



Opportunities and Challenges in Commissioning Materiality-Driven Sustainability Reporting Towards the SDGs: The Case of Cadeler A/S

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Abstract

Frequently and recently tightening and expanding sustainability reporting policies and requirements can pose significant administrative burdens on SMEs upholding a strong culture of accountability to their stakeholder network. This seminal case study examines how a Danish offshore wind farm commissioner can efficiently (1) navigate towards credibility in and (2) derive actionable insights from their sustainability (reporting) integration trajectory by capitalizing on the increasingly emphasized materiality principle. Group-based Fuzzy AHP and Textual Analysis aim to excavate and assess senior managers' and external stakeholders' preferences based on the GRI Standards and the UN's SDG targets. Internal priorities emphasize safety, compliance, and profitability, whereas external stakeholders' and their groups' priorities exhibit mixed findings on their type and extent of alignment with the former. Content elements assigned higher relative importance tend to be more robust to changes in decision-makers' uncertainty and verbal bias. The author confirms that a simplicity-informativeness trade-off tends to be driven by stakeholder grouping and that a data-driven, subject-based, and objectifying approach should be complemented with context, managerial judgment, and process iteration.

Keywords: Sustainability; materiality; prioritization; credibility; actionability.

1. Introduction

Burgeoning streams within natural sciences stress increasingly adverse anthropogenic influence reflected in growing negative impacts on ecosystems' planetary boundaries through depletion of groundwater, rare earth metals and fossil fuels, and increasing GHG release (Bebbington et al., 2019). In the late 1990s, the Dutch chemist and Nobel laureate Paul Crutzen coined the term "Anthropocene" to describe the geological epoch in which human behavior is the primary driver of increasingly drastic changes in environmental processes, behaviors, and livelihoods (ibid.; Crutzen, 2006; Zoomers & Otsuki, 2017). In a parallel movement to worsening ecological conditions, conceptually similar trends in the social realm of human society gave birth to CSR, which was devised to hold organizations accountable for increasing social tension in communities and encourage a transition towards corporate citizenship that is argued to have emerged with the inception of the Industrial Revolution (Carroll, 2009; Schwartz & Carroll, 2003; Wren, 2005).

During the 1960s, social responsibility shifted from a re-

mote phenomenon into a corporate matter and expanded to community affairs (ibid.). Scholars started defining CSR, with one side emphasizing that businesses should use their resources in the interest of society and an intimate relationship between the two (e.g. Frederick, 1960), and another questioning the legitimacy of behavior that contradicts economic rationale (Friedman, 1970). Following conceptual acceleration in the 1970s, research streams from 1980s call for voluntary CSR adoption through businesses to maximize its effectiveness and focus on their stakeholder audience (Freeman, 1984; Jones, 1980). First empirical studies on stakeholder theory have evolved in the 1990s with CSR activity experiencing increasing adoption in Europe and the US (Carroll, 2009; Moon, 2005), which will be successful only if (1) mainstream organizations engage in CSR and incentivize related activity and (2) such commitment has a tangible and positive impact on the organization by adding to their environmental and/or social bottom line (Vogel, 2006).

Synchronically, such environmental catastrophes as the Exxon Valdez oil spill in Alaska in 1989 that arose from failing governance mechanisms and lacking sensitivity to

ESG and reputational risks (Bebbington, Larrinaga, & Mon-eva, 2008; Maguire, 2010) have raised the need for organizations to credibly explain to an increasingly pressuring stakeholder audience how their business model and activity creates value over time and how it tackles sustainability challenges through innovation in technology and/or management control; this type of transparency has become a critical requirement for their long-term survival (Bebbington & Larrinaga, 2014; Bocken, Short, Rana, & Evans, 2014; Busco, Frigo, Quattrone, & Riccaboni, 2014; Dyllick & Muff, 2016; International Integrated Reporting Council, 2013). The incident gave birth to the CERES Principles that allow investors and stakeholders to assess an organization's environmental performance (Orsato, 2009). Since the 1980s, the link between the occurrence of manmade natural disasters and the emergence of so-called Green Clubs that entail a wide range of guidelines, charters and programs to help organizations manage their reputational risk at cost of voluntary entry has intensified (ibid.; Bebbington et al., 2008; Power, 2009).

As part of the trend towards stakeholder centrality, legitimacy, and reputational capital, SR emerged as a complement to the corporate reporting portfolio, which was primarily focused on an organization's financial health and, unlike its nonfinancial counterpart, has gained substantial credibility, consistency, comparability, and maturity over the course of the 20th century that was shaped by conflicts, market crashes, and accounting scandals (Abernathy, Stefaniak, Wilkins, & Olson, 2017; Baron, 2014; Rupley, Brown, & Marshall, 2017; Tschopp & Huefner, 2015). Along with a substantial increase in investors' and public attention to nonfinancial performance, reporting on such has gained significant uptake and has become a standard routine for multinational firms in response to increasing stakeholder demand (Amir & Serafeim, 2018; KPMG, 2020).

To an extent, this development can also be attributed to expansion in international agreements and frameworks such as the UN's SDGs and the UNGC that provide companies with extensive guidance on improving SR (Jespersen & Olmsted, 2019; Rasche, Gwozdz, Larsen, & Moon, 2020; United Nations, 2015a, 2015b). This carries particular importance for increasingly mandated SR that emerged from South Africa as part of the King Codes stressing more stakeholder-centric corporate governance and carried over to the NFRD that mandates SR for larger-scale EU-based organizations in accordance with the UNGC's principles that encourages thorough sustainability risk management, performance management and measurement, and stakeholder engagement (Baron, 2014; European Commission, 2014; KPMG, 2016; Rasche et al., 2020).

With earlier studies doubting the value of SR (Burritt & Schaltegger, 2010; Vinnari & Laine, 2013), an increasing number of studies points at a wide range of (non-)financial advantages adopters can have over non-adopters and can therefore capitalize on dual returns arising from linking business-as-usual activity with strategic CSR (Baron, 2014; Dyllick & Muff, 2016). To start with, the value-generating

ability of the organization can be enhanced by reaping such direct benefits as better-informed decisions related to strategic direction, improved (opportunity) cost management, reduced coordination effort by building common ground or gains in productivity or reputational capital (Jespersen & Olmsted, 2019). Transparent reporting specifically can mitigate risk factors' impact on the organization and improve their access to cheaper debt and equity financing (Abernathy et al., 2017; Cheng, Ioannou, & Serafeim, 2014). Indirect benefits include, but are not limited to, higher legitimacy, greater chances of taking supplier roles as a result of higher transparency and information-processing capacity, and thus competitive edges from superior business relationships, project contracts, and improved access to capital markets (Jespersen & Olmsted, 2019).

With the advantages tending to outweigh a number of potential shorter-term drawbacks that can arise from greater transparency, it seems as if the adoption of nonfinancial reporting seems straightforward, especially since a growing number of investors and nonfinancial stakeholders tend to attribute financial value relevance to such disclosure practice (Barman, 2015; Grewal, Hauptmann, & Serafeim, 2020; Schiehl & Kolahgar, 2020). With a broad variety in approaches and high-level regulation with virtually absent enforcement mechanisms (Johansen, 2016), a major challenge resides in the implementation of SR that provides concise coverage on topics that matter to statement users without rendering the preparation of such reports into a comprehensive compliance exercise (Power, 2009). Put differently, the present lack of binding comprehensive regulation and guidance that would discourage cherry-picking and predominantly aspirational talk tends to disincentivize potentially committed organizations to identify, prioritize, and report on sustainability topics that are genuinely material to the business and their stakeholder's informational needs (Beske, Hausteiner, & Lorson, 2020; Christensen, Morsing, & Thyssen, 2013).

Very recently, the NFRD's review and the introduction of the EU Taxonomy on Sustainable Finance, along with continuously growing market interest, tend to push reporting organizations from greenwashing and towards more data-driven and comprehensive SR to efficiently direct capital flows to sustainable investment projects that are likely to yield dual returns for impact and ESG investors (Blowfield & Murray, 2008; Dyck, Lins, Roth, & Wagner, 2019; EU Technical Expert Group on Sustainable Finance, 2019; European Commission, 2014). With the EU Taxonomy becoming a mandatory disclosure that institutional investors are mandated to adhere to by late 2021, organizations outside financial services are required to follow suit by late 2022 (ibid.). With a majority of stakeholders involved in the NFRD review requesting that (1) the policy apply to organizations that are privately owned and count at least 250 members and (2) a tighter integration of sustainability performance indicators and higher-quality and more comprehensive explanations on which topics matter most and how they relate to the organization's sustainability strategy, an increasing reporting burden would start

applying to SMEs that may be constrained in committing organizational resources towards SR and therefore need to channel their capacity towards an approach that allows them to engage in informative disclosure practice, most notably through the identification of key nonfinancial topics and recipients (Baumann-Pauly, Wickert, Spence, & Scherer, 2013; Germanwatch, 2021; Majoch, Hoepner, & Hebb, 2017).

To illustrate how a smaller-sized organization can effectively move towards SR that is informative about their key sustainability drivers, this thesis report develops a possible point of departure for Cadeler A/S, a Copenhagen-based offshore windfarm commissioner that very recently became a public-interest entity on the OSL and very likely to become subject to tightening SR regulation in the wake of the organization's high-pace growth trajectory. With the EU heavily promoting renewable energy and committing up to 800 billion euros to offshore windfarm development plan as part of the Green Deal sealed in 2019, Cadeler A/S is assumed to substantially benefit from high-quality SR and strong financials to build trust with ESG investors and increase the likelihood to attract more financial resources to accelerate the Green Transition towards a carbon-neutral EU economy over the next decade (Cheng et al., 2014; EU Technical Expert Group on Sustainable Finance, 2019; European Commission, 2020a, 2020b; La Torre, Sabelfeld, Blomkvist, & Dumay, 2020; United Nations, 2015b).

This study focuses on how the organization can credibly substantiate their mission statement of contributing towards a sustainable future by means of a structured materiality-driven approach that fosters transparent SR beyond compliance and towards competitive edges (Churet & Eccles, 2014; Orsato, 2006). Apart from releasing their first SD Report in April 2021 as part of the SR mandate imposed through the firm's listing, the organization has a largely absent track record with SR and is expected to face significant competitive disadvantages, should they refrain from improving disclosure quality (ibid.). In particular, reporting against the SDGs has become a commonplace reporting activity and tends to be linked with thorough implementation of a recognized SR framework (Global Reporting Initiative, 2020a; Pizzi, Rosati, & Venturelli, 2021). Cadeler's unique situation with the opportunity to make a substantial contribution towards greening the EU's energy mix as part of the Green Deal's agenda motivates the following research question:

“What are the opportunities and challenges that Cadeler A/S should be wary of when integrating materiality-driven ESG Reporting that is more stakeholder-centric and in line with de facto established SR Standards the latest EU legislation on nonfinancial disclosure?”

The author attempts to answer this question geared towards effective SR and related information processing by answering two sub-questions in this report:

1. How could Cadeler A/S prioritize material sustainability topics when planning the production of an SD Re-

port that signals compliance with established frameworks and regulation, alignment with industry practices, and contribution towards relevant SDGs?

2. What are the steps to take for Cadeler A/S when integrating materiality-driven SR into organizational routines, management practices, and respective and sustainability control systems?

The first question deals with the concept of materiality and its dual nature that can drive both transparency and cherry-picking when preparing a value relevance-driven SD report. With the Standards released by the GRI in 2016 as the framework's sixth iteration, expanded by additional reporting standards in early 2021, and representing a de facto established SR framework, the GRI Standards represent a powerful framework that helps a reporting organization to live up to legal SR requirements imposed on the regional level due its strong link to the UN's SDGs, the UNGC, the NFRD, and ties to IR coming from an attempt to harmonize frameworks that presently work complementarily (Buhmann, 2018; Villiers & Maroun, 2017; La Torre, Sabelfeld, Blomkvist, Tarquinio, & Dumay, 2018; Sonnerfeldt & Pontoppidan, 2020).

The second question draws on the latest development preparing compliant SR with such frameworks as the GRI Standards, the NFRD, or the EU Taxonomy that is bound to substantiate SR practice by imposing sector-specific sustainability criteria for economic activity is intended to point at a possible action plan that bring Cadeler A/S closer to more substantiated future SR. This plan includes increasing information-processing efficiency and potential synergies from jointly using management control and sustainability control systems (George, Siti-Nabiha, Jalaludin, & Abdalla, 2016). Despite some studies proposing a transition from internal controls to external reporting, the opposite pathway can also produce high-quality SR that does not necessarily prioritize a feel-good narrative over stating genuine sustainability performance development, risks, and opportunities (Alrazi, Villiers, & Staden, 2015; Derchi, Zoni, & Dossi, 2020; Figge, Hahn, Schaltegger, & Wagner, 2002; Traxler, Schrack, & Greiling, 2020). Throughout the report, the author takes an information-processing perspective on how a resource-constrained organization like Cadeler A/S can capitalize on the materiality concept and leverage its potential towards truthful (self-)reporting to keep key recipients well-informed and increase financial markets' efficiency (Orlitzky, 2013).

Like in every scientific study, delimitations apply to this report. To start with, the paper is primarily concerned with prioritizing material topics with a quantitative case study approach and their implications on the construction of an external nonfinancial reporting system and how this can potentially impact its adoption an integration process. The study assumes that the applied SR frameworks are structurally efficient and do not induce perverse incentives, though those shortcomings may apply to specific sectors or industries. Likewise, the study is rather suggestive on the topics reported or those that could be disclosed outside of applied

frameworks and is reserving the assessment of framework-induced performance measure congruity to emerging research branches. The thesis is, to the author's knowledge, one of few reports that empirically test a structured materiality assessment methodology outside of the study it was applied to at inception (e.g. Calabrese, Costa, Levialedi, & Menichini, 2016) and is intended to provide the case study company, Cadeler A/S, with hands-on implications on how to prioritize SR topics in a controlled setting and pinpoint opportunities and challenges in its planning, adoption, and construction to effectively integrate materiality-driven SR on the organizational level. Therefore, the thesis departs from existing policies and suggests a possible baseline towards developing unique screening criteria, metrics or distinctive reporting topics for the renewables sector which are deemed advisable once an informative SR foundation is in place.

The remainder of the thesis report is organized as follows. Section 2 reviews literature on accounting and reporting for SD and introduces the concept of materiality as a key concept in this report, and outlines benefits and challenges inherent to adopting such routines rendering related processes and disclosures informative and credible for investors and non-financial stakeholders. Section 3 describes the methodological approach taken to analyze and draw implications from sustainability topics that are potentially material to Cadeler A/S and assumed to be informative on the organization's sustainability-related efforts and effects. Section 4 presents the results obtained from the internal and external materiality assessment and their corresponding SDGs. Section 5 discusses the results and their broader implications for Cadeler A/S and concludes with limitations and suggestions for future research.

2. Theoretical Background

2.1. Nonfinancial Reporting

2.1.1. Developments in the Reporting Landscape

Prior to the rise of stakeholder theory and SR, communication to the stakeholder audience was primarily directed to providers of financial capital through financial statements and primarily looked at reporting organizations through lenses of profitability, productivity, and risk management (Tschopp & Huefner, 2015). Its history traces back to the early 1900s with its value to the user increasing during the Progressive movement in the 1920s and 1930s, increasing industrialization, and more frequent and extensive access to capital markets (ibid.). With local developments and refinements in GAAP, the transition towards IFRS as a global reporting framework pushed forward by such intergovernmental institutions and NGOs as the OECD to enable global comparability of organizational financial performance and the IFRS' harmonization with potentially stricter local regulations poses ongoing challenges, as does the dichotomy of rules-based and principles-based regulation (ibid.).

Over time, the corporate reporting portfolio expanded substantially from brief income statements to complementary financial statements, risk management and governance

disclosures, and standalone SRs to give report users a clearer picture of an organization's past, present, and future (non-)financial performance and risks and their drivers, partly in response to the formation of CERES in response to the Exxon Valdez oil spill in 1989 (Baron, 2014; Rupley et al., 2017). Along with the advent of extensive financial reporting regulation and increasing stakeholder pressure in partial response to failures to hold organizations accountable for (non-)financial misconduct yet primarily for improved decision-making (Rupley et al., 2017; Tschopp & Huefner, 2015), both financial and nonfinancial disclosure have become increasingly comprehensive and sparked a discussion on how to render corporate disclosure more concise without sacrificing informativeness to the comprehensiveness-conciseness tradeoff outlined in the (non-)financial reporting literature (Jespersen & Olmsted, 2019). To illustrate, Stolowy and Paugam (2018) underline SR's significant uptake which tends to grab relatively more investor attention than financial information, implying that providers of financial capital tend to put nonfinancial reporting under more scrutiny to improve their asset allocation towards dual returns (Agrawal & Hockerts, 2019).

In 2013, the IIRC presented IR as a potential solution that integrates financial and nonfinancial strategic considerations into six capitals that the organization's business model uses as input factors for long-term value creation which tend to represent the outputs it generates. The underlying idea is that a higher input factor quality, such as more stringent focus on hard factors such as financial performance management paired with internal policies improving soft factors such as human and relational capital, can improve the states of either of the capitals and use the realized benefits as refined input factors to further improve their output (International Integrated Reporting Council, 2013). The (shared) value added to outputs by focusing on the inputs factor quality is assumed to accumulate over time and is contingent on the content elements that have the most material influence on a firm's business model's ability to create value (ibid.; Porter & Kramer, 2011).

Taking together the most prominent examples on SR, at least five organizations including the GRI, UNGC, PRI, IIRC, EC, and ISO provide reporting guidance, with most reporting frameworks serving as complements with partial overlap and therefore (1) representing a substantial administrative burden to organizations aspiring to truthful reporting and (2) creating the need to streamline nonfinancial reporting guidance and standards to reduce complexity and render SR more accessible, comparable, consistent, and reliable (La Torre et al., 2018). However, most frameworks encourage voluntary adoption and the NFRD, which tends to be well-received as an initial move towards mandating nonfinancial reporting on the EU level, does not require the reported information to be independently reviewed and can encourage organizations to ramp up disclosure volume by employing a comply-or-explain clause reducing the density of decision-useful information and likely incurring excess opportunity cost (European Commission, 2014; Johansen, 2016; La Torre et al.,

2020). Insights obtained from its review towards more credible SR implying a certain degree of dissatisfaction with the stringency of the NFRD's present state reveal that stakeholder pressure and the call for stronger enforcement will likely intensify in the near future and make a substantial contribution to the administrative reform building common ground for more evidence-based policymaking and more comparable, reliable, and consistent SR to support the efficient allocation of capital flows towards genuinely sustainable investments to bring SR on par with financial accounting and reporting (EU Technical Expert Group on Sustainable Finance, 2019; Germanwatch, 2021; R. Gray, 2006; La Torre et al., 2020; Lucarelli, Mazzoli, Rancan, & Severini, 2020).

