcing of wax • Supplier collaboration • Strategic energy management program to enhance suppliers' operations • Supply chain sustainability programs • Reduction of suppliers' environmental footprint • Greenhouse gas emissions from supply chain 		
<ul style="list-style-type: none"> • Diversity training 	<i>Training</i>	
<ul style="list-style-type: none"> • Reducing waste sent to landfills 	<i>Waste Reduction</i>	
<ul style="list-style-type: none"> • Reach toward simplicity in packaging • Packaging innovations for printing and personal systems 	<i>Packaging Innovations</i>	
<ul style="list-style-type: none"> • Circular, low-carbon economy 	<i>Circular Economy</i>	
<ul style="list-style-type: none"> • School refurbishment and waste segregation training and drawing contest • Build sustainable communities near where we work by investing in initiatives to benefit at least 12.5 million women and girls • Access to healthier options for underserved communities • Access to healthier options for underserved communities • Food for Good Program focused on child hunger • Food for Good Program focused on child hunger 	<i>Community Engagement</i>	External Processes and Projects
<ul style="list-style-type: none"> • Education and training grant 	<i>Grants</i>	
<ul style="list-style-type: none"> • Make where we sell • Locally sourced waste as biomass fuel source 	<i>Local Sourcing</i>	
<ul style="list-style-type: none"> • Alliance of companies for water and climate change • Work with partners and experts • join leading companies in programs • Join Smart Cocoa programs 	<i>Partnerships</i>	
<ul style="list-style-type: none"> • Free access to information • Information sharing 	<i>Public Engagement</i>	
<ul style="list-style-type: none"> • ISO14001 certification • CDP A Lists • Eco-labeling 	<i>Certification</i>	Metrics and Assurance

<ul style="list-style-type: none"> • Certifications 		
<ul style="list-style-type: none"> • Life Cycle Analysis • Water quality assessment 	<i>Data Analysis</i>	
<ul style="list-style-type: none"> • Real-time metrics • Footprinting metrics 	<i>Metrics</i>	
<ul style="list-style-type: none"> • Working conditions compliance program 	<i>Compliance Program</i>	

The Governance and Management category includes text articulating a general focus on multiple sustainability issues as well as broad-based and interconnected goals relating to those issues. One paper packaging company, for example, lists five strategic sustainability priorities, while a drinks company mentions its five-year goal of reducing greenhouse gas emissions and water use by 50%. This category also includes mechanisms utilized to integrate consideration of these issues into corporate governance and risk management processes. A household products manufacturer discusses how the company's Board of Directors *"has established and approved the framework for [its] policies and procedures. Among these are our policies relating to environmental stewardship, fiber sourcing, energy and greenhouse gas emissions, waste, product safety, charitable contributions, human rights, labor, diversity and inclusion and employment."* As part of its 2022 Water Strategy, the company also outlines a process involving water risk screening, watershed analysis, and biodiversity risk analysis to *"determine mechanisms to reduce overall watershed risk."* A building products manufacturer also emphasized how its brand promise and mission contributes to sustainable cities and communities and responsible consumption and production.

The second category includes text emphasizing the implementation of processes and products primarily inside the company that relate to multiple sustainability challenges. Product innovation and supply chain management were the most common themes identified within this category. A packaged food and meats company, for example, discusses, how *"Sunlight, part of our global Surf brand, is having a big impact in South Africa with its new handwashing laundry powder...In drought-affected South Africa, where women still do the majority of laundry by hand, reducing the number of rinses required to wash laundry can make a real social difference by liberating women's time as well as saving water."* As an example of sustainable supply chain

management, a personal products manufacturer discusses how it is working to improve worker livelihoods and protect biodiversity in its Candelilla wax supply chain, which *“comes from a wild shrub that grows in the Chihuahan Desert, in Mexico, a very rich biodiversity zone. This wax is used in cosmetics for its softening and protective properties. In order to improve the conditions of production under which candelilla wax is produced while respecting biodiversity, [our company] and its partners provide support to 225 rural producers...by structuring the production and sourcing of the wax and improving access to the Mexican social security system.”*

Other themes mentioned in this category relate to making production processes more sustainable through greater packaging efficiency, improved facility management, more responsible procurement, and reduced waste. Several themes, including energy efficiency, renewable energy and fuel efficiency, focus on sustainable energy production. More specific actions include granting prizes for sustainable designs, the use of circular economy concepts, better worker training, and more responsible marketing practices.

The third aggregate theme identified covers text highlighting projects and processes primarily focused on engaging with external stakeholders, specifically through community engagement and partnerships. A publishing company, for example, describes its partnership projects with SOS Children’s Villages Netherlands (SOS) that *“focuses on helping girls enter (or return to) the educational system... In addition to working directly with the girls and their families, SOS support is being used for engaging social workers, literacy lessons for care givers, school materials, and teacher training. SOS is also creating a micro-fund for families who want to begin an income-generating activity, such as setting up a shop or farm. And there will be training for government officials and community stakeholders on avoiding child labour in the*

Yamoussoukro markets.” The project simultaneously addresses economic growth, education, and gender equity. Other themes in this category include grants for external organizations, local market development, local sourcing, and broader public engagement.

Metrics and assurance cover the fourth category identified which includes measurement, data analysis, certification, and compliance. A computer hardware producer mentions, for example, that its *“product use carbon and water footprints measure overall environmental impacts related to customer use of [our] products in absolute terms, taking into account shipped volumes. For personal systems, this includes the GHG emissions and water use associated with energy consumption throughout the lifetime use of a product. For printers, it includes the GHG emissions and water use associated with consumption of energy as well as paper and supplies during lifetime use of the product.”* The company also claims that it achieved “A” list status for different CDP surveys and that it uses third-party Life Cycle Analyses to identify areas for significant decreases in both its greenhouse gas emissions and its water consumption.