2.1.2. The GRI Standards

The concept of sustainability or rather SD presently lacks a superior definition and can cause confusion when combined with growth aspirations (Robinson, 2004) and implications from SR that are contingent on the framework chosen for such (Wu, Shao, & Chen, 2018). The GRI originated in 1997 as a collaboration project of CERES and the Telus Group in Boston and released the first version of their SR framework in 2000 and has gone through five major iterations between 1997 and 2016 (Jebe, 2019; Matuszyk & Rymkiewicz, 2018) though lacks a definition of SD either yet guides the document user towards a "three-dimensional model based on an organization's economic, environmental and social impact" (Villiers & Maroun, 2017:4). The framework geared towards holistic and informative ESG reporting aims to establish a common language between companies and stakeholders through the provision of reporting principles, ruling on general (voluntary) disclosures, and guidance on how to deal with sustainability issues spanning across economic, environmental, and social topics (Villiers & Maroun, 2017).

Despite the framework's aspiration to guide a reporting company towards more informative SR by stressing the importance of disclosing material content elements that have a significant impact on the business and its stakeholders, its semantics tend to make the G4 appear as a framework that is encouraged to be adopted by organizations with sufficient available financial, temporal, and cognitive resources (Calabrese et al., 2016). With further reviews stating that these guidelines tend to suffer from partial redundancy, lack of clarity, and causing perceived overwhelm to reporting organizations, the GRI Standards, the framework's latest iteration and in effect since 1st July 2018, render SR more accessible in several ways, which are outlined below.

First, changing the semantic title from "Guidelines" to "Standards" signals a higher degree of legitimacy and tends to set them more on par with established financial accounting standards. Second, this transition is further restructuring the framework into modules (Global Reporting Initiative & University of Stellenbosch Business School, 2020). That is, the GRI Standards 101, 102 and 103 set the framework's foundations and general baseline SR requirements. Economic, environmental, and social topics are split over 34

topic-specific standards and 89 disclosures indicating how sub-elements of a topic shall be measured and reported (ibid.). Coverage on each topic is voluntary and encourages reporting based on what is deemed most material to the organization and their stakeholders; omissions, however, must be justified through a comply or explain clause (Pizzi, Venturelli, & Caputo, 2020). Reporting organizations can then decide whether to report on all management approach disclosures and at least one topic-specific disclosure of a material topic (core) or all of them (comprehensive) (ibid.). Its modular structure also enables more responsive SR updates and encourages quick adaptation to changes in compliance requirements (Skouloudis, Evangelinos, & Kourmousis, 2009) and provides a "balanced disclosure on management, economic, environmental and social sustainability themes" (Wu et al., 2018:1).

Second, the GRI Standards refine and emphasize the concept of materiality to the catalogue and therefore organizations making or intending to make optimal use of the framework by a thorough materiality analysis outlined in GRI 102-46 and GRI 102-47 (Machado, Dias, & Fonseca, 2021; Global Reporting Initiative & University of Stellenbosch Business School, 2020). Third, its rule-based nature, structured construction and detailed guidance on compliant reporting and metrics makes it a convenient alternative for organizations who are used to rule-based routines inherent to financial reporting and want to refrain from principles-based regulation (Reynolds & Yuthas, 2008). Finally, its strong stakeholder focus encourages truthful, simple, and appropriate reporting through its aspiration to balance comprehensiveness and conciseness when adhered to and makes it responsive to changes in stakeholders and their informational requirements (ibid.). Presently, the GRI framework tends to be the preferred alternative among organizations planning to adopt SR (Rodríguez-Gutiérrez, Guerrero-Baena, Luque-Vílchez, & Castilla-Polo, 2021) and their database lists 63,852 Reports and 38,484 GRI Reports (as of 22nd May 2021).

2.1.3. IR and SR: Mutually Exclusive Concepts?

SR is a critical first step for organizations to assess the extent to which their activities contribute to planetary (un-)sustainability and identify where to be held accountable for sustainability impacts, potentially through cooperation with investors and the public sector (R. Gray, 2006). Put differently, an organization can increase its chances of long-term survival by transparently engaging with their stakeholders and conveying the link between their business model activities and value creation over time (International Integrated Reporting Council, 2013). Value, however, does not share a common definition and perception in individuals and thus needs to be reified to resolve disagreement on its presence and type of contribution (Bourguignon, 2005). For instance, shared value, coined by Porter and Kramer (2011) and created by organizations through profit-making and stakeholder engagement geared to social welfare, is a relatively novel concept and is thus earlier in its reification process and pre-

sumably more susceptible to be challenged for conceptual shortcomings (Bourguignon, 2005). The failure to recognize compliance or challenges to reconcile an organization's financial profit-orientation with that directed towards non-financial surpluses and thus breaking a perceived trade-off tends to be a general issue brought up in academic literature since the inception of shareholder theory, stakeholder theory, and CSR (Crane, Palazzo, Spence, & Matten, 2014; Friedman, 1970).

Intertwined with value creation and relevant sustainability topics is their linkage to the organization's business model, which consists of three pillars essential to gaining and sustaining competitive advantage (Barney, 1991): (1) value proposition, i.e. the incremental benefit customers are only receiving at the providing organization and are willing to devote monetary resources to, (2) value delivery, i.e. how organizational stakeholders receive incremental benefits, and (3) value capture, i.e. how the providing organization retains the incremental benefit received (Richardson, 2008). Bocken et al. (2014) extend this traditional perspective by introducing eight generic business model archetypes geared towards the creating of sustainable value through a technological, social, and/or organizational focus. With technological business models focusing on material and/or energy efficiency, circularity and green substitutes, socially oriented archetypes emphasize functionality instead of ownership, stewardship, and frugal behavior, whereas business models with an organizational focus tend to be geared towards so centering around societal needs and scalability (ibid.). Since both the GRI and IR framework require disclosure on the properties of the organization's business model, focusing on such can render SR more credible when aligned with highly material content elements (Global Reporting Initiative & University of Stellenbosch Business School, 2020; International Integrated Reporting Council, 2013; Morioka, Evans, & Carvalho, 2016).

Whereas IR explicitly stresses value creation over time, the GRI is more explicit on sustainability impacts induced by a reporting organization (Global Reporting Initiative, 2020a; International Integrated Reporting Council, 2013). Despite a growing stream of research building on the value-impact distinction and further conceptual difference that are assumed to lead to the adoption of either alternative (e.g. Jensen & Berg, 2012), recent findings signal a degree of harmonization by identifying increasing overlaps between the GRI's SR framework and IR (Petcharat & Zaman, 2019). Therefore, one can argue that GRI-based reporting is not exclusively impact-oriented albeit its emphasis on value creation over time is less explicit (ibid.). Implications from this finding are twofold: First, distinguishing between SR and IR may become less clear in the future given complementarities between reporting styles (ibid.) and when factoring in efforts directed towards the harmonization of the wealth of non-financial reporting frameworks in addition to IR and GRI, such as SASB's guidance and a number of assurance standards such as the AA1000AS (Jebe, 2019; La Torre et al., 2018; Saenz, 2019; Safari & Areeb, 2020). Second, IR with its

partial integration into the GRI Standards becomes more accessible to organizations that face higher reporting capacity constraints and more informative given informational complementarities between SR and IR (ibid.), since the former in the form of GRI tends to be well-adopted in reporting organizations worldwide (e.g. Rupley et al., 2017).

2.1.4. Disclosure Quality and Enforcement

A burgeoning stream of research notes that SR quality that can be influenced by such internal organizational drivers and external forces as mandated SR policies embedded in government regulation (Badia, Bracci, & Tallaki, 2020; Mies & Neergaard, 2020). With respect to non-mandated IR, recent investigations assert that such reports tend to be inflated and susceptible to increases in disclosure volume and impression management when organizational earnings are low (Melloni, Caglio, & Perego, 2016). Similarly, Stacchezzini, Melloni, and Lai (2016) reveal biased disclosures and a positive link between sustainability performance and the extent of information provided on such along with an overall substantial lack of quantification.

Du and Yu (2020) find that future CSR performance tends to be significantly affected by the disclosure material's readability and textual sentiment. It is likely that the attempt to conceal sub-par sustainability performance at the expense of disclosure quality will divert investor interest from publicly listed organizations engaging in such practice (H. Z. Khan, Bose, Mollik, & Harun, 2020). Therefore, it can be inferred that emphasis on underlying impacts and effects can positively impact perceived credibility from (non-)financial stakeholders (ibid.). Factoring in concerns on SR frameworks' integrity, it seems as if disclosure-related opportunism applied to nonfinancial reporting frameworks tends to occur independently of such. As a potential remedy, Amran, Lee, and Devi (2014) recommend to tightly integrate CSR management into organizational processes and governance mechanisms to legitimize SR and disclosure credibility on the firm's vision and mission statement, potentially along with external stakeholder pressure.

Regarding GRI report quality in the wind energy sector, Moseñe, Burrirt, Sanagustín, Moneva, and Tingey-Holyoak (2013) show that institutions do not necessarily enforce a transition towards higher-quality SR sufficiently. In the case of the Spanish Wind Energy sector, Iberdrola as a "strategic company leader" (ibid.:210) has capitalized on their unique ability to prepare extensive SR documentation in accordance with the GRI framework and their size to put "coercive pressure" (ibid.) on their industry rivals that went beyond that imposed by institutions. As a result, Iberdrola paved the way for how Spanish organizations operating in the Wind Energy sector disclose sustainability information based on GRI by imitating the organization (ibid.). Adopting nonfinancial reporting and the degree of framework compliance conveyed by organizations operating in the wind energy sector is a largely unexplored field, making this thesis report one of the first of its kind to assess which SR topic tend to be most prioritized and how pronounced GRI compliance in reports is

reflected.

To the author's best knowledge, only one longitudinal study by Talbot and Boiral (2018) assesses the degree to which organizations in the energy sector adhere to the requirements laid out in the GRI framework. The authors find that 92 percent of audited sample reports and the practices from six out of 21 organizations tend to engage in non-compliant SR and tend to apply a diverse methodology of impression management techniques (ibid.). Disclosure of non-compliant information spans from lacking transparency in the calculation methodology applied to GHG emissions over incomplete information on environmental metrics to content that lacks entirely (ibid.). Over time, the authors find mixed yet mainly negative evidence on improvements in environmental SR and changes in content elements of SR disclosure material and attribute the results to two mechanisms (ibid.). First, implemented legitimization strategies tend to downplay the lack of impact data that may have significant implications on the organization's sustainability strategy and emphasize commitment to future disclosure of presently lacking information (ibid.).

Second, there tends to be a positive link between non-compliant reporting and an organization's propensity to distort balanced disclosure by artificially inflating positive news and further downplaying their negative counterpart through deliberate neglect of information or transferring negative information to less visible spots in reports such as footnotes (ibid.). Likewise, organizations tend to manipulate numbers, for instance by replacing total GHG emissions with GHG intensity or changing reference points when reporting environmental performance data (ibid.). Importantly, the conclusions hold for organizational SRs that were approved by an independent third party that presumably enhances the reports' credibility to the stakeholder audience (Porter & Kramer, 2011). Therefore, one can argue that stakeholders with a less sophisticated assessment tools are likely to have difficulty in verifying SR information (Talbot & Boiral, 2018). Notably, the study relies on the GRI G3, which tend to be less refined than the GRI Standards in that they do not reflect 10 years of learning since the integration of the materiality principle in the GRI framework and evolution in assurance (Abernathy et al., 2017; Brown, Jong, Lessidrenska, & Mossavar-Rahmani, 2007; Gerwanski, Kordsachia, & Velte, 2019; Jebe, 2019; Matuszyk & Rymkiewicz, 2018).

Given the rather pessimistic review of institutional influence on SR, what has changed in the last years and where will it go? Over the last decade and most notably eight years, the call for putting a tighter grip on organizations and investors has been translated into the Accounting Directive 2013/34/EU and, more importantly, the NFRD which can be considered the first mandatory nonfinancial reporting regulation introduced on the EU level (Johansen, 2016). It has recently been complemented by the EU Taxonomy framework to fuel the transition towards a carbon-neutral economy and achievement of the UN's SDGs' ambitions laid out in the 2019 EU Green Deal (EU Technical Expert Group on Sustainable Finance, 2019). The NFRD presently requires or-

ganizations with more than 500 employees to report on four pillars based on the UNGC's principles, namely (1) social & employee-related matters, (2) environmental matters, (3) respect to human rights, and (4) anti-corruption and bribery (European Commission, 2014). According to § 19a, each of these pillars requires a description of the organizations business model, related policies, their outcome and risks to manage, and which metrics are used to capture performance on the respective pillar (ibid.).

Although an integrated comply-or-explain clause and a rather open policy design are intended to foster informative SR reporting and organizational learning towards it (Buhmann, 2018), the NFRD does not require an assurance engagement to verify the information disclosed (ibid.). Along with opening the door to managerial opportunism in CSR disclosure due to the ambiguity inherent to nonfinancial information, the optionality of external verification implies that its adoption can be seen as beyond-compliance behavior though making it a statutory requirement can have a positive impact on SR quality and enhance its credibility (Junior, Best, & Cotter, 2014; Porter & Kramer, 2011). Mandating such verification procedures and more rule-based reporting tend to positively impact SR quality and performance, which tend to be substantially driven by cultural factors and the sophistication and experience of a country's legal system in setting SR rules (Ioannou & Serafeim, 2012; Mies & Neergaard, 2020; Scholtens & Sievänen, 2013) and temporal factors (Conway, 2019). Denmark, France and Norway, for instance, have introduced mandatory CSR reporting in 2009 and 2001 and 2013, and well ahead of other EU members though do not prescribe any specific SR framework (Baron, 2014). Although mandatory reporting has a significantly positive impact on preserving environmental and social conditions (Eccles, Krusz, & Serafeim, 2012), such standardization can render SR compliance-driven, make adopters neglect potential benefits, and could "portray business-as-usual as genuine efforts in ESG" (Baron, 2014:26). The introduction of the EU Taxonomy on Sustainable Finance together with an extensive review on the NFRD, tend to underline the EU's transition towards more standardized and mandated SR activity (Baron, 2014; EU Technical Expert Group on Sustainable Finance, 2019; Germanwatch, 2021; Matteo La Torre et al., 2020), with the former elaborated on in the following.

The EU Taxonomy on Sustainable Finance represents the centrepiece of the EU's efforts to channel capital flows towards activities that sustainably develop the economy towards the UN's SDGs and carbon-neutrality by 2030 and 2050, respectively, by setting sector-specific technical screening criteria (TSC) that classify an economic activity as sustainable and thus able to contribute to environmental policy objectives (EU Technical Expert Group on Sustainable Finance, 2019; European Commission, 2020b). The TSCs are tailored to a wealth of economic activities defined by the NACE Rev 2 framework intend to ensure that the activities channel efforts towards six environmental objectives, namely (1) climate change mitigation, (2) climate change adaptation, (3) sustainable use of water and marine re-

sources, (4) transition to a circular economy, was prevention and recycling, (5) pollution prevention and control, and (6) protection of healthy ecosystems (ibid.). According to the framework, an economic activity is environmentally sustainable (i.e. Taxonomy-aligned) when it (1) makes a substantial contribution towards at least one of the six objectives and (2) does no significant harm to any of the six targets, (3) complies with minimum social safeguards outlined by the ILO core labor conventions, and (4) adheres to the activity-specific technical screening criteria (ibid.). There are presently TSCs for climate change mitigation and adaptation objectives and on how an adopting organization shall avoid harm to the remainder, indicating that parts of the framework are under very recent development (ibid.).

Identifying reporting requirements can complement environmental reporting based on the GRI Framework since such catalogues as the EU Taxonomy, which is virtually the first evidence-based SR policy, tend to stimulate a significant negative relation between such policies made and GHG emissions on a supranational level (Lucarelli et al., 2020). This framework will require Cadeler A/S to substantiate their environmental reporting by the extent to which their realized Revenue and incurred Capex and Opex materialize through environmentally sustainable activity and contribute to decarbonizing the EU economy. Furthermore, it is assumed to enhance the organization's ability to attract capital flows from ESG investors and convey its theory of change on how capital flows build an economically and environmentally desirable outcome proxied by the SDGs (EU Technical Expert Group on Sustainable Finance, 2019; United Nations, 2015a, 2015b). The following section emphasizes the materiality principle, which will, along with other desirable characteristics such as timeliness and comparability, be assigned special emphasis in this thesis report. The underlying idea is that (1) the goal of SR should be the provision of decision-relevant information towards the organization's stakeholder audience, and (2) incorporating the materiality principle into organizational processes can reduce long-term reporting and communication costs to the organization.

2.2. Materiality Analysis: Engaging Stakeholders with a Double-Edged Sword

Present the wealth of benefits that an organization can reap with the integration of sustainability accounting, reporting and increased sensitivity towards accountability, how can it start its transitional journey towards comprehensive sustainability integration (Dyllick & Muff, 2016) and implement a nonfinancial reporting ecosystem that is in line with recognized SR frameworks and the latest (upcoming) regulatory practice in the EU? In the words of Torelli, Balluchi, and Furlotti (2020), "Materiality is the driver through which companies can select issues to be included in nonfinancial reports favouring the expectations of all stakeholders" and the key ingredient for integrating ESG matters into organizational routines and refining a firm's sustainability strategy towards the creation of shared value (Whitehead, 2017). In other

words, incorporating the materiality principle into organizational processes can reduce long-term SR and communication costs and foster innovation and beyond-compliance behavior (ibid.). Nonetheless, SR informativeness is inherently multi-dimensional and is presumed to hinge on how well an adopting organization can credibly identify and prioritize the focus areas of its sustainability strategy and external SR (e.g. Torelli et al., 2020).

Considered "one of the cornerstones of accountancy" (Frishkoff, 1970:116), the materiality principle plays a dual role in that (1) it sets the minimum extent of disclosure reporting organizations their auditors need to verify and (2) it sets boundaries on disclosure-grade elements to ensure concise and balanced reporting that does not expend on potentially competitive edges (Baumüller & Schaffhauser-Linzatti, 2018; Hsu, Lee, & Chao, 2013). Consequently, it channels an organization's financial, temporal, and cognitive resources towards informative disclosure practice by maximizing their efficiency and effectiveness absent both (1) overstraining those resources' capacity and (2) misdirected reporting efforts towards virtually immaterial content elements (G. L. Gray, Turner, Coram, & Mock, 2011). Importantly, unnecessary strain on statement users' information-processing capacity is avoided and reduces information asymmetry in the organization-stakeholder dyad (Churet & Eccles, 2014; Jebe, 2019). On the EU level, the materiality principle is embedded in the Accounting Directive 2013/34/EU and the NFRD which guide the preparation of financial and nonfinancial statements (Baumüller & Schaffhauser-Linzatti, 2018). Similarly, Jebe (2019) notes that laying relevance thresholds over a reporting firm tends to ensure their compliance to externally imposed policies and therefore (1) a license to operate, and (2) an increased likelihood to attract interest from sophisticated impact investors providing capital flows (Deegan, 2002; Weber, 2016).

2.2.1. Organizational Drivers

Recent empirical investigations note that a technical-rational approach applied to common materiality assessments is not free of managerial judgment and tends to objectify its inherent subjectivity and should therefore be complemented by socio-political considerations and dialogic accounting which is virtually synonymous with active stakeholder engagement (Puroila & Mäkelä, 2019; Zhou, 2011). Specifically, the former note that materiality assessment tends to entail considerable variability across (1) underlying objectives, (2) authorities of information, (3) potential (in-)comparability, and (4) transferability (ibid.). Depending on either a society- or corporate-centered approach materiality assessments can either be used to make sustainability considerations or stakeholder relationship management part of the organization's decision-making agenda or expose risk factors to the business and its finances or stakeholders' informational needs (ibid.; Puroila, Kujala, & Mäkelä, 2016). Authorities of information tend to be defined on a continuum ranging from a strictly internal corporate to a strictly external and group-based matter reflected in methodologies

falling in the same continuum (*ibid.*). Regarding criteria used to determine material topics, technic-rational criteria are represented by materiality matrices or co-measurement across categories, whereas topic-specificity favors evaluating topics to defined and isolated categories such as economic, environmental, or social; importantly, results obtained from different approaches may suffer from incomparability (*ibid.*).

Finally, the assessment's outcome can differ in its nature and therefore tends to limit its transferability to changes in the reporting organization's operational or strategic financial and/or sustainability context (*ibid.*; Gerwanski et al., 2019). Put differently, a truthful and accurate snapshot of an organization's material sustainability issues may lose its ability to capitalize on these two traits over time and tends to be susceptible not only to changes in the reporting organization's operational and strategic focus, but also to the composition of its stakeholder audience that tends to use such assessment as a guidance to assess the organization's strategy towards dual returns (*ibid.*; Beske et al., 2020). Conversely, it is likely that inaccurately disclosed material elements become accurate over time though unlikely for an external statement reader to identify with limited organizational knowledge (Talbot & Boiral, 2018).

2.2.2. Benefits and Challenges

Typically, material topics are conveniently communicated through a matrix that captures their relative impact on the reporting firm and importance to their stakeholders (Bellantuono, Pontrandolfo, & Scozzi, 2016). In a burgeoning stream of research on this method's sensibility, Puroila and Mäkelä (2018) find that materiality disclosure of large-cap organizations with GRI-compliant SR tends to assume that reportedly material topics apply to the organization's entire stakeholder audience and is unclear on their relevance to each party. Put differently, a materiality matrix tends to over-aggregate and -simplify potentially complex stakeholder perspectives and assume comparability and (com-)measurability in their type and magnitude, meaning that disclosed overviews tend to be silent on stakeholders' and the organization's underlying economics and preferences (*ibid.*) and present "a compromise of different [divergent] perceptions on what sustainability information is material" (Puroila & Mäkelä, 2019:1056). Omitting detailed information on how the disclosed materiality matrix was constructed can question its credibility and necessitates the materiality assessment to be a structured and transparent procedure (Calabrese et al., 2016; Machado et al., 2021). Importantly, interpreting omissions through a materiality lens are deemed imperative to not misinterpret information gaps in SR material (Unerman & Zappettini, 2014).

Besides improved stakeholder engagement and exposing business risks and value drivers, a materiality analysis tailored to the organization's core capabilities can be used to capitalize on organizational learning on such key outputs as GHG emissions, energy management, or safety measures to get a better grasp of how an organization's underlying processes drive their sustainability performance and use the in-

sights as strategic inputs for the organizations' sustainability strategy and communicating risk factors to the stakeholder audience (Jebe, 2019; Puroila et al., 2016). In turn, resulting outputs serve as inputs for a refined analysis that can further build organizational legitimacy and work against the trend of instrumentalizing materiality analysis for impression management rather than credible SR and reframe the concept (Beske et al., 2020; Puroila et al., 2016). From an investor perspective, a transparent and concise disclosure on material nonfinancial items tends to positively impact an organization's stock price informativeness, value relevance and market- and firm-level ESG performance, where the market gains be explained by growing investor interest towards materiality-driven SR and accountability (Grewal et al., 2020; M. Khan, Serafeim, & Yoon, 2016; Schiehl & Kolahgar, 2020). Further benefits include improved investment risk management and lower opportunity cost through stronger focus on a market's underlying value drivers (Jebe, 2019). Plus, an organization and their stakeholders tend to face lower communication and agency cost in communicating their aspiration levels through a market, framework, or institutional lens (Cerbone & Maroun, 2020).

When adopting materiality-driven reporting, an organization tends to face several challenges and dilemmas. To start with, the concept of materiality, similar to sustainability, does not share a universal and/or mandated definition and what is perceived as material tends to be the result of social engineering driven by society's or addressees' context and framing (Jebe, 2019). Consequentially, different parties can describe the same issue in different terms with different perceived meanings shaped through an interplay of construction and intervention to such, which ultimately leads to a frame or rather perception of an element and makes an assessment inherently subjective (*ibid.*; Reimsbach, Schiemann, Hahn, & Schmiedchen, 2020). Further complexity is introduced by the absence of standardized methodology and guidance in nonfinancial reporting frameworks (Machado et al., 2021; Puroila & Mäkelä, 2019). Materiality-driven SR can be based on two types of materiality, namely (1) quantitative materiality (investor-oriented) of figures that are strongly informative about an organization's underlying economics, and (2) qualitative materiality (stakeholder-focused), which emphasizes information that is not economic or financial in nature yet can have financial implications on the organization's value-generating ability (Grewal et al., 2020; Jebe, 2019).

From another SR perspective, Zhou (2011) points at the dilemmas of conciseness and comprehensiveness and selective and mechanized reporting. Comprehensiveness is argued to result from increasing informational needs from stakeholders that are required to be reflected in previously concise reporting material, though other stakeholders may consider the same information less relevant to their decision-making (*ibid.*; Jebe, 2019). With diverse information demand from stakeholders, reporting organizations tend to transition from selective reporting focusing on key issues to mechanized reporting, which tends to be SR that is more streamlined, comprehensive, and compliance-driven

yet tends to lack topic prioritization and responsiveness to emerging topics that may be interrelated or challenge the value and belief system reported (*ibid.*). Compliance, on the other hand, tends to be relevant only if misreporting is sufficiently disincentivized to render materiality-driven reporting more cost-efficient and potentially enforceable (*ibid.*; Beske et al., 2020). A possible step is to interlink quantitative and qualitative materiality more tightly by (1) disincentivizing impression management and (2) separating financial and nonfinancial policymakers to co-evolve both systems to a comparable standard (Beske et al., 2020; Jebe, 2019).

2.2.3. Materiality in the GRI Framework

The GRI Standards take a multi-stakeholder perspective on SR and thus stress the principle of including external stakeholders in assessing material content elements to report that transcends through a four-step procedure (Global Reporting Initiative, 2013; Global Reporting Initiative & University of Stellenbosch Business School, 2020). The materiality principle states that SR must “reflect the reporting organization’s significant economic, environmental, and social impacts; or substantively influence the assessments and decisions of stakeholders” (Global Reporting Initiative & University of Stellenbosch Business School, 2020:10) by setting relevance thresholds to ensure compliance (Jebe, 2019). In the assessment, the first three steps prior to SR disclosure entail (1) identifying, (2) prioritizing, and (3) validating material topics to the reporting organization and their stakeholder audience that qualitatively give an idea on how to allocate resources committed to SR; the final step comprises the review of the report under considerations of stakeholder inclusiveness and the organization’s sustainability context for the next period’s SR (Global Reporting Initiative, 2013).

The GRI Disclosures 102-46 and 102-47 require an organization to describe the approach through which they determined material sustainability topics and a list of such (Global Reporting Initiative & University of Stellenbosch Business School, 2020). Although moving beyond compliance by adhering to voluntary guidelines tends to be associated with positive feedback from regulators, assurance providers, and the broader stakeholder audience (e.g. Pizzi et al., 2021; Porter & Kramer, 2011), doing so tends to be an imperfect remedy against excess reputational or sustainability risk and also stakeholders with higher-powered informational needs. A practical example is represented by how both the organization’s most salient stakeholder audience and most material topics are determined (Beske et al., 2020; Mitchell, Agle, & Wood, 1997; Torelli et al., 2020).

In very recent studies devoted to assessing disclosure quality of GRI-compliant SR, Machado et al. (2021) investigate how transparently a sample of GRI-compliant organizations report on determining key addressees and material topics as their SR’s foundation. They find that most organizations tend to provide a high-level outline rather than a detailed description on their methods’ assumptions and procedures (*ibid.*). This has three implications. First, a statement user interested in the methodology could question

the credibility of the report with imperfect knowledge on the methodology provided by such. Second, a number of studies, statement users, and ESG rating agencies taking SR information as inputs are at risk of taking materiality and thus credibility for granted by assessing GRI compliance and adoption alone (e.g. Torelli et al., 2020). These findings hint at a positive association between lacking enforcement on transparent methodological disclosure and cherry-picking and incomparability (Puroila & Mäkelä, 2019).

Third, assurance providers and regulators carry not only responsibility in ensuring accuracy in more elaborate reporting demanded as part of the NFRD review, but also in that the organization has run a structured approach for determining SR content that was selected due to its relative importance rather than its convenient reportability (Beske et al., 2020; Calabrese, Costa, Ghiron, & Menichini, 2019; Germanwatch, 2021). Importantly, future iterations of the GRI framework could not only focus on broader coverage of transferable content elements, but also on providing more methodological guidance on determining material topics and salient stakeholder groups to improve comparability and accuracy of SR information, build congruence in the perception of materiality, incorporate the principle in a larger number of mandating policies such as the NFRD and the EU Taxonomy, and co-evolve policies with financial reporting and disincentivize cherry-picking in SR (Baumüller & Schaffhauser-Linzatti, 2018; Beske et al., 2020; Jebe, 2019; Machado et al., 2021; Puroila & Mäkelä, 2019).

2.3. Challenges in Sustainability Adoption and Integration

Integrating sustainability into daily decision-making tends to stimulate organizational learning and change processes that should be thoroughly coordinated, tailored to the organization’s aspiration and promote proactivity (Buhmann, 2018). In a similar vein, Alrazi et al. (2015) find that firm-level sustainability performance tends to be driven by interrelation of an organization’s perceived legitimacy, accountability, and proactivity. Specifically, accountability tends to be determined by the perceived informativeness of their SR and/or performance, whereas proactivity, the firm’s ability and/or willingness to “invest in environmental management and accounting systems and stakeholder engagement [and affect their satisfaction]” (*ibid.*:44), drives accountability and SR’s legitimacy. To enable successful sustainability integration in that CSR is used credibly (e.g. Koep, 2017), two overarching ideas should be considered. First, transitioning towards more sustainable operations is ideally phased over time to capitalize on learning economies and a growing knowledge repository to improve future decision-making, especially in the wake of an ambitious growth trajectory (Dyllick & Muff, 2016; Vermeulen & Barkema, 2002). Second, replicating a historically successful integration process that is not company-specific and will likely not yield the expected complementary benefits (Witjes, Vermeulen, & Cramer, 2017). Therefore, organizations are encouraged to identify a best practice that fits their unique portfolio of processes, routines, and aspirations to maximize the benefits

from their custom kind and degree of sustainability integration (Maas, Schaltegger, & Crutzen, 2016).

2.3.1. Raising Awareness Towards the SDGs

Unlike scientific coverage on the evolution and possible trajectories of nonfinancial reporting, empirical studies on the adoption of ESG reporting are emerging and tend to speak in favor of adopting SR. For instance, Rosati & Faria (2019) posit that early adoption of SDG reporting is more likely if a reporting organization has younger DMs and is strongly committed towards informative disclosure practice. Similarly, Pizzi et al. (2021) and Venturelli et al. (2020) assert that adopting the GRI Standards for SDG-oriented reporting tends to have a positive impact on performance on achieving SDG targets and that both the GRI and the SDGs tend to be intimately linked. Nonetheless, reporting performance tends to be influenced by how well a reporting organization adopts a prioritization of content elements and metrics that link the targets and underlying economics (Machado et al., 2021). Organizations should beware that credible reporting on sustainability performance is an inherently multidimensional reporting challenge and requires a holistic approach to the exercise (Adams & Larrinaga, 2019; Buniamin, Nazli, & Ahmad, 2015).

Further requirements allude to the presence of sustainability in business as the mere adoption of a SR framework tends to be insufficient and can raise credibility concerns (Jong, Harkink, & Barth, 2018). In a similar vein, Hallstedt, Ny, Robèrt, and Broman (2010) list three key generic requirements to increase the chances of successful ESG integration. First, nonfinancial aspirations must be tightly integrated into the organization's business-as-usual goals and plans. Second, those decision-making bodies with significant impact on the aspirations' achievement need to be provided (dis-)incentives to foster goal-oriented decision-making and a more efficient allocation of personal cost (Feltham & Xie, 1994). To illustrate, Derchi et al. (2020) suggest that CSR performance be tightly linked to manager compensation, provided that the MCS in place credibly captures the former. The author assumes that a realization of such may be achieved by introducing GRI metrics into the organization's performance evaluation system to support decision-making towards higher disclosure transparency and a stronger accountability to the stakeholder audience.

Finally, the authors speak in favor of adopting decision-support tools to both improve information-processing and decision-making and rendering incentive management more cost-efficient to make a tangible impact towards the advancement of societies and advancing business practices by creating a feedback loop between observant researchers providing evidence-based guidance to practitioners, who in turn provide inputs to academia (Bebington & Larrinaga, 2014; Hallstedt et al., 2010). For instance, an organization committing to reporting on environmental impact tends to investigate their environmental cost in terms of (1) how they arise in a manufacturing/service provision process and (2) how environmental cost are captured and accounted for, of-

ten distinguishing by private cost to the organization from cost to the social context the organization is embedded in (Deegan, 2005). Private costs are usually represented by that of inputs resulting in by-product disposed or those costs incurred through the excessive and inefficient use of input factors (ibid.). These properties make the quantification and measurement of these private cost relatively straightforward, whereas public cost have a more indirect and complex nature that makes them difficult to capture (ibid.). Steering incentives towards a more refined cost-tracing mechanism may potentially unlock eco-efficiency gains and competitive edges that add sustainable value (Orsato, 2009; Schaltegger, Burritt, & Petersen, 2017). This, in turn, can be achieved by the skillful deployment of metrics and targets that channel SD efforts towards the SDGs (Buonocore et al., 2019).

2.3.2. Mobilizing (Top) Management

A rich body of literature focusing on the importance of management in adopting ESG-oriented routines and integrating them into existing workflows. For instance, Kiesnere and Baumgartner (2019) posit that support from top management and a responsive organizational culture are two key imperatives to successful sustainability integration. The former in particular must be willing and show commitment to allow linkages between organizational routines, culture, and SD concerns (ibid.; Adams & Frost, 2008).

Importantly, SD integration tends to require a "power promoter" (Kiesnere & Baumgartner, 2019:1607) that drives the integration process from the top or the bottom layers in the organizational hierarchy, assuming there is willingness and responsiveness to organizational change. Taking a top-down perspective, Adams and McNicholas (2007) identify several knowledge-driven impediments that managers across different levels of seniority can encounter: lacking knowledge on best practice SR and/or linking SD with the organization's strategy, unclarity on how report on SD and related KPIs, and indecisiveness on which reporting framework to use as guidance and a potential incapacity to separate financial, economic, or other nonfinancial KPIs. Metrics in particular have gained significant importance in organizational strategic planning, decision-making, and reporting yet are susceptible to comparability issues due to variability in input and output data used for calculation (Adams & Frost, 2008; Talbot & Boiral, 2018). Thus, shortcomings in managerial competency are likely to impede bottom-up integration mechanisms (ibid.).

Eccles, Ioannou, and Serafeim (2014) note that effective sustainability integration is realized by a high degree of formalizing CSR-oriented routines and by increasing top management's incentive sensitivity to it by making a larger fraction of their pay contingent on sustainability metrics; holding top management more accountable for nonfinancial performance tends to enable more extensive stakeholder management, a propensity to longer-term strategic commitments, and a higher degree of SR disclosure, of which especially environmentally related information tends to be influenced positively by the share of MBAs with a legal background (Ma,

Zhang, Yin, & Wang, 2019) yet less pronounced than social disclosures, similar to economic disclosures (Alshehhi, Nobanee, & Khare, 2018). In addition, a strong market position and commitment from its stakeholder community can increase an organization's accountability and legitimacy within their industry and financial market environment (Rodrigues & Franco, 2019).

A financial markets lens takes a confirmative role by observing a positive relation between sustainability commitments and significant long-term outperformance in the stock market pointing at a "virtuous circle" between the prioritization of CSR matters and an organization's economic prosperity, and investors' commitment to contribute (Eccles et al., 2014; Oikonomou, Yin, & Zhao, 2020:14; Winkler, Etter, & Castelló, 2020). Furthermore, studies confirm that public listing and consequential exposure to an expectant and diverse stakeholder community tends to increase internal pressure to engage in CSR reporting; the most notable impact tends to be visible on the top management level due to their alleged ability to drive sustainability integration most effectively (Thoradeniya, Lee, Tan, & Ferreira, 2015). The integration process, however, tends to be unintuitive and can be either split between economic, environmental and social impacts or tackled in an integrated way; it seems likely that either type of sustainability issues has to be assessed with a unique approach and unique timing indicative of prioritization (Morrison-Saunders & Therivel, 2006).

2.3.3. Evolving Internal Controls

Somewhat linked to management-related challenges are those pertaining to internal controls, which are intended to direct managerial decision-making towards the most efficient possible outcome (Feltham & Xie, 1994). An adopting organization should have an internal control system in place that can accurately capture financial and nonfinancial performance in the form of dedicated metrics to assess incentive alignment in the principal-agent relationship or rather ties between the organization's stakeholder audience and their management (Davidson, 2011; Figge et al., 2002; Whitehead, 2017).

Effectively integrating sustainability metrics into a control system that is intimately linked to manager compensation tends to have substantial influence on rendering organizational decision-making, internal processes, and governance codes more stakeholder-centric (Derchi et al., 2020; Rubino & Napoli, 2020). Kerr, Rouse, and de Villiers (2015) note that integrating SR into an MCS greatly supports the communication on and of such metrics and how beliefs and aspirations towards sustainability should be formalized, suggesting a BSC as a well-established and simple-to-use medium. Importantly, the authors find that a focus on (moving beyond) environmental compliance is positively linked to boundary systems such as certifications to assure lawful business conduct and stronger integration of environmental performance metrics and issues into their diagnostic and interactive controls, respectively, preferably indicators used for SR activity (ibid.). Assuming truthful intentions, organiza-

tions engaging in SR could benefit by integrating GRI metrics into their sustainability-driven performance measurement system and improve their data collection and progress monitoring mechanisms (Hubbard, 2009; Traxler et al., 2020) and also their progress towards SDG achievement (Buonocore et al., 2019).