Overall, findings from the CSR/sustainability reports broadly fall into the “managerial devices” category previously identified in the CDP data. As an important exception, however, elements of the “Governance and Management” theme identified in these reports more closely resemble “rhetorical devices” due to their prospective and aspirational nature.

5. Discussion

Our insights from a theoretical sample of “comprehensive-disclosers” suggest that at best companies demonstrate a tentative awareness of the need for responding to multiple, interconnected sustainability issues consistent with academic calls for nexus thinking (Liu et al., 2017; 2018; Ghodsvali et al., 2019). Theoretically, we advance research on the concept of nexus

thinking by extending its application to organizational attention to multiple sustainability issues. We argue that while extant theories on organizational attention mostly stress companies' limited and selective focus, our initial findings suggest that some companies may be able to deploy executive attention to respond to multiple sustainability issues "quasisimultaneously" (Ocasio, 1997; 2011). Our paper adds to existing theories on the framings companies employ to advance these responses, and how nexus thinking may be an important aspect in creating these framings (Fleming et al., 2015).

Our findings suggest that the 14 companies identified are only slowly beginning to pay more attention to the interconnections and interdependencies between sustainability challenges. However, none of them yet demonstrate a more explicit and comprehensive variety of nexus "systems" thinking, for example, by mapping all of their products and operations against different sustainability challenges and providing a more scale or place/spaced-based assessment of co-benefits and spill-over effects. Such an exercise would not only highlight synergies and success stories, but also allow the identification of major gaps, disconnections, and trade-offs between different connected sustainability issues (Dyllick and Muff, 2016). Consequently, we find very little evidence to suggest that companies exhibit a paradox approach by providing a more transparent, honest, and integrated appraisal of their contributions to sustainable development, both negative and positive (Hahn et al., 2014; 2016; 2018; Smith and Lewis, 2011). Instead, companies in our sample tended to focus on a few selected products, projects and goals to sustainability issues they believed they were (positively) contributing to.

While limited, some practices described in the CDP surveys and sustainability reports of our sample nevertheless appeared to represent some progress beyond simple siloed approaches to interconnected sustainability challenges. This engagement with the "sustainability nexus"

covered a wide range of issues, perspectives and functions within the businesses, including marketing, product development, corporate governance and supply chain management, and thus perhaps represent early first steps towards greater executive attention to the complex interconnections among today's multiple sustainability challenges.

From a policy perspective, emerging disclosure standards, including Integrated Reporting and GRI, should guide and encourage companies to reflect on and report on sustainability issues in a more interconnected manner consistent with nexus thinking, rather than by treating each sustainability issue as a separate silo. This is particularly important as the more recent adoption of the UN Sustainable Development Goals has raised the broader policy challenge of developing solutions to the intertwined nature of sustainable development in an integrated manner (Folke et al., 2016; Olsson et al., 2017; Stafford-Smith et al., 2017; Walker et al., 2009; Williams et al., 2017). With the advent of this complex "network of targets" (LeBlanc, 2015), the term nexus is acquiring a significant new meaning which exceeds its origins in energy-food-water policy considerations. Instead, both policy makers and businesses are called on to approach the achievement of the SDGs through nexus thinking more broadly (Hull and Liu, 2018; Liu, 2018; Liu et al., 2018).

Important therefore would be for the UN to diffuse knowledge and guidance through the Global Compact and other channels to ensure that business leaders understand the importance of nexus thinking as a baseline means for addressing multiple, interconnected sustainability goals. Investors, non-governmental organizations and national governments can also encourage such integrated reporting through new and existing socially-responsible investing criteria, corporate sustainability rating initiatives, and mandatory disclosure policies.

5.1 Limitations

Our specific research design precludes broader generalization but offers opportunities for future research. First, our purposefully-chosen set of “extreme cases” provided us with insights from a sample that followed a very specific approach towards disclosing information through the CDP. While it is impossible for us to judge whether our findings were indeed unusual, this sampling strategy allowed us to assess data from companies which clearly engaged with different sustainability issues through the CDP. Future research would benefit from studying company responses across whole stock indices or sectors.

A second limitation relates to the sources and the nature of self-reported data included. Without legal requirements for companies to disclose sustainability information, the extent and quality of information provided are naturally driven by companies’ own interests. While companies can provide professional assurance of their disclosures, there is a need for further external validation. Combined with the fact that our data reflect self-written statements rather than real-world observations, our interpretations and conclusions are subject to bias. Future research should therefore also examine how companies and managers make sense of and respond to multiple sustainability issues by closely shadowing their work in situ.

6. Conclusion

The mounting challenges from sustainable development require policy-makers and other stakeholders to develop a broad, systemic understanding of the complexities, tensions and trade-offs involved in their solution. Business plays a dual role as cause and potential partners in helping governments and civil society with addressing these nexus challenges. We provide first empirical evidence suggesting that while companies largely continue with silo-based approaches,

there are early indications that at least some are beginning to understand the importance of more integrated, forward-looking responses. Our research thus contributes to existing perspectives on nexus thinking by studying its application in the context of multiple, interconnected sustainability challenges, rather than the more narrowly defined water-energy-food nexus. While nexus thinking continues to progress within social sciences and policy domains, we hope our research also provides insights into the broader utility of the concept by connecting with, contributing to and stimulating debates in other fields.

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