Managerial motivation that can be based on incentive provision tends to have substantial influence on the design of both MSCs and SCSs and ultimately the SR system integrated in the organization (Herremans & Nazari, 2016). Notably, neither of them tends to be well-developed when SR is primarily compliance-driven (ibid.). However, strategic use of all three mechanisms can be achieved by learning across vertical and horizontal boundaries to differentiate the organization and their SR beyond compliance and industry rivalry when both control systems and SR practice are formalized relative to universally accepted SR guidelines. This implies that although navigating a diverse stakeholder community and industry peers and a company's own requirements and aspirations in search of unique best practices is resource-intensive and requires mechanisms to restrain managerial opportunism and foster informed and committed decision-making towards sustainability, it allows a thoroughly integrating, controlling, and reporting organization to advance their competitive positioning in the pursuit of a beyond-compliance strategy and transition from mechanistic to organic reporting that can potentially shape reporting practice on the industry level (ibid.; Moseñe et al., 2013).

Three additional remarks should be made. First, an organization does not necessarily have to agree with their stakeholder community in scope and scale of responsibility towards all CSR topics to become an industry leader in SR (Herremans & Nazari, 2016). Second, a reporting organization can substantially benefit by (1) building linkages between disclosed SR and its impact on their members' work across hierarchy levels and organizational performance and (2) assigning the compilation of the SR to representatives of several departments to obtain a holistic perspective on the past, present, and future context in which the organization has performed and aspires to create sustainable value (ibid.; Rodríguez-Olalla & Avilés-Palacios, 2017). Finally, board members deemed to be the primary drivers of sustainability integration should foster resourceful business practices, be more professionally, culturally, and humanly diverse to reap the most benefits out of a limited amount of resources; this can reduce environmental impact and drive environmental performance, in part by avoiding overt generosity in providing organizational resources on the path towards integration (Rubino & Napoli, 2020).

Besides considering what enables sustainability integration, what are potential inhibitors? Gond, Grubnic, Herzig, and Moon (2012) propose eight constellations between sustainability controls and management controls that are contingent on their degree of mutual integration and whether they are used for diagnostic use (i.e. measurement) or interactively to refine the organization's sustainability strategy through dialogue between top management and lower-

level employees. The framework hinges on the idea of an ideal state of sustainability integration in which traditional and sustainability-oriented control systems are tightly integrated into each other and encourage communication across the organizational hierarchy (ibid.). This state, however, tends to be achieved by transitioning on a path that can have more than one transitional state lying between the assumed ideal and a state in which sustainability is virtually disconnected from the core business and controls, which is called a dormant decoupled strategy (ibid.). For instance, the introduction of sustainability to organizational strategy can either emerge as a strategic need due to voluntary reorientation or can be imposed by regulators requiring compliance with sustainability policies (ibid.). After introducing sustainability to the organization and making its first adoption, the next transitional state tends to be a schizoid strategy characterized through likely deliberate “contrasted sustainable behaviours” (ibid.:213) indicating low sustainability integration, or peripheral sustainability integration as a result of extending compliance to mandated policies to voluntary reporting framework and adopting a long-term operational focus lacking SD engrained in organizational culture that is reflected in routines, usually through an organization-wide monitoring system (ibid.).

Sustainability integration, i.e. the intensity of the interplay between MCSs and SCSs tends to face technological (degree of sophistication in both systems), organizational (capture organizational members' behavior), and cognitive barriers (ability to capture how these members think of sustainability) and become a complex process requiring thorough management (Gond et al., 2012). In a study on the oil and gas sector, George et al. (2016) outline characteristics, enablers and barriers that firms with a disconnected, compliance-driven, or peripheral degree of sustainability integration tend to face.

A dormant decoupled strategy setting tends to be characterized by external pressures and an organization prioritizing economic growth and building organizational learning and capabilities, also on the management level, and control systems, if in place, tend to be diagnostic and rather unresponsive to changes in performance (ibid.). Technical barriers comprise underdeveloped controls, lacking formalization in performance evaluation and target setting and isolated HSEQ planning, whereas organizational barriers entail rapid expansion and a lack of structure and formalization for sustainability and related roles and responsibilities (ibid.). The latter tend to be paired with cognitive issues characterized by little industry experience and understanding of higher-level sustainability issues. Regarding enablers, those of technical nature represent a tighter integration of HSEQ into budgeting and auditing processes and the creation of policies for all business units. On the organizational level, HSEQ control should be expanded and in terms of cognitive enablers, the authors recommend increasing awareness on HSEQ issues and relate organizational vision and mission statements to economic and social development issues on the national level (ibid.).

Compliance-driven strategies, on the other hand, also face external pressures yet tend to focus on organizational excellence across processes, publicity, and CSR disclosure reactively (ibid.). MCSs are actively used for feedback, budgeting, and rewarding, and tend to be used interactively, whereas SCSs tend to remain diagnostic and less coherent than the former (ibid.). Technical barriers tend to be characterized by concentrating sustainability planning and performance evaluation in senior management functions and/or a few departments, and limited extent of SR, whereas organizational barriers tend to be characterized by weakly developed implementation of sustainability aspects and related hiring limited to HSEQ (ibid.). From a cognitive perspective, employee focus tends to lie on profits and the roles, responsibilities, and knowledge on the concept and scope of sustainability concerns to the organizations tend to be weakly defined (ibid.). From a technical standpoint, moving beyond compliance can be accomplished by making MCSs and SR more comprehensive and integrating the HSEQ lens across the supply chain (ibid.). On the organizational level, establishing a dedicated ESG framework, focus areas, working groups, and hiring experts tend to be beneficial, whereas cognitive stances can be improved by raising awareness on sustainability issues and obtaining (further) support from top management (ibid.).

Peripheral sustainability integration tends to rest on external pressures, changes in leadership, and/or reputational issues (ibid.). MCSs and SCSs are more tightly integrated and the latter more coherent, most notably by establishing dedicated data collection channels for sustainability data (ibid.). Technically, however, measuring sustainability costs and risks poses a challenge and HSEQ KPIs and environmental impact assessment tend to be limited in their usefulness and the key organizational impediment is limited stakeholder engagement, whereas cognitive issues tend to point at a poorly developed innovation culture and poorly diffused knowledge around sustainability (ibid.). From a technical perspective, this constellation can be enabled through more extensive sustainability planning and linking more HSEQ KPIs to individuals and top managers' compensation schemes, which could (1) potentially be tied to successfully realigning organizational functions, strengthening HSEQ procedures, and capitalizing on sustainability task forces from an organizational standpoint, and (2) coerce changes in top management and employee mindset towards a more holistic understanding of organizational sustainability performance and driving operational impacts (ibid.).

To conclude, transitioning away from decoupled and compliance-driven strategies tends to hinge on cognitive barriers, which emphasize the need to build legitimacy of sustainability concerns and high-powered incentives across organizational levels and departments through such mechanisms (ibid.; Derchi et al., 2020). For instance, forming task forces as groups of promoters and assigning a higher priority to sustainability performance and dual returns, steepening organizational learning curves, and retaining newly gained knowledge and awareness in dedicated MCSs capturing en-

environmental and social impacts and knowledge repositories (Agrawal & Hockerts, 2019; Figge et al., 2002; Hubbard, 2009; Jackson, 2013; Vermeulen & Barkema, 2002). It should be noted, however, that even when a comprehensive SR, sustainability budgets and efficient incentives are implemented can weak or negative economic performance supersede organizational alignment towards sustainability and prioritize financial profitability over improving nonfinancial performance (Battaglia, Passetti, Bianchi, & Frey, 2016). This implies that sustainability integration can be marginalized despite sophisticated control mechanisms; assuming a beyond-compliance sustainability integration strategy, the adopting organization (here: Cadeler A/S) tends to find itself in a transitional position between a compliance-driven sustainability strategy and peripheral integration of such until it has regained its ability to generate financial returns (ibid.).

2.3.4. Bridging the SR Gap in SMEs

The initial discussion on SR was primarily focused on large-scale corporations which are assumed more likely to have sufficient information-processing capacity to successfully carry out SR and capitalize on the insights provided by a complementary nonfinancial lens (Baron, 2014; Maguire, 2010; Reynolds & Yuthas, 2008). SMEs, smaller in scale yet higher in count, tend to account for most of the business activity, GHG emissions, and employment in the non-public sector yet have witnessed a rather low degree of SR adoption, for which potential reasons are reviewed in this section. A key challenge for such organizations is to “manage their dual mission, integrate social and environmental goals in their business model, and incorporate accountability mechanisms, all while scaling up and garnering the necessary resources to be economically competitive” (Nigri & Baldo, 2018:1). With the GRI Standards as a well-recognized SR framework and IR as an emerging trend in corporate disclosure (Arena & Azzone, 2012; Mauro, Cinquini, Simonini, & Tenucci, 2020), this section focuses on these two alternatives specifically.

Despite seemingly tangible benefits that SMEs can realize through adopting SR which “are not necessarily less advanced in organizing CSR [Reporting] than large firms” (Baumann-Pauly et al., 2013:693), what prevents them from implementing it? Arena and Azzone (2012) present three impediments to smaller-scale organizations: (1) time constraints, (2) skill gaps in preparing sustainability information due to largely present track records or low sensitivity towards SR along with imprecise expert judgments on resource consumption as a result of such, and (3) low benefits relative to informational cost and managers as business owners having little incentive to move organizational disclosure beyond compliance (Orsato, 2006). Importantly, SMEs tend to be at risk of lacking information-processing capacity to live up to informational requirements set by an increasingly diverse stakeholder audience (Arena & Azzone, 2012). Specifically, empirical evidence on organizing CSR reporting in organizations by Baumann-Pauly et al. (2013) identifies a negative relation between a reporting organization’s scale and relative com-

munication cost linked to CSR activity and a positive link between scale and organizational cost of integrating nonfinancial reporting mechanisms into existing routines (ibid.). That is, smaller-scale organizations tend to face lower implementation cost yet much higher reporting cost. The authors describe this discrepancy as a reporting gap, whereas the opposite case holds for larger-scale organizations as they tend to suffer from an implementation gap (ibid.). In the authors’ conceptual model, the cost-induced gaps seem to disappear when the organization has obtained a medium scale, which does not mean that SR becomes more cost-efficient but rather that implementation and reporting cost incurred are virtually not prohibitive for either alternative (ibid.).

Lacking information-processing capacity due to low scale economies also tends to be one of the drivers on why reporting organizations initially join such reporting initiatives as the UNGC and become delisted once required to submit a “Communication on Progress” document that discloses an organization’s sustainability performance according to the UNGC’s principles, which are largely embodied in the NFRD and GRI (European Commission, 2014; Rasche et al., 2020; Shift & Mazars, 2015). Specifically, Rasche et al. (2020) identify a positive link between the decision to remain listed and an organization’s scale, early adoption of SR, public listing, and connectedness to a local network promoting SR. The findings imply that late adopters that do not benefit from “legitimacy spillover effects on local networks” (ibid.:1) and join a multi-stakeholder initiative for the sake of certification without the capacity to live up to reporting requirements will face substantially higher challenges to engage in a transparent stakeholder dialogue, provided that the organization’s management shows little commitment to such (ibid., Adams and McNicholas (2007)). With Morsing and Thyssen (2003) indicating strong social networks, strong ties between the government, organizations and the media, and partiality to transparency, commitment and fairness in the Danish economic environment, it seems unlikely that Danish UNGC signatories resign as the longer-term opportunity costs would outweigh potential benefits from slack information processing capacity.

Very recent research notes that resource constraints do not only hold with respect to SR, but also to IR. In a series of semi-structured interviews with SMEs’ executives, Gerwanski (2020) finds that IR is primarily regarded as a means to improve the organization’s image and perceived legitimacy rather than a viable reporting tool that tends to face three major implementation barriers: (1) public addressees do not consider such reports to be relevant or informative, (2) conceptual shortcomings inherent to IR such as a potential overstatement of the importance of shareholders and corporate image, and (3) substantial preparation costs in excess of the surveyed SMEs’ reporting capacity. Factoring in that IR tends to be a rather advanced concept that implicitly assumes experience with more traditional SR (Baron, 2014), this study assumes that Cadeler can reap more learning economies by getting started with SR that is holistic yet less integrated than IR and use accumulated reporting knowledge to condense or-

ganizational information into a potentially more condensed and integrated framework in the future.

3. Methodology

3.1. Internal Materiality Assessment

The research method applied in this study attempts to take an outward-looking and an inward-looking perspective on Cadeler's material sustainability topics to effectively live up to the concept of double materiality that tends to emphasize balanced and informative SR and can attract more ESG/impact investors' attention (Agrawal & Hockerts, 2019; Amir & Serafeim, 2018; Quatrini, 2021). It follows the four-step procedure for materiality assessments described in Global Reporting Initiative (2013), in which the identification and prioritization procedures are based on the Fuzzy AHP (FAHP) methodology introduced in Calabrese et al. (2016); Calabrese, Costa, and Menichini (2013). FAHP falls under a broad range of MCDM techniques that have been designed to enable decision-making under uncertainty and consideration of multiple criteria and/or alternatives and tend to be most applicable to complex decision problems with a high impact to the decision that, relative to its consequences, should be better-informed, substantiated, and transparent (Krejčí, 2018). Importantly, these methods intend to not provide an exact correct but rather to support the decision-making process of an individual with imperfect knowledge on his/her own preferences (ibid.). Consequentially, virtually all MCDM methods are bound to entail a certain degree of subjectivity when guiding a DM towards a most preferred rather than an optimal solution (ibid.). A materiality assessment is an inherently subjective process and requires one or more DMs to learn and provide their own preferences on a novel topic to generate a solution that is, to an extent, aligned with their own and external stakeholders' preferences (Beske et al., 2020; Calabrese, Costa, Ghiron, & Menichini, 2017).

3.1.1. Analytical Hierarchy and (Fuzzy) AHP

Fuzzy AHP was initially developed by Van Laarhoven and Pedrycz (1983) as an extension to classical AHP, developed by Thomas Saaty in 1971 and intended to account for more than one analytical objective and deal with potentially unstructured and complex decision problems that involve incomplete information and quantitative and qualitative considerations (Mattiussi, Rosano, & Simeoni, 2014; Wind & Saaty, 1980). Classical AHP decomposes a decision problem into a hierarchical structure of two or more levels and allows a DM to iteratively conduct preference judgments for the next lower level of the hierarchy that contain both subjective and objective considerations in constructing a prioritization (Saaty, 1978). Whereas the procedure is relatively simple to use and tests transitivity of preferences through a maximum eigenvalue approach (ibid.), one of its major drawbacks is that the conversion scale capturing the intensity of a preference consists of crisp numbers that assume

that a DM's verbal judgment is perfectly certain and argued to be contradictory to the nature of human thinking (S. Chen & Fan, 2011). Uncertainty can, in such case, evoke different perceptions among individuals such as vagueness that can arise from incomplete information and is similar yet different to the concept of imprecision that points at fuzziness as a moderator of the truthfulness and the value of information used for decision-making (Dubois & Prade, 1988; İbrahim Özkan & Türkşen, 2014). Fuzzy numbers were introduced to remedy this shortcoming and capture this uncertainty and subjectivity inherent to linguistic expressions and have found increasingly broad application within business disciplines (Govindan, Khodaverdi, & Jafarian, 2013; Mardani, Jusoh, & Zavadskas, 2015) and diverse scientific areas (Chan et al., 2019) and are preferred to fuzzifying crisp numbers (Saaty & Tran, 2007). Based on previous assertions, the author converts DMs' judgments into TFNs due to their linearity and simplified arithmetic (Calabrese et al., 2016; Kaufmann & Gupta, 1991; Krejčí, 2018).

To obtain a suggestive GRI-compliant SR and integration agenda for Cadeler, the hierarchy is based on the GRI Standards in effect since 1st July 2018 and expanded by three additional standards on 1st January 2021 (Global Reporting Initiative & University of Stellenbosch Business School, 2020; Matuszyk & Rymkiewicz, 2018) because they tend to be the preferred and most widely dispersed SR framework to adopt (Brown, de Jong, & Levy, 2009; Rodríguez-Gutiérrez et al., 2021) and reflect the impact-oriented multi-stakeholder focus that Cadeler intends to pursue strategically. Finally, Cadeler's former parent company, SPO, uses the GRI Standards, indicating that GRI tends to fit the reporting aspiration of offshore operators. Importantly, the content elements included in the hierarchy are focused on the GRI's reporting requirements and provide a point of departure for GRI-based SR.

The generic method applied in this study, besides its computational and conceptual simplicity, has further advantages over other candidates suggested by Hsu et al. (2013), Bellantuono et al. (2016), and Calabrese et al. (2019). To start with, an analytical hierarchy of the GRI Standards facilitates the preparation of a SR document and renders sustainability performance more comparable across GRI-compliant organizations (Calabrese et al., 2017) allows to set minimum materiality thresholds to quantitative information in the absence of the five percent rule (Villiers & Maroun, 2017; Morgan, 2014; Whitehead, 2017). In addition, relative priorities (weights) obtained in the process are additive and allow a reporting organization to set a coverage level to economize on organizational resources and expertise, render the most material content elements as informative as possible and aggregate fewer material items into summary descriptions; this quantitative tracker is largely absent in alternative frameworks (ibid.). The ability to aggregate stakeholder judgment is consistent with the GRI Standard' multi-stakeholder nature and a step-wise procedure mirrors the GRI's recommendation in that they recommend to first prioritize material topics and disclosures (i.e. sub-topics) in that order (Global Report-

ing Initiative & University of Stellenbosch Business School, 2020). Given time constraints in the data collection process, this approach was selected as it can be used to factor in external stakeholders' considerations through an internal perspective (Calabrese et al., 2016) which the author instructed survey participants to do. This procedure can potentially reduce endogeneity bias and is consistent with the idea that MCDM techniques intend to provide decision support rather than a definitive solution (Krejčí, 2018).

The approach used for this study entails a few modifications compared to Calabrese et al. (2016). First, it can test the results for their robustness by changing DM bias and the nature (COA) of the TFNs (C. W. Chang, Wu, Lin, & Chen, 2007; Tsai, Chang, & Lin, 2010). Second, the method is based on a more recent, comprehensive, and mandating set of GRI ruling. Third, a tolerance mechanisms for seemingly inconsistent preferences is explicitly provided (Alonso & Lamata, 2006). The approach aggregates input data from several specialists across Cadeler, following Herremans and Nazari (2016) in that the prioritizing and reporting on material sustainability issues is the aggregate of specialist preferences throughout the organization to obtain sufficiently objectified priorities of Cadeler A/S as a single collective DM (ibid.; Aull-Hyde, Erdogan, & Duke, 2006).

The materiality survey consists of nine questionnaires covering preferences on subcategories, topics, and disclosures across the GRI's economic, environmental, and social standards. Though social subcategories are absent in the GRI Standards, the author added a subcategory layer known from the GRI G4 (Global Reporting Initiative, 2013) and assigned standards to each subcategory by mapping them to their G4 "aspects" equivalent through a mapping provided by the GRI to ease the transition from the G4 to the Standards (Global Reporting Initiative, 2017). Doing so reduces computational effort and decision fatigue for the author and surveyed DMs as the number of pairwise comparisons decreases substantially (Calabrese et al., 2017, 2016). An additional subcategory ranking intends to mimic the GRI Standards' modular structure and topics' sensitivity.¹

Because sustainability performance is driven by inherently quantitative factors and entails substantial multidimensionality and potential interrelatedness (Venturelli et al., 2020), integrating the GRI Standards into the Fuzzy AHP framework reduces complexity by a clear distinction between sustainability (sub-)categories, topics, and disclosures (Calabrese et al., 2016). In addition, each GRI disclosure is only connected to one higher-level topic, which is connected to a (sub-)category higher up in the analytical hierarchy (ibid.). To illustrate, the framework's structure distinguishing between economic, environmental and social categories is intended to (1) facilitate prioritization of content elements by proceeding from topics to disclosures, (2) put equal emphasis on each of these categories to provide a balanced picture on organizational sustainability performance sustainability

performance, and (3) signal credible contribution towards SD and aspiration levels within each of these categories by encouraging decision-relevant SR (Calabrese et al., 2016; Global Reporting Initiative, 2020a; Robinson, 2004; Torelli et al., 2020).

Similar to the framework proposed in previous works, the hierarchy of the modular GRI Standards expands over four levels: Goal, Criteria, Sub-Criteria, and Alternatives (Calabrese et al., 2016, 2013). The goal lies in the prioritization of material GRI topics and disclosures to Cadeler A/S to plan the SR process more efficiently. The criteria represent the economic, environmental, and social perspectives on sustainability that are embodied by the Standards' categories. The third (sub-category) layer lists the economic and environmental topics and social subcategories and topics that provide guidance on which content elements should be paid most attention to. The fourth and lowest level contains management approach and topic-specific disclosures that are only linked to one higher-level sub-criterion.

3.1.2. Translating DM Judgment into SR Priorities

From the collection and compilation of DMs' preferences to the prioritization of economic, environmental, and social sustainability topics and disclosures, there are four steps involved in the framework. In large parts, the analytical procedure is based on the Fuzzy AHP approach proposed by Calabrese et al. (2016, 2013) yet provides three additions to the approach: (1) a tolerance measure that further allows a resource-constrained reporting organization to vary the degree of consistency to avoid resubmissions of preferences that may incur additional informational cost (Alonso & Lamata, 2006), an updated hierarchy that allows the reporting organization to prioritize the latest set of SR content elements provided by GRI, and (3) a sensitivity mechanism to also validate the internal results with respect to changes in DM attitude and degrees of uncertainty exhibited in decision-making (Balusa & Gorai, 2019).

In the first step of the analysis, a decision maker's verbal preferences are compiled in a square PCM \tilde{A} (1):

$$\tilde{A} = \left(a_{ij}^\alpha \right)_{n \times n} = \begin{bmatrix} (1, 1, 1) & \dots & (l_{12}^\alpha, m_{12}^\alpha, u_{12}^\alpha) & \dots & (l_{1n}^\alpha, m_{1n}^\alpha, u_{1n}^\alpha) \\ (l_{21}^\alpha, m_{21}^\alpha, u_{21}^\alpha) & \dots & (1, 1, 1) & \dots & (l_{2n}^\alpha, m_{2n}^\alpha, u_{2n}^\alpha) \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ (l_{n1}^\alpha, m_{n1}^\alpha, u_{n1}^\alpha) & \dots & (l_{n2}^\alpha, m_{n2}^\alpha, u_{n2}^\alpha) & \dots & (1, 1, 1) \end{bmatrix} \quad (1)$$

Where:

$$a_{ij}^\alpha = \left(l_{ij}^\alpha, m_{ij}^\alpha, u_{ij}^\alpha \right) = \left(a_{ji}^\alpha \right)^{-1} = \left(\frac{1}{u_{ij}^\alpha}, \frac{1}{m_{ij}^\alpha}, \frac{1}{l_{ij}^\alpha} \right) \quad i, j = 1, \dots, n; i \neq j \quad (2)$$

represents a fuzzy number for the linguistic judgment(s) a decision maker assigns to an alternative i relative to alternative j on a nine-point triangular fuzzy conversion scale (D. Y. Chang, 1996; S. H. Lee, 2010).

¹See table 1 in the appendix.

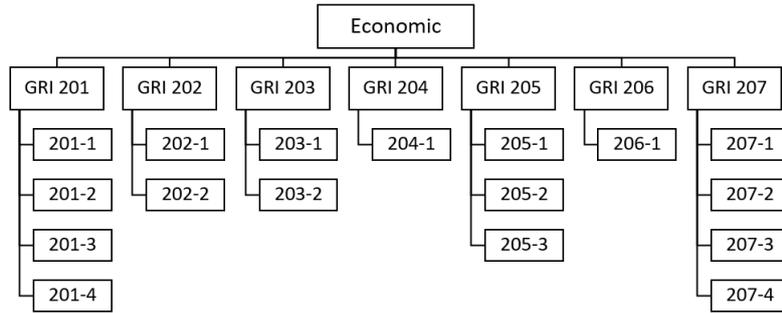


Figure 1: Hierarchy of Economic Topics and Disclosures (own work)

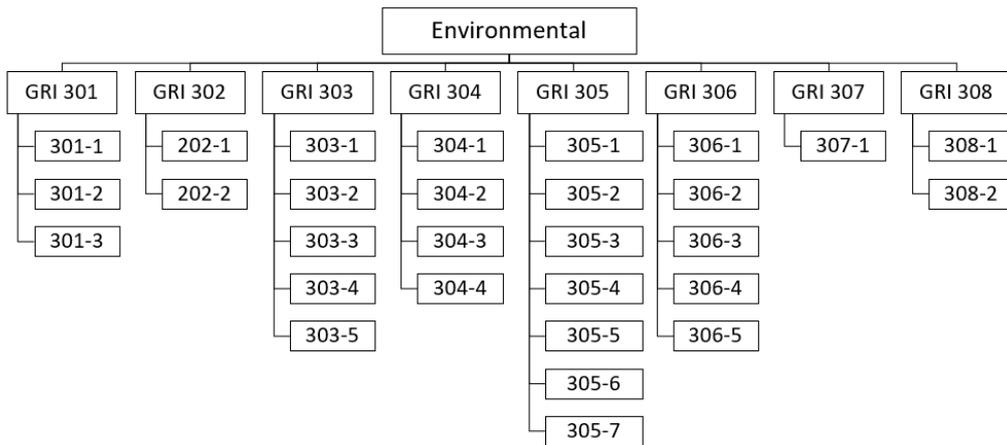


Figure 2: Hierarchy of Environmental Topics and Disclosures (own work)

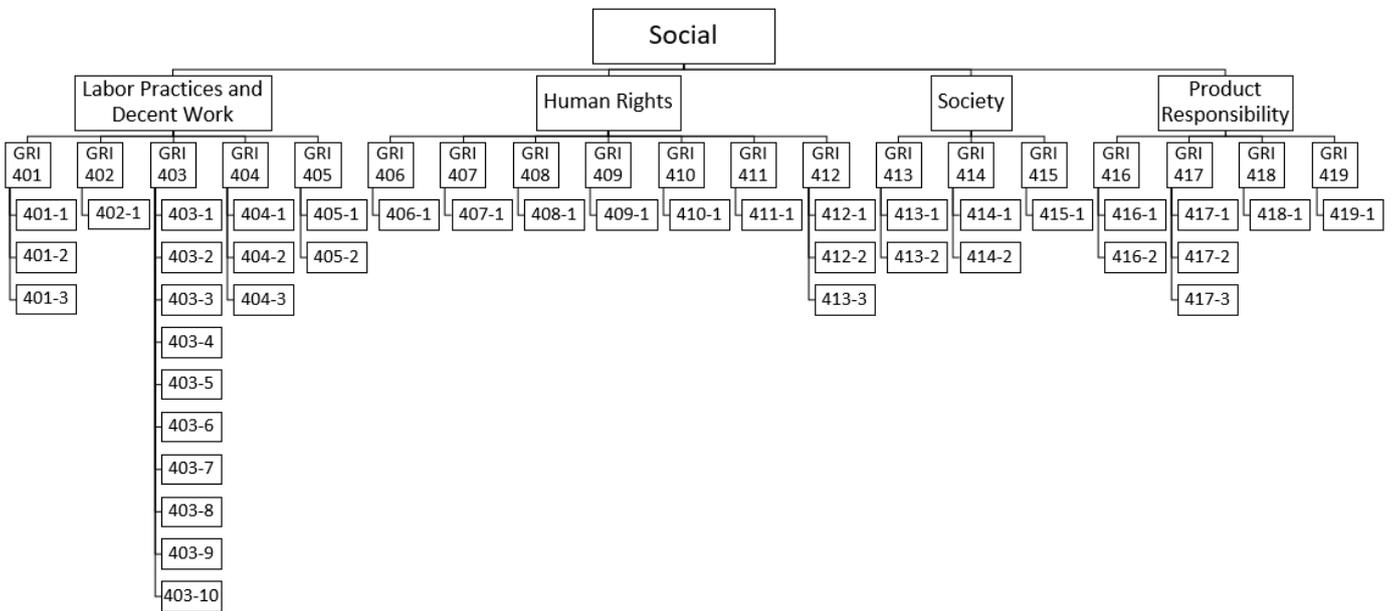


Figure 3: Hierarchy of Social Subcategories, Topics, and Disclosures (own work)

A TFN a_{ij}^α has the following membership function (Kaufmann & Gupta, 1991):

$$a_{ij}^\alpha(x) = \begin{cases} \frac{x-l}{m-l}, & l \leq x \leq m \\ \frac{u-x}{u-m}, & m \leq x \leq u \\ 0, & \text{otherwise} \end{cases} \quad (3)$$

Where m has the highest extent of $a_{ij}^\alpha(x)$ and l and u represent the TFN's upper and lower bounds that can overlap depending on the level of fuzziness α inherent to the TFNs (Balusa & Gorai, 2019). Figure 4 displays the TFNs for the analysis based on Table 2 in the appendix.

The method is based on the Fuzzy AHP method proposed by Calabrese et al. (2016, 2013) to identify the relative weights of the GRI subcategories, topics, and disclosures without assigning illogical zero weights to DM preference sets (ibid.) and expands it by a generic defuzzification mechanism that allows for robustness tests given that rank reversal tends to be a common problem in AHP-based approaches (Krejčí, 2018). When compared to traditional fuzzy extensions of classical AHP, the fuzzy extension of the approach applied in this study is limited to capturing verbal uncertainty in the DMs' preferences (Calabrese et al., 2016). Primarily, this setup is intended to reduce computational complexity to a considerable extent and preserve the method's relative simplicity through the calculation of crisp eigenvalues (Krejčí, 2018).

The content elements' materiality scores are determined in a four-step process. In Step 1, a DM's fuzzy PCM defined in equation (1) is converted into a crisp PCM with the centroid or rather center of area (COA) method (Takagi & Sugeno, 1985). This approach increases computational simplicity and tends to yield "well accepted results" (Krejčí, 2018:33). In its generic form and this study, TFNs are defuzzified with a weighted average proposed by A. R. Lee (1995) that captures a DM's bias and uncertainty inherent to the preference set through equation (4):

$$\tilde{a}_{ij}^\alpha = \lambda u_{ij}^\alpha + (1 - \lambda) l_{ij}^\alpha, i, j = 1, \dots, n \quad (4)$$

Where u_{ij}^α and l_{ij}^α denote the upper and lower bound of a triangular fuzzy number defined in a DM's PCM. λ captures the condition of the DM's attitude and can take the values 0, 0.5 and 1 to model pessimistic, neutral, or optimistic conditions, respectively (Balusa & Gorai, 2019; A. R. Lee, 1995). α , on the other hand, acts as a proxy for fuzziness, i.e. the degree of vagueness under which the preferences are set (ibid.) and ranges from 0 to 1 in increments of 0.2. In the base case analysis, the author assumes that all DMs (1) are unbiased in setting a preference towards and alternative and (2) face a medium level of uncertainty in their decision-making, both of which are indicated by $\lambda = \alpha = 0.5$ and in line with the TFN conversion scale suggested by D. Y. Chang (1996) and S. H. Lee (2010). In addition to the benefit of testing (aggregate) priorities for their robustness, this modification is assumed to be more appropriate for mimicking conditions in

which different levels of DM bias and sentiment towards preferences are present. Compared to the defuzzification formula proposed by Wang and Elhag (2007) and used originally by Calabrese et al. (2013), the preferences for the base case scenario remain qualitatively unchanged.

In Step 2, the PCMs' consistency is analyzed with the Maximum Eigenvalue Method proposed by Saaty (1978). A PCM's consistency and preferences' transitivity are measured through a CI (6) and CR (7):

$$CI = \frac{(\lambda_{\max} - n)}{n - 1} \quad (6)$$

$$CR = \frac{CI}{RI} \quad (7)$$

Where λ_{\max} is a PCM's largest eigenvalue, n its dimensionality and RI a random index contingent on the PCM's dimensionality which is a "CI expected from a matrix of that order [dimensionality]" (Donegan & Dodd, 1991:135).

Conventionally, preferences tend to be consistent (transitive) when the CR of a PCM is lower than 10%. Although traditional MCDM research suggests that a DM should re-evaluate his or her preferences with a new PCM in the case of inconsistency, Alonso and Lamata (2006) assert that this threshold can be adjusted relative to the DMs' tolerance towards (in)transitivity/consistency or a larger sample of decision makers' preferences that are aggregated to infer possible collective priorities. This mechanism also provides DMs with a certain degree of flexibility and compensation for decision fatigue, for instance when DMs tend to be less familiar with the survey set which may be detrimental to transitive preferences; in addition, it allows a reporting organization to further economize on SR-related resource commitment (ibid.).²

Third, local priority weights for each sub-category, topic, and/or disclosure item are computed by taking the row sums of a consistent fuzzy PCM \tilde{A} (8) and then normalizing them with equation (9) to obtain \tilde{S}_j (Wang, Luo, & Hua, 2008). The latter enables a more precise normalization of fuzzy weights as it considers the fuzzy weights' interdependence (see Wang & Elhag, 2006 for its derivation and a detailed discussion):

$$\tilde{RS}_i^\alpha = \sum_{j=1}^n \tilde{a}_{ij}^\alpha = \left(\sum_{j=1}^n l_{ij}^\alpha, \sum_{j=1}^n m_{ij}^\alpha, \sum_{j=1}^n u_{ij}^\alpha \right), \quad i = 1, \dots, n \quad (8)$$

$$\begin{aligned} \tilde{S}_i^\alpha &= \frac{\tilde{RS}_i^\alpha}{\sum_{j=1}^n \tilde{RS}_j^\alpha} \\ &= \left(\frac{\sum_{j=1}^n l_{ij}^\alpha}{\sum_{j=1}^n l_{ij}^\alpha + \sum_{k=1, k \neq i}^n \sum_{j=1}^n u_{kj}^\alpha}, \frac{\sum_{j=1}^n m_{ij}^\alpha}{\sum_{k=1}^n \sum_{j=1}^n m_{kj}^\alpha}, \frac{\sum_{j=1}^n u_{ij}^\alpha}{\sum_{j=1}^n u_{ij}^\alpha + \sum_{k=1, k \neq i}^n \sum_{j=1}^n l_{kj}^\alpha} \right) \\ &= (l_i^\alpha, m_i^\alpha, u_i^\alpha), \quad i = 1, \dots, n \end{aligned} \quad (9)$$

²See table 3 and 4 in the appendix.

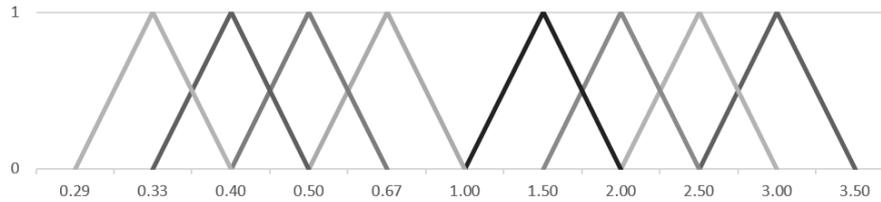


Figure 4: TFNs' Membership Functions for $\alpha = 0.5$ (based on D. Y. Chang, 1996; S. H. Lee, 2010)

Finally, the crisp numbers obtained through equation (10) are normalized to obtain the DM's local materiality vector for all local alternatives in the hierarchy (Balusa & Gorai, 2019; Calabrese et al., 2016).

$$w_i^\alpha = S_i^\alpha (\tilde{S}_i^\alpha) = \lambda u_i^\alpha + (1 - \lambda) l_i^\alpha, i, j = 1, \dots, n \quad (10)$$

$$W^\alpha = (w_1^{\alpha'}, w_2^{\alpha'}, \dots, w_n^{\alpha'}) \quad (11)$$

Since the economic, environmental, and social surveys are completed by multiple DMs in Cadeler A/S, the individual preferences are synthesized into a single aggregate PCM per category, sub-category, and/or topic. Assuming (1) a similar level of expertise on the GRI Standards and (2) a similar degree of perceived novelty among the surveyed DMs along with high similarity in ranking preferences under the consideration of both Cadeler's interests and the organization's external stakeholders' informational needs each surveyed individual in Cadeler A/S was assigned the same level of importance in the aggregation process. Furthermore, this approach tends to be representative of the participatory decision-making in organizing SR within Cadeler A/S.

If formula (12) denotes the TFN provided by a decision maker $k(k = 1, \dots, m)$ and (13) its reciprocal, then (14) represents the average judgment or rather collective preference according to the fuzzy addition of TFNs (Kaufmann & Gupta, 1991). In the model of Calabrese et al. (2016), the aggregate PCM obtained through (14) is then used to infer the collective preference set by utilizing the above four-step approach.

$$\tilde{a}_{ij}^{(ak)} = (l_{ij}^{(ak)}, m_{ij}^{(ak)}, u_{ij}^{(ak)}) \quad (12)$$

$$\left(\tilde{a}_{ij}^{(ak)}\right)^{-1} = \left(\frac{1}{u_{ij}^{(ak)}}, \frac{1}{m_{ij}^{(ak)}}, \frac{1}{l_{ij}^{(ak)}}\right) \quad (13)$$

$$\bar{a}_{ij}^\alpha = \frac{1}{m} \sum_{k=1}^m \tilde{a}_{ij}^{(ak)} = \left(\frac{1}{m} \sum_{k=1}^m l_{ij}^{(ak)}, \frac{1}{m} \sum_{k=1}^m m_{ij}^{(ak)}, \frac{1}{m} \sum_{k=1}^m u_{ij}^{(ak)}\right) \quad (14)$$

Given the relative small range in the verbal conversion scale, an arithmetic mean tends to yield qualitatively similar conclusions to a geometric mean and its application to

all a_{ij}^α only preserves reciprocity in quantification (Aczél & Saaty, 1983; Aull-Hyde et al., 2006; Pandey, 2012). In addition, the DMs' judgments were given equal importance in the analytical model for three reasons. First, adopting a structured materiality assessment is a novelty to the organization and assumes a similar extent to which the survey participants are familiar with the implications of a quantitative approach. Second, the surveyed individuals have a similar degree of influence on which content elements are deemed more material and/or disclosed externally to Cadeler's cross-industry stakeholder audience. Finally, equal weighting accounts for alike decision-making power on the scope of organizational processes that are assumed to be linked to the content of the preference surveys.

3.1.3. Application to Cadeler A/S

Cadeler A/S operates WIVs primarily used for the transportation, installation, and maintenance of offshore wind turbines and their foundations. As such, the company's operations are a critical link in the offshore wind supply chain enabling the transition of the electrical grid to renewable energy sources. The organization is certified under ISO 9001:2015 and ISO 14001:2015 and strictly follows ISO 26000:2015 which signals strong organizational commitment to SD across economic, environmental, and social areas such as long-term value creation, biodiversity preservation and circular economy, and the promotion of diversity and empowering employees. Their four-pronged SD strategy is summarized in Figure 5.

The scope of potentially material topics and disclosures was identified through semi-structured interviews with the organization's sustainability and environment manager. Despite the possibility to aggregate immaterial or non-applicable items into summary positions, all GRI Standards were deemed applicable and included in the internal materiality assessment. Internal data for the internal FAHP study was collected from generalist and specialist managers across such functions as Finance, Operations, HSEQ, Sustainability, Procurement, Tender Management, Marine Operations, and General Management. The DMs tend to be most knowledgeable on Cadeler's and their stakeholders' preferences based on frequent exposure through project-level cooperation and correspondence and can consider the latter in completing the PCMs they are assigned to. Out of ten DMs contacted, the survey realized a response rate of 50%. Aggregation ensures the respondents' anonymity given the small sample and scale

Reduce Vessels' Negative Environmental Impact	Improve and Expand Waste Circularity
Sustainable Development Strategy	
Emphasize Corporate Responsibility	Create and Maintain a Healthy and Safe Work Environment

Figure 5: Cadeler A/S SD Strategy (Cadeler A/S, 2021)

of the organization, simulates group-level decision-making and further ensures a democratic balanced perspective on content elements' relative importance and a snapshot of the organization's SR priorities (Aull-Hyde et al., 2006).

The surveys were tailored to generalist and specialist managers in that the former received surveys on the full scope of GRI subcategories and topics only, whereas the latter were invited to provide preferences on disclosures in addition. This structure is consistent with the idea that specialist knowledge is embedded in such departments and that consistent yet non-indifferent preferences are provided as a result of higher topic familiarity (Schlöpfer & Fischhoff, 2010). Preference data was collected through Excel-based surveys over a period of four weeks to account for time constraints and to increase the likelihood of obtaining consistent preferences (CR \leq 10%). Each survey included a completion manual and definitions on the GRI Topics and Disclosures; in addition, the author provided tutorials and content element definitions in the survey material and organized online walkthroughs to ensure DMs' understanding of the survey's objective, the mechanisms in play, and how DMs can contribute to their best knowledge. The surveyed DMs were familiarized with the content elements' hierarchy and are assumed to have set clear preferences on which subcategories should be prioritized over others to assign, *ceteris paribus*, a higher importance to the social topics assigned to the subcategory. For illustration, the first pairwise comparison in Table 6 in the appendix answers the following question:

“How much more (or less) informative is the GRI Topic “Materials” compared to “Energy” to accurately describe Cadeler's activities' environmental impact and sustainability performance?”

Following the same architecture of the question for topics and disclosures, the respondents set preferences and were asked to reflect the content elements' materiality in terms of strategic importance rather than their ease of reporting or related data collection (Puroila & Mäkelä, 2019). Prior to aggregating individual DMs' preferences into a collective preference set for Cadeler, each submitted PCM was tested for consistency and transitive preferences. Untabulated results indicate that all submitted PCM exhibit transitivity (CR $<$ 10%) and are aggregated for the base case analysis, of which the results also point at transitivity. Across all GRI Standards and DMs, the author collected 492 pairwise comparisons.³

³See tables 5, 6 and 7 in the appendix.

3.2. External Materiality Assessment

Due to research and temporal constraints arising from reputational and strategic concerns that inquiries to external stakeholders may result in reporting requirements that may be misaligned with Cadeler's priorities, prioritizations from this stakeholder group is not obtained but rather derived from the materiality sections of SRs from organizations that Cadeler A/S is frequently exposed to due to the nature of their business (Machado et al., 2021). Cadeler's stakeholders can be segmented into three major groups, namely (1) Direct Competitors, (2) OEMs, i.e. offshore wind turbine manufacturers, and (3) Windfarm Developers. A comprehensive overview on 19 stakeholders based on the organization's track record has been derived from the organization's website and extended by records provided by Cadeler's sustainability management. Though Cadeler's NACE Rev 2 Code according to Orbis (Bureau van Dijk) is 50.20 (“Sea and coastal freight water transport”), setting up a peer group based on this code yields organizations that are not occupied with offshore windfarm commissioning. Therefore, Cadeler's primary economic activity is more accurately described through NACE Code 42.91 (“Construction of Water Projects”) since Orbis classifies direct competitors as such. Furthermore, the competitors' revenue streams arising from offshore windfarm commission on a vessel basis are deemed comparable to Cadeler's. OEMs are characterized by the NACE Code 28.11 (Manufacturing of wind turbines) whereas Windfarm developers exhibit the NACE Code 35.11 (Production of electricity).

This type of manual content analysis is beneficial in that the absence of direct inquiries to external stakeholders is assumed to avoid the short-term emergence of inapplicable reporting requirements to Cadeler A/S. On the other hand, it assumes that topic priorities are truthfully reported and informative on the organization's true preferences and not constructed or tailored towards a specific stakeholder group (Mitchell et al., 1997). Due to lacking standardization in the SRs' topic descriptions, the author mapped each topic included in an organization's materiality matrix to its closest GRI equivalent based on the GRI's Standards catalogue and available information in the stakeholders' reporting material. The analysis was restricted to the topic level to avoid over-interpreting content from potentially non-GRI compliant reports and to focus on higher-level priority alignment. Some organizations reported against SDG targets which required translation though a dedicated GRI-SDG mapping (Global Reporting Initiative, 2020b). Broadly speaking, the more recurrent a GRI topic is, the more material it is assumed (Bellantuono et al., 2016). Topic rankings were constructed

based on their recurrence. Within stakeholder groups, the materiality sections were, on average, similarly comprehensive among direct competitors, OEMs, and windfarm developers reporting on 17, 16, and 20 GRI topics, respectively. Equal stakeholder salience within and across groups is assumed and stakeholder groups are analyzed independently to avoid oversimplification of priorities (Puroila & Mäkelä, 2019). Spearman rank correlations and two-tailed significance tests examine the derived ordinal data's explanatory power (Gauthier, 2001).

3.3. SDG Prioritization

Performance reporting against the UN's SDGs is becoming increasingly important for tracking progress towards a carbon-neutral economy by 2030 (Adams, 2017; KPMG, 2020; United Nations, 2015b). Notably, Adams (2017) emphasizes that reporting organizations should (1) align the SDGs with their sustainability strategy and (2) identify environmental issues impeding shared value creation and therefore contribution and progress towards SD and growth (Robinson, 2004). Implying that the UN can be perceived as a Green Club can strengthen organizational legitimacy to a degree similar to that the GRI can realize, the SDGs represent a convenient solution for reporting on progress towards SD (Adams, 2017; Orsato, 2009).

Out of the few studies that explore and call for more coverage on the link between policy abidance and improved sustainability performance over time (Conway, 2019), very recent developments identify a significant positive association between SDG-driven reporting and progress towards them and the adoption of the GRI Standards (Pizzi et al., 2021). Therefore, Cadeler could enhance their SR's legitimacy, credibility and value relevance by tightly integrating the SDGs and potentially reap benefits from improved stakeholder engagement and recalibrating their SD(G) strategy (Adams, 2017; Adams & Larrinaga, 2019). In the same vein, KPMG (2020) calls for more extensive SDG integration, stronger strategic alignment, greater emphasis on biodiversity. A recent joint project by the GRI, the PRI and the UNGC has resulted in extensive guidance for reporting organizations in how to address investors' informational needs on SDG performance by reporting on the GRI Standards (Global Reporting Initiative, 2020b). The author applies the suggested mapping to the priorities obtained from the internal materiality assessment to display how Cadeler could report on the SDGs, which increasingly shape SR policymaking in the EU (Global Reporting Initiative, 2020a). In the tables with the results, proposed SDG and/or target substitutes (complements) are indicated in brackets and separated without (with) a comma from the GRI's official translation.

4. Results

4.1. Preliminary Insights on Cadeler A/S

Regarding the internal materiality assessment, all DMs' and 38 aggregate PCMs were found to be consistent (CR <

0.1) (Aull-Hyde et al., 2006; Saaty, 1978). Internal results are complemented by their S.D. and CV to proxy dispersion among DMs. Topics' and disclosures' descriptions are taken from the most recent GRI Standards catalogue from 1st January 2021 (Global Reporting Initiative & University of Stellenbosch Business School, 2020).

Concerning Cadeler's present degree of sustainability integration, MCSs are used interactively, whereas SCSs are primarily used diagnostically yet are gaining increased feedback. Unstructured management interviews revealed that compliance is critical to ensure operational excellence and profitability. Regarding environmental KPIs, Cadeler's SCS captures data for activities onshore and offshore. For the former, flight data, fuel consumption of company cars, electrical consumption and waste production are captured. On vessels, MGO consumption, flight data, waste production, paper, and plastic recycling rates along with freshwater consumption, bunkering data, and use and spills of chemicals or hazardous materials along with reported incidents and pollution events (e.g. through ballast water). In terms of employment, Cadeler A/S captures such data as staff diversity, retention rates, and salary and benefit benchmarks on the industry level. The organization's HSEQ system tracks lost time incidents relative to manhours worked, the number of vessel track observations, near misses and hazard IDs to indicate the focus level on onboard safety. Despite a rather comprehensive baseline focus on nonfinancial performance, economic profitability tends to be prioritized which may be detrimental to sustainability integration (George et al., 2016). However, recent initiatives to intertwine administrative processes, strengthen HSEQ, and plans to tie remuneration more closely to sustainability performance indicate a proactive movement beyond compliance and a transition towards peripheral sustainability integration, mainly because of ongoing process innovation, departmental integration, and sustainability knowledge diffusion (ibid.).

4.2. Internal Materiality Assessment

4.2.1. Economic Priorities

Figure 6, Figure 7, and Table 8 in the appendix show the global weights for economic topics and disclosures for Cadeler A/S which represent the content elements' relative importance on the topic and disclosure level and for the organization to report their GRI-based economic sustainability performance internally and to their stakeholders along with their dispersion scores.⁴

GRI 201 (Economic Performance) was given the highest materiality score of 18.46% on the organizational level. It also displays the highest standard deviation across all seven alternatives at 6.21% yet the second-highest relative variation at a CV of 0.34. The topics with the second- and third-highest priority are Anti-Corruption (GRI 205), and Anti-Corruptive Behavior (GRI 206), with materiality scores of 16.82%, and 16.29% and similar CVs of 0.34 and 0.33. Tax

⁴See tables 1 and 8 in the appendix.

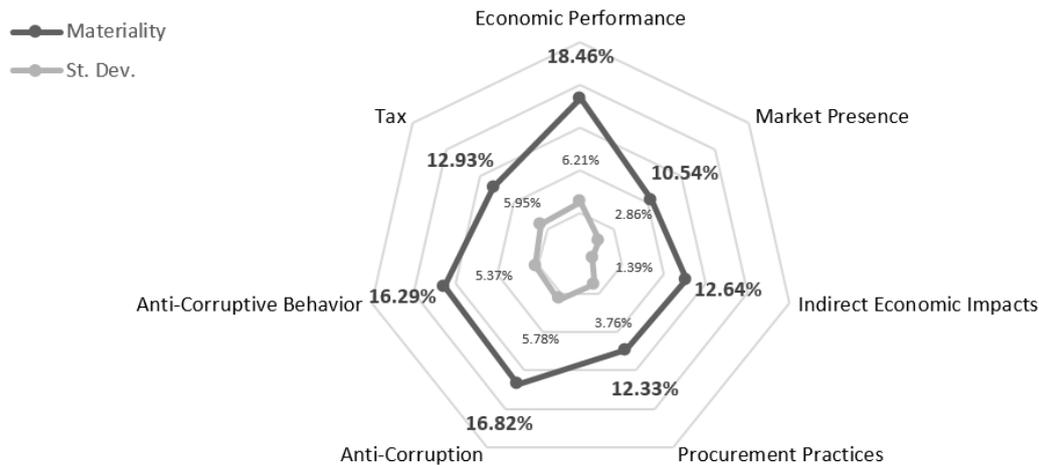


Figure 6: Materiality and Dispersion of Economic GRI Topics (own work)

(GRI 207) is ranked fourth at 12.93% yet has the highest CV in the list (0.46). Indirect Economic Impacts (GRI 203) and Procurement Practices (GRI 204) assumed materiality (CVs) of 12.64% and 12.33% (0.11 and 0.30) along with GRI 207, displaying a similar level of relative importance on the organizational level yet lower absolute and relative variability. Market Presence (GRI 202) is ranked lowest at 10.54% and entails the second-lowest CV across economic topics at 0.27. Economic, environmental, and social topics have an average CV of 0.31, 0.19, and 0.32, respectively. Thus, GRI 302's CV is below-average across economic and social topics yet above-average relative to environmental content elements. All economic topics' CVs except for Tax are about average. To the author's surprise, individual submissions went against the author's expectation that these reflect a DM's task familiarity (Schläpfer & Fischhoff, 2010). To illustrate, when a strong bias to procurement practices was expected, the emphasis lied on coverage on anti-corruption and anti-corruptive behavior.

Figure 7 depicts the global weights of Economic GRI disclosures and their contribution towards a report that assumes full coverage on all materiality prioritization of the economic GRI Disclosures for the Case of Cadeler A/S. It further conveys within-topic priorities should Cadeler decide to cover all topics to an extent. Within GRI 201, the most material disclosures are GRI 201-2 and GRI 201-1 at global weights of 8.28% and 6.08% that deal with financial implications, opportunities, and risks related to climate change and the generation and distribution of economic value. Regarding GRI 205, disclosure 205-3 was assigned the highest priority and covers the quantity of and actions taken against corruption incidences on the organizational, employee, supplier, and public level. GRI 206 ranked third only includes GRI 206-1, which reports on exposure to legal action because of anti-competitive behavior and the outcome of the trials and of which the disclosure weight equals that of the topic and represents the most material disclosure item across the economic scope. With regards to Tax, GRI 207-1 to GRI 207-3 represent

management approach disclosures that need to be reported in case GRI 207 is adopted. The results show that these disclosures related to the organization's tax-related approach, governance, and stakeholder engagement are ranked highest in this order, whereas disclosure on country-by-country reporting is ranked lowest within GRI 207 and across economic disclosures. GRI 203, GRI 204, and GRI 202 are covered most effectively by reporting on GRI 203-1 and GRI 203-2, GRI 204-1, and GRI 201-1 or 202-2. None of these topics contains management approach disclosures (see [Global Reporting Initiative & University of Stellenbosch Business School, 2020](#)).

4.2.2. Environmental Priorities

Figure 8, Figure 9, and Table 9 in the appendix display the relative materiality of environmental topics and disclosures across and within content elements to capture Cadeler's sustainability performance in this category, respectively, along with dispersion scores. At a materiality score (CV) of 22.87% (0.19), Environmental Compliance (GRI 307) is ranked as the most material topic at medium relative variation ahead of Energy (GRI 302) with a considerable margin of 7.51 percentage points. In addition, its relative CV is about average (0.19). Energy (GRI 302) is ranked second at 15.36% and a CV of 0.08, the lowest among environmental topics. Emissions (GRI 305), Waste (GRI 306) and Water and Effluents (GRI 303) complete the list of the top five environmental topics to achieve a GRI coverage of 75.43% achieved by reporting on all 25 disclosures related to the topics. The top three topics and their 13 disclosures would cover 50.43% of the environmental GRI scope. Assuming linear economies of scale in preparing reporting internal and external environmental SR for each topic and disclosure item, reporting costs tend to increase relative to the level of comprehensiveness achieved in the research process. Interestingly, Biodiversity (GRI 304) and Materials (GRI 301) are considered least material (8.22% and 8.03%) yet entail the highest CVs of 0.31

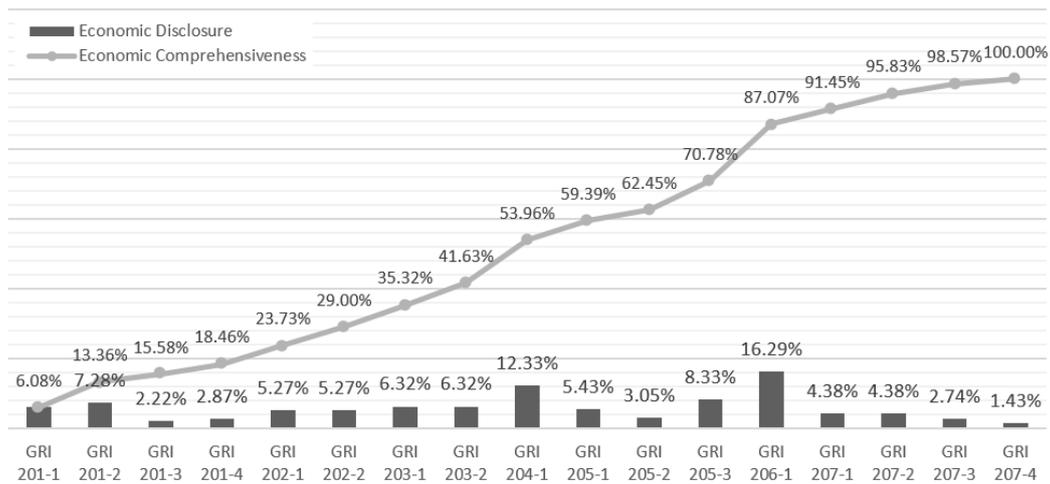


Figure 7: Comprehensiveness and Materiality of Economic GRI Disclosures (own work)

each.⁵

Figure 10 describes environmental disclosures’ individual contribution to covering the required content elements included in the environmental GRI Standards. Starting with Environmental Compliance (GRI 307), its only disclosure 307-1 has the same materiality score and thus has the highest individual contribution within environmental disclosures but also across all 89 subtopics included in the framework. Within Energy (GRI 302), over 75% of the topic is covered by the disclosures GRI 302-3, 302-4, and 302-1 that require reporting on Energy intensity (i.e. relative efficiency), reducing energy consumption and energy consumed within Cadeler A/S, respectively at local (global) scores of 28.09%, 24.29%, and 22.65% (4.32%, 3.73%, and 3.48%). Concerning Emissions (GRI 305), GHG Emissions intensity (305-4), Actions to reduce GHG emissions (GRI 305-5), and Direct (Scope 1) emissions (GRI 305-1) are ranked highest at global weights of 3.26%, 2.57%, and 2.46%, and are over 50% informative on Cadeler’s environmental performance on Emissions. With regards to Waste (GRI 306), most priority was assigned to the disclosures GRI 306-3 and 306-4 which shed light on how much (hazardous) waste Cadeler A/S has generated and/or diverted from disposal (i.e., reused or recycled) along with contextual information on how data was compiled and segmented according to internal definitions. Notably, GRI 306-1 (waste-related impacts in the organization’s value chain) and 306-2 (actions to monitor and mitigate waste-related impacts) were not ranked highest yet constitute mandatory disclosure elements as per *Global Reporting Initiative and University of Stellenbosch Business School (2020)*.

4.2.3. Social Priorities

Figure 10, Figure 11, and Table 10 in the appendix describe the relative importance of social topics to Cadeler A/S on the topic level. In an attempt to update the analytical

framework with the latest generation of GRI reporting elements and balance the framework’s modularity and the resulting higher cognitive effort and potential decision fatigue and inconsistent preferences when setting preferences on social reporting topics, the author added a social subcategory layer from the GRI G4 (*Calabrese et al., 2016; Global Reporting Initiative, 2013*) and determined preferences on a subcategory level to mimic a topic ranking absent subcategories.⁶

Figure 10 shows the global weights of social sustainability topics, which are calculated as the product of the of their local weight within a subcategory and the that of the subcategory they are part. Occupational Health & Safety (GRI 403), the highest-ranking topic among all social topics and highest-ranking in the LPDW subcategory, has a global weight of 8.43% = 27.75% * 30.37%. GRI 403 also faces the highest CV of 0.63, which is almost twice the average CV of social topics. The score suggests that Cadeler should commit a maximum of 8.43% of resources committed to social SR to the disclosure elements contained in GRI 403. Within LPDW, Employment (GRI 401) is ranked second (fifth) locally (globally) at 23.33% (7.08%) with a CV of 0.39 and covers hiring and firing, and benefits to full-time employees in office or on (parental) leave.

GRI 416 (Customer Health and Safety) is ranked second across all social topics and reports on an organization’s commitment and performance to/on increasing service safety and ensuring such by covering incidents that are a result of non-compliance to safety guidelines. Its materiality (CV) amounts to 7.08% (0.38). Notably, GRI 416 is deemed most material within the PR subcategory, whereas GRI 417–419 cover three of the bottom four spots within PR and among all social GRI Standards. GRI 415 (Public Policy) ranks third at 7.28% (CV pf 0.21) and attempts to quantify the contribution Cadeler A/S makes towards the achievement of political goals per country and beneficiary operated in (*Global Report-*

⁵See tables 1 and 9 in the appendix.

⁶See tables 1 and 10 in the appendix.

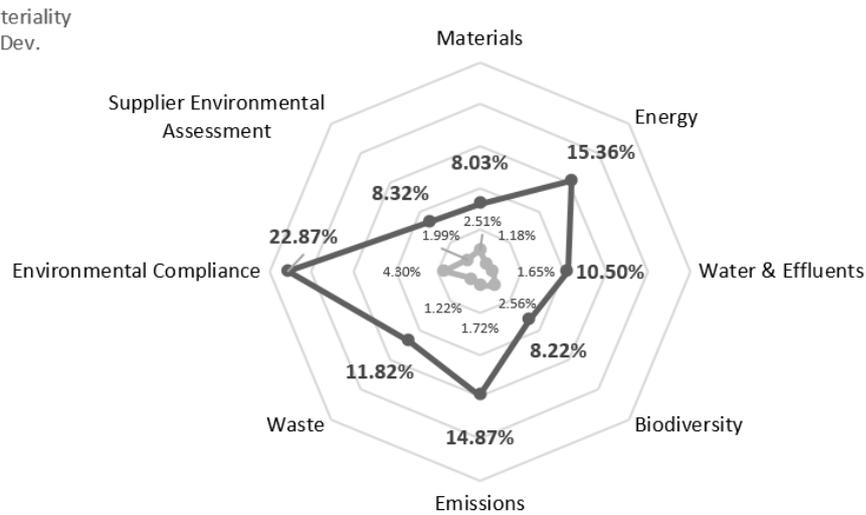


Figure 8: Materiality and Dispersion of Environmental GRI Topics (own work)

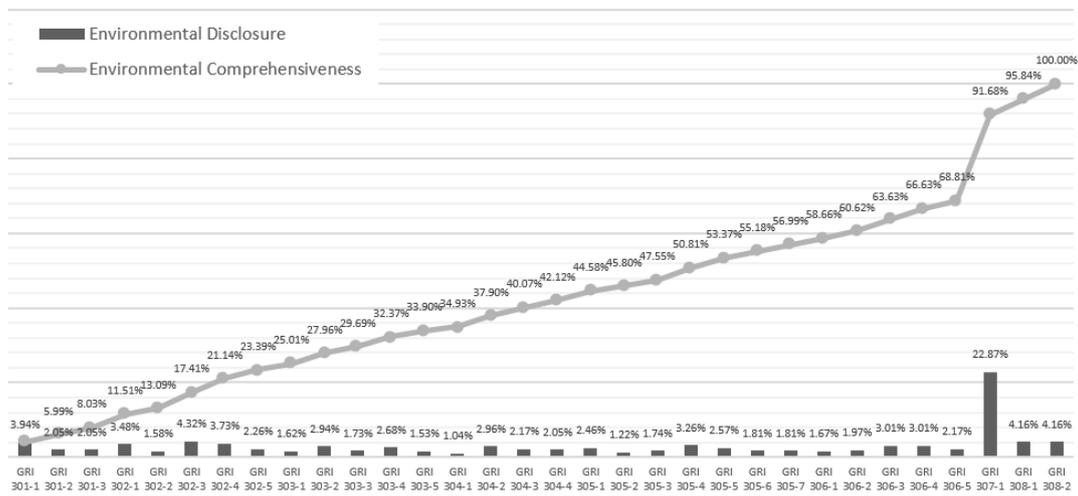


Figure 9: Comprehensiveness and Materiality of Environmental GRI Disclosures (own work)

ing Initiative & University of Stellenbosch Business School, 2020). Such contribution not only includes corruptions risks or lobbyism, but also party financing (ibid.).

GRI 415 ranks highest within the SOC subcategory and is closely followed by GRI 414 (Social Supplier Assessment) within the same subcategory, with that topic ranking fourth across all social GRI Topics at 7.21% and a below-average CV of 0.17. This topic deals with HRDD conducted on new suppliers that is directed to negative social impacts that can adversely influence activities in Cadeler’s value chain or a large commissioning project. The fourth social subcategory, HR, was found to be the most important subcategory in the assessment at 31.32%. However, the category’s two highest-ranking topics, Child Labor (GRI 408) and Forced or Compulsory Labor (GRI 409) take the global ranks six and eight at 6.47% and 5.88% and CVs of 0.53 and 0.54.

Regarding social disclosures, the results for GRI 403 show

that 403-9 and 403-10 entail the highest local (global) materiality levels at 13.60% and 14.00% (1.18% and 1.15%) and deal with work-related injuries and illness. Its inherent management approach disclosures 403-1 to 403-7 are found to range lower and between 0.60% and 0.95% although the GRI Standards mandate their prioritization. Within GRI 416, the disclosure GRI 416-2 is weighted locally (globally) at 70.83% (5.40%), making it one of the highest-ranking social subtopics. It provides guidance on reporting incidents linked to a product’s or service’s noncompliance caused by shortcomings in the safety concept of operations with clients (see Global Reporting Initiative & University of Stellenbosch Business School, 2020).

Similar to GRI 307 or GRI 206, GRI 415 also covers one disclosure element, GRI 415-1, at a global weight of 7.28% that deals with contributions directed towards political causes through parties, beneficiaries, or governments that

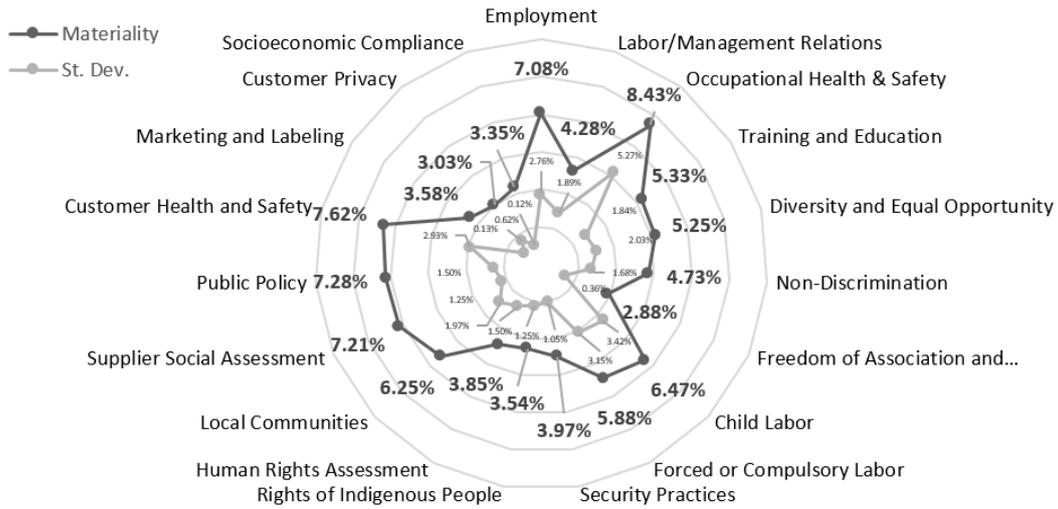


Figure 10: Materiality and Dispersion of Social GRI Topics (own work)

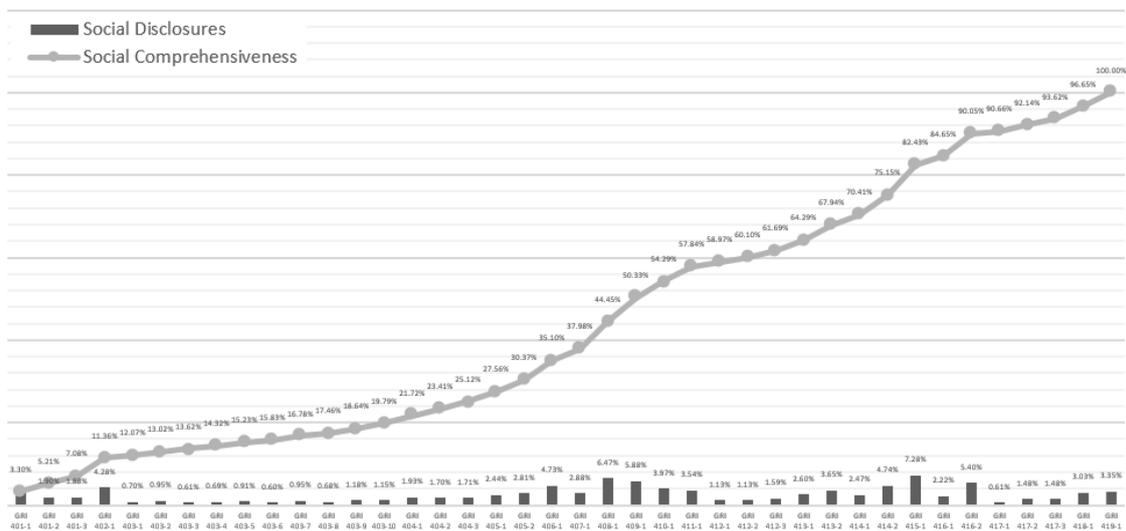


Figure 11: Comprehensiveness and Materiality of Social GRI Disclosures (own work)

can either be captured in the form of monetary payments or estimates, e.g. the value an offshore windfarm commissioning program or other services provided to a party's political agenda (Global Reporting Initiative & University of Stellenbosch Business School, 2020). Similar to GRI 416, the second disclosure in GRI 414 is prioritized at 4.74% globally and emphasizes occurrences of and actions taken against value chain activities that impede or adversely influence an organization or project's ability to create dual and shared value (Global Reporting Initiative & University of Stellenbosch Business School, 2020; Porter & Kramer, 2011).

Within Employment (GRI 401), main emphasis lies on new hires and turnover (GRI 401-1), which covers 46.64% of GRI 401 and 3.30% of all social disclosures. GRI 401-2 and 401-3 that deal with benefits provided and parental leave provided and taken are ranked almost identically at 1.90% and 1.88% globally. GRI 408 and GRI 409 entail

only one disclosure item each that (1) requires disclosure on operations and suppliers at risk of child labor, incidents of such, and abolition measures (GRI 408-1), and (2) covers operations and suppliers at risk and/or showing incidents of forced and/or compulsory labor and mitigation measures taken. Both disclosures' weights are equal to their topics' (6.47% and 5.88%).

4.3. Stakeholders' Priorities

Along with time constraints in the data collection process, a major concern that arose in Cadeler's management is that direct inquiries regarding external parties' reporting preferences may lead to expectations that Cadeler A/S may not be able to live up to in a satisfactory way due to information asymmetries in expectations and strategic considerations. Therefore, external stakeholders' SR priorities towards Cadeler were inferred from manual content analysis

on stakeholders' sustainability reports and surveys of which the approach is outlined in section 3.2. Although the nature of this approach is seemingly not in line with the GRI's notion of stakeholder inclusiveness transcending the identification, prioritization, and verification of material content elements, the standard setting organization remains silent on a specific definition of such and thus gives room for interpreting stakeholder inclusiveness. Among, direct competitors, only one organization is listed in the GRI's database yet does not provide GRI-compliant SR. Therefore, the inference from reported material topics to GRI topics is a "most likely" translation from proprietary to framework jargon as no organization in the sample reports compliant to the GRI. However, offshore windfarm commissioners tend to have similar stakeholder groups, so their materiality assessments can be used to proxy expected stakeholder interests in Cadeler A/S.

The results displayed in Table 11 in the appendix show that among direct competitors, GRI 205, GRI 206, and GRI 207 recur most frequently, whereas the remaining topics are not found to be covered in the SRs. OEMs rank GRI 205 and GRI 206 highest and only one organization reports on procurement practices (GRI 204). As with direct competitors, the remaining economic topics were not found to be deemed material under sustainability concerns. Spearman's rho is low at 0.3482 and insignificant at a 95% confidence level. Windfarm developers, taken together, tend to prioritize GRI 201, GRI 205, and GRI 206 and, on the group level, exhibit a prioritization very similar to that of Cadeler A/S. The author finds a highly positive and significant correlation between the economic GRI priorities provided by Cadeler A/S and windfarm developers of 0.8125 and a p-value of 0.0264. On the audience level, GRI 205 and GRI 206 are slightly prioritized over GRI 201, and the author finds a strong positive yet weakly significant association.

Table 12 in the appendix displays the results from the analysis on environmental topics. Direct competitors tend to consider Emissions, Energy, and Environmental Compliance (GRI 305, GRI 302, and GRI 307) as most material and report on the remaining five environmental topics when taken as a group which are ranked similarly to Cadeler's. This is underlined by a highly positive and significant Spearman rank correlation coefficient of 0.8095 and a p-value of 0.0149. The opposite conclusion is drawn for OEMs, which tend to provide more balanced environmental reporting yet prioritize Emissions, "Waste" (GRI 306), and "Supplier Environmental Assessment" (GRI 308). Windfarm developers consider GRI 305, GRI 302, and GRI 308 material most frequently, and the topic ranking shows a weakly positive and insignificant association with Cadeler's priorities. On the audience level, the positive association is 12.5 percentage points weaker than that for direct competitors and is weakly significant (p-value of 0.0611). On a side note, all environmental GRI topics have been referred to in the sample of stakeholders' SR material.

The results on the analysis directed to social topics in Table 13 in the appendix show that Cadeler's direct competitors are most likely to prioritize Occupational Health and Safety, Non-Discrimination, and Diversity and Equal Oppor-

tunity with them recurring eleven, seven, and six times, respectively, with the first rank identical to that of Cadeler A/S. Social topics falling under the PR subcategory are not covered in the materiality analyses except for GRI 416, which was found in one competitor's materiality analysis. Spearman's rho is found low and insignificant. Among OEMs, GRI 403 is ranked highest and followed by the GRI Standards GRI 413, GRI 414, GRI 401, GRI 402, and GRI 405. Among PR topics, only GRI 416 is referred to once. Interestingly, Training and Education (GRI 404) is not referred to by any OEM's materiality assessment. Despite a medium magnitude in Spearman's rho, the association between the ranks is found to be significant. Windfarm developers tend to refer to GRI 403, GRI 404, GRI 405, GRI 401, and GRI 406 most frequently in this order and tend to refer to topics within SOC at a medium frequency and to topics within PR with the least, except for GRI 416. Spearman's rho is slightly less than in the OEM group with 0.4382 and weakly significant. Taking the stakeholder groups together, the qualitative ranking of top five topics is very similar to that of windfarm developers, and Spearman's rho of 0.3873 is found insignificant.

To summarize, two key observations are made. First, medium to high and significant correlations are found for only one group of stakeholders within the sample. For economic topics, it is windfarm developers whereas for environmental and social topics, the findings tend to not result from the method or sample when considering direct competitors and OEMs, respectively. Second, the two other stakeholder groups in the considered categories exhibit either weakly significant or mostly insignificant associations. Topic rankings inferred from the entire stakeholder sample tend to be either weakly significant or insignificant.

4.4. SDG Integration

This section looks at how Cadeler's reporting priorities across economic, environmental, and social topics could translate into SDG coverage along with their respective targets. As outlined in section 3.3, the translation is displayed on the topic level; however, the SDG targets and SDGs are sorted based on the GRI disclosures' local materiality. That is, the more material a GRI disclosure is locally, the earlier are the SDG target and SDG listed in their respective column; the analysis is based on the preceding internal materiality assessment and guidance provided by [Global Reporting Initiative \(2020b\)](#) and [United Nations \(2015b\)](#). For brevity and to show a potentially realistic example on how Cadeler can leverage the UN's comprehensive framework that contains 17 goals, 169 targets, and 231 unique indicators ([United Nations, 2015b](#)), this section assumes that Cadeler A/S decide to only report on material topics that exhibit a materiality score above the average weight assuming DM indifference. Therefore, the following sections will look at economic, environmental, and social topics with global materiality scores of more than 14.29%, 12.50%, and 5.27%, respectively.

4.4.1. Economic SDGs

In the Economic category, the topics with above average materiality are GRI 201, GRI 205, and GRI 206. For the former, the translation manual suggests the SDG targets 13.1 for the disclosure GRI 201-2 and the targets 8.1, 8.2, 9.4, and 9.5 as covered by disclosure 201-1. SDG target 13.1 calls for climate change adaptation efforts, whereas the SDG targets linked to GRI 201-1 cover economic growth, productivity gains, eco-efficient value creation, and GHG emissions relative to value creation, and advancing research functions, respectively (United Nations, 2015b). Therefore, GRI 201 is linked to the SDGs, 8, 9, and 13. Regarding GRI 205, all three disclosures are associated with SDG target 16.5, which aims to decimate the presence of bribery (ibid.). Similarly, GRI 206 is linked to SDG 16, with its equivalent target 16.3 promoting the importance of lawful behavior. This SDG target does not explicitly link to economic compliance but rather to injustice that legal systems impose on non-convicted individuals (ibid.) which makes the link between the GRI and the SDG target more symbolic than accurate in terms of content. Taken together, above-average material economic topics cover four unique SDGs and six unique SDG targets.⁷

4.4.2. Environmental SDGs

GRI 307 and its disclosure GRI 307-1 are linked to SDG target 16.3 and thus SDG 16. Conceptually, the problem with this association is the same as with GRI 206 as the SDG focuses on lawful behavior of legal institutions rather than organizations exhibiting environmental compliance. Based on an additional content analysis, SDG target 12.4 (lawful chemicals and waste management to limit their adverse impact) seems more appropriate as it points at material handling in line with such ruling. The association tends to be conceptual in the sense that it only alludes to the idea of compliance in an open fashion. GRI 302 and all five disclosures are associated with the SDG targets 7.3, 8.4, 12.2, and 13.1, which cover the relative contribution of renewable energy to the global energy supply, resource efficiency, eco-efficiency in material management and use through reduced footprints, and climate change adaptation efforts, respectively (ibid.). Regarding GRI, its most material disclosure GRI 305-4 (GHG intensity) is linked to the SDG targets 13.1 (climate change adaptation), 14.3 (fighting ocean acidification), and 15.2 (foster sustainable forest management) (ibid.). GRI 305-1, the second most material disclosure, is associated with the same ones and 3.9 (reducing air pollution) and 12.4. In total, the defined range of environmental topics covers seven SDGs and nine unique SDG targets.⁸

4.4.3. Social SDGs

Social SDGs are prioritized as follows. To start with, GRI 403 is associated with SDG 8 with its target 8.8, seven unique targets 3.3 – 3.9 along with the SDG targets 16.1,

and 16.7. The former target is most present within GRI 403 with its emphasis on increasing workplace security and reducing adverse work-related impacts. This target is also referenced most frequently with above-average material social topics (eleven times) and within GRI 403 (nine times). The SDG targets 3.3–3.9 are referenced to mostly once and are linked to reducing mortality and increasing health coverage by mitigating adverse health and safety impacts; though work-related safety is not mentioned explicitly, the link to these targets is less explicit and more conceptual. A qualitatively similar finding is related to the associated SDG targets 16.1 and 16.7, though the latter implicitly points at compliant decision-making directed to population safety, of which the work environment can be seen as a subset (ibid.). GRI 416 takes a client perspective on work safety; conceptually, SDG target 8.8 can expand the compliance-driven translation related to 16.3, which stresses the role of legal enforcement. GRI 415 is linked to SDG target 16.3 because both alternatives point at the mitigation of bribery risk and potentially resulting negative societal impacts.

With GRI 414 emphasizing risk arising from socially unsustainable supplier practices, the targets 5.2, 8.8, and 16.1 geared to eliminating workplace safety, partly by eliminating violent practices, the association is deemed an accurate translation for this standard. GRI 401-1, the most material disclosure in GRI 401, is associated with the SDG targets 5.1, 8.5, 8.6, and 10.3, of which 8.5 and 8.6 exhibit the most explicit link to GRI 401. The targets 5.1 and 10.3 emphasize non-discrimination and equal opportunity (ibid.). The target 8.6 alludes to training and can thus be added to GRI 404, which shows strong overlap with GRI 401 and adds the SDG targets 4.3–4.5 and 8.2 that deal with increased access to education and productivity gains as such. GRI 408 and GRI 409 also exhibit substantial overlap as both are associated with SDG target 8.7 (banning forced and child labor) and the former on the target 16.2 (end child abuse). Finally, GRI 413 is linked to the SDG targets 1.2 and 2.3 which aim to reduce poverty by increasing work productivity across sectors and thus income, wealth, and SD in communities. Taken together, Cadeler's above-average material topics cover eight SDGs and 27 SDG targets, of which SDGs 8, 3, and 16 and the targets 8.8, 8.5, 16.1, and 5.1 are covered most frequently.⁹

4.5. Sensitivity Analysis

Robustness tests changing the base case assumptions test the results from section 4.1 for ranks reversal by simulating collective DM bias and exposure to uncertainty (Majumdar, Tiwari, Agarwal, & Prajapat, 2021; Velasquez & Hester, 2013). It mimics DM bias by manipulating a TFN's center of gravity towards its upper or lower bound by varying λ and/or a DM's uncertainty in preference setting by varying the vagueness of/overlap between linguistic options through α (Tsai et al., 2010; Tseng & Lin, 2008). One parameter is changed at a time for each DM and tested for consistency.

⁷See table 14 in the appendix.

⁸See table 15 in the appendix.

⁹See table 16 in the appendix.

Pre-tests for all 20 cases show that all DM's CRs remain below 10%. Therefore, the same number of PCMs is aggregated. The author uses the words "pessimism" and "optimism" with their variations synonymous to DMs' partiality to the lower or upper bound of their linguistic judgments' TFNs.

4.5.1. Economic Standards

Rank reversal is not observed when introducing DM bias to the base case. As expected, materiality scores are identical when $\alpha = 0$ as the conversion scale becomes crisp. Across all variations of fuzziness when keeping DM bias constant, the materiality scores converge slightly, meaning that the lower-ranking economic topics such as GRI 207, GRI 204, or GRI 202 gain relative importance at the expense of higher-ranking items GRI 201, 205 or 206. In the case of $\lambda = 0$, rank reversal is not observed when increasing uncertainty when compared to the base case in which $\alpha = \lambda = 0.5$. In the unbiased setting, GRI 203's rank increases from five to four whereas that of GRI 204 decreases accordingly when fuzziness is high or extreme with $\alpha \geq 0.8$ or rather when the overlap between linguistic judgments is highest and DM bias absent. In the setting with $\lambda = 1$ and α increasing, changes in ranks are observed on three topics when $\alpha \geq 0.4$. To illustrate, GRI 203 and GRI 207 trade the fourth and fifth rank $\alpha = 0.4$ as the latter's weight decreased from 13.03% to 12.69% and the former increasing above. At $\alpha = 0.8$, the rank of GRI 204 improves from six to five whereas GRI 207 loses one rank at a materiality score of 12.37%.

Holistically, the four highest-ranking economic topics lose relative importance with increasing fuzziness, with GRI 207 losing one spot in the unbiased setting and two spots in the optimistic case, whereas the alternatives that were ranked fifth or sixth in the base case gain materiality. GRI 202, the lowest-ranking items, gains most relative importance yet remains the lowest-ranking topic in all scenarios. High to extreme levels of fuzziness paired with small differences in medium-ranked materiality scores and DM optimism indicate sooner rank reversal and stronger convergence. For instance, GRI 201's materiality decreases from 18.69% to 17.63% when increasing fuzziness, whereas the decrease is less for when bias is excluded and even slightly negative when preferences are pessimistic ($\alpha = 0$). Importantly, the ranking of the three highest-ranking topics remains unchanged across all levels of fuzziness and bias. 13 of 20 rankings are equal to the reference and rank changes are only observed between the ranks four and six.¹⁰

Disclosure convergence within economic topics is observed for most cases except for those in which disclosures are ranked equally important or in which there is only one disclosure. The lowest-ranking disclosures within a topic gain relative importance at the expense of their highest-ranking alternatives. For instance, at $\alpha = 0.5$, the materiality score of GRI 201-1 decreases from 40.22% to 36.86% when increasing fuzziness from 0 to 1, whereas GRI 201-3 increases from 11.3% to 14.90%. Across all topics that

contain heterogeneously ranked disclosures, rank reversal is found absent.¹¹

4.5.2. Environmental Standards

The results on environmental topics show that their relative importance converges for every level of DM bias and increasing fuzziness. Likewise, the rankings of the three most material topics remain robust across all variations of DM bias and uncertainty and the ranking is robust to changes in DM bias at $\alpha = 0.5$. When $\alpha = 0$, the ranking remains robust until GRI 303 and 306 switch ranks when $\alpha \geq 0.8$. In the unbiased and optimistic setting, GRI 304 and GRI 308 exchange the ranks six and seven. In the unbiased setting, rank reversal also occurs only if $\alpha \geq 0.8$ yet two different topics, GRI 303 and GRI 308 exchange the sixth and seventh rank. The same observation is made at the same minimum level of fuzziness and $\lambda = 1$. In total, rankings from 14 of 20 scenarios replicate the base case.¹²

Disclosures within GRI 301, GRI 307, and GRI 308 are found robust to changes in DM bias and uncertainty across all scenarios. Priorities within GRI 304 are found to be robust in all scenarios except for when $\lambda = \alpha = 1$ in which GRI 304-3 and 304-4 exchange the third and fourth rank. Priorities within GRI 302 only exhibit rank reversal when $\lambda = 0$ and $\alpha = 1$, where, interestingly, GRI 302-5 and GRI 302-4 switch the first and second rank. Regarding GRI 303, 13 scenarios are robust to variations with ranks changing most frequently when $\alpha \geq 0.8$ across all types of bias. In the case of GRI 305, 14 scenarios are consistent with the base case, with most rank reversals taking place at medium to low ranks at $\alpha = 1$ across all bias levels and with $\alpha \geq 0.6$ when $\lambda = 1$. Across GRI 306, only medium to low-ranked elements change priority when $\lambda = 0$ and $\alpha \geq 0.8$. In total, disclosure rankings are robust when changing fuzziness in the TFNs and when $\alpha < 0.5$ across all bias levels.¹³

4.5.3. Social Standards

Table 21 in the appendix shows the results on the sub-category level and that their ranks remain stable across all bias-fuzziness combinations. The results on social topics in Table 22 in the appendix show that ranks do not only change among medium- and lower-ranked topics in the prioritizations, but also among high-ranking alternatives though only when fuzziness is extreme. Specifically, GRI 403 and GRI 416 are ranked first and second in all scenarios except when $\lambda = 0$ and $\alpha = 1$. The only topics exhibiting robust ranks across all scenarios are GRI 405, GRI 407, GRI 409, and GRI 418. GRI 402 to GRI 404 show variation when introduced to bias and extreme fuzziness at $\alpha = 1$. Excluding the base case, the topic ranking is perfectly robust in the unbiased setting when $\alpha = 0.6$ and in the optimistic setting when $0.5 \leq \alpha \leq 0.6$. In addition, the results show that the frequency and extent of

¹¹See table 18 in the appendix.

¹²See table 19 in the appendix.

¹³See table 20 in the appendix.

¹⁰See table 17 in the appendix.

deviations is mainly contingent on α rather than λ . To illustrate, whereas five topics deviate from the base case when assuming $\lambda = 0$, the number remains unchanged when making TFNs crisp and, on average, doubles at high and extreme fuzziness levels. In the unbiased and optimistic cases, manipulating default fuzziness tends to lead to more ranking variability.

All disclosure preferences from GRI 412 upwards are robust across all scenarios, whereas all disclosures below show rank variability. Disclosures within GRI 405 and GRI 401 only exhibit priority changes at $\alpha = 1$ and $\alpha \geq 0.8$, respectively, across all types of bias. GRI 404-1 is only found to change its top rank when $\lambda = \alpha = 1$ whereas its lower-ranked alternatives change ranks with decreasing fuzziness in the unbiased and pessimistic scenarios and extremely low or high levels of fuzziness in the optimistic case. Lastly, findings on GRI 403 show that its most material disclosures GRI 403-9 and GRI 403-10 are robust across all combinations, with the latter sharing the same rank with the former when $\lambda = \alpha = 1$. GRI 403-1's rank is robust to zero bias and optimism and $\alpha \leq 0.2$ across all λ . The remaining disclosures show mixed findings yet are more susceptible to rank changes with increasing fuzziness and DM bias. Combining optimism and low deviations from medium fuzziness results in the least rank variation relative to the base case.¹⁴

Table 24 in the appendix provides a summary of the preceding analysis on topic and disclosure rankings and shows the scenarios', items' (topics and disclosures), and rank's accuracy in replicating the base case. Accuracy is defined as the percentage of cases that are robust across all topics, disclosures, and scenarios, respectively. When a social topic includes more than one disclosure, their total is reflected in the number of total disclosures across all bias-fuzziness combinations. The results show that most scenarios accurately represent economic topics and disclosures, whereas most economic topics and disclosures are robust across all bias-fuzziness combinations. In addition, social subcategories, topics, and disclosures when ranked on the subcategory level exhibit high accuracy, unlike the aggregate of all described previously. Finally, the ranks of environmental topics and economic disclosures are most persistent globally.

5. Discussion & Conclusion

The objectives of this research were to shed light on how Cadeler A/S could plan their future SR activity by deploying a quantitative materiality assessment process as a resource planning tool that provides the organization with a structured approach to prioritize their allocation of financial, cognitive, and temporal resources towards SR content elements and related data collection efforts and long-term progress towards the UN's SDGs. The research questions addresses in this study were geared towards (1) how Cadeler A/S could, with a structured and scientific methodology, prioritize SR

topics at limited organizational information-processing capacity that makes the resulting SR materiality-driven, compliant with established SR regulation, endorsed standards, and can substantiate contribution towards the UN's SDGs, and (2) how Cadeler A/S could go forward to integrate such materiality-driven SR in the organizations to make sustainability data processing more responsive, inclusive, and ubiquitous to reconcile operative efficiency with an ambitious growth trajectory observed in the offshore windfarm construction market (European Commission, 2020a). One of the main contributions of this thesis is that it empirically determines materiality scores for an SME rooted in the offshore wind sector and its stakeholder audience and provides a suggestive agenda for how Cadeler A/S can enhance their future SR in an emerging industry to increase their chances to secure longer-term success through informative disclosure activity.

This study applied Group-based Fuzzy AHP based on Calabrese et al. (2016) and is paired with a manual content analysis screening SRs of a sample of 19 stakeholders linked to Cadeler A/S that are segmented into groups of direct competitors, OEMs, and windfarm developers. The analysis meets a dual purpose as a tool for (1) both prioritization and resource planning centered around the preparation of a GRI-compliant report and (2) setting a comparative case for reporting preferences local to Cadeler A/S and across the larger-scale organizations that are members of the offshore wind supply and value chain as organizations winning contracts, providing energy-converting assets, and delivering the construction service to the second. This section outlines the key findings from the preceding analyses and looks at the implications for Cadeler regarding the research questions posed on this report. On a general note, what Cadeler A/S may take as a given or required by law may be considered highly material by external stakeholders who are less familiar with intra-industry focal points.

5.1. Commissioning SR

The results from the economic section suggest that Cadeler A/S should run a four-pronged approach centering around Economic Performance including economic value added and climate-related financial and value risks, integrity in business conduct through GRI 205 and GRI 206 by shedding light of bribery risk and trials based on related allegations, and emphasizing tax matters such as their approach, governance, and stakeholder management related to such. Priorities within GRI 207 show that it is consistent with the GRI's prioritization of the topic's management approach disclosures. The results further show that these topics' respective CVs exhibit the highest dispersion among DMs' individual judgments. Interestingly, individual submissions were not necessarily in line with the author's expectation that managers prefer what they are most familiar with, such as the submission from one DM specialist in procurement (Schläpfer & Fischhoff, 2010). Insights like these indicate that respondents may have considered the broader scope of

¹⁴See table 23 in the appendix.

organizational reporting priorities rather than local phenomena on the department level. This partly rejects the implicit hypothesis that returned questionnaires entail department bias (ibid.).

Considerable dispersion among high-ranking topics and notably within GRI 207 can be explained by one DM ranking it highest, whereas two other DMs ranked it in the lower half of the topic ranking at half of the materiality score. GRI 205 and GRI 206 are ranked highest by two DMs whereas one DM ranked them as the second-lowest priorities. Besides possible prioritizations for SR planning and construction, the results across all categories confirm T. C. T. Chen (2020) in that group-based decision analysis with FAHP is susceptible to lacking perfect consensus and that aggregating results may over-simplify internal preferences, which may also be driven by content elements' perceived reportability rather than their strategic importance to Cadeler A/S, or managers' personality traits or affiliation, since the sample consists of DMs reporting to the CEO. Although a participative approach intends to mitigate the risk for possible impression management, the survey cannot perfectly mitigate it despite capturing verbal preference cues. Untabulated results showing DMs' individual preferences indicate that a topic's CV increases when most topic-level materiality scores are at least 50 percent higher in magnitude than the minority's vote. The correlation between the materiality scores and the CVs at 0.2832 points at a weakly positive and statistically insignificant relationship across all topics. Dedicated sensitivity analyses on topics and disclosures show that the preferences, on an aggregate level, are highly robust to changes in collective DM bias and exposure to uncertainty and informational value discounts (Dubois & Prade, 1988).

High CVs in economic priorities can render task planning and delegation more complex by pointing at control hotspots and greater need to coordinate DMs with alike preferences to render collaboration more resource- and cost-efficient (George et al., 2016; Herremans & Nazari, 2016). To illustrate, DMs with higher preference similarity to each other and top management's interests may exhibit a higher willingness to collect and report related data for internal information-processing and require a stronger involvement in organizational action centered around their inclination. Such actions tends to fall in line with Herremans and Nazari (2016) who advocate delegating specialist tasks to the most committed experts with the most fitting perspective. This would require screening more executives' preferences and higher procedural legitimacy driven by a promoting member or group (see Kiesnere & Baumgartner, 2019). Accomplishing this outcome, however tends to hinge on a culture responsive to organizational change and top management support towards creating stronger linkages between HSEQ, management functions, and organizational units across all hierarchy levels (ibid.; Adams & Frost, 2008; George et al., 2016).

Broadly speaking, most of Cadeler's stakeholders tend to put little emphasis on reporting on economic topics which confirms assertions in previous studies on a propensity to-

wards social and environmental reporting (Hubbard, 2009; Saenz, 2019). It is likely that related disclosure can impact the perceived relative importance of social and environmental reporting (ibid.). The reliability of this data is also impacted by that the priorities are derived from disclosure material that may not directly address Cadeler A/S or can be translated to a GRI equivalent. For instance, reporting GHG emissions based on the MARPOL conventions is a common requirement to Cadeler A/S stated in dedicated sustainability surveys, though SRs emphasize the topic rather than the method or policy. A higher-level description tends to keep disclosure material more concise at the potential expense of explanatory power; over time, more detail will have to be disclosed either on demand or as a supplement provided at the expense of potentially less convenient access and conciseness. Put differently, an organization adopting SR is likely to have to trade off conciseness and comprehensiveness in a longer-term setting assuming scale increases (Zhou, 2011).

The observed lack of economic coverage can come from at least two possible sources. First, economic topics may be important for an organization's sustainability yet were omitted in the report, which would be consistent with (Beske et al., 2020) pointing at impression management to signal stronger commitment to nonfinancial topics besides economic considerations. Given that neither direct competitor complies with the GRI Standards, this could explain why the author finds little to no information on how these organizations constructed their materiality matrices and defined the topic lists. This finding also holds for two out of three OEMs and five out of ten windfarm developers, and confirms Machado et al. (2021) in that GRI-compliant reporting on the materiality assessment methodology is mostly high-level in the absence of regulation enforcing such practice.

Given the significant reporting gap in that no direct competitor in the sample adheres to the GRI framework, this can represent a strategic opportunity for Cadeler A/S to adopt economic GRI standards signal commitment to informative SR towards OEMs and windfarm developers, of which all organizations in the sample engage in SR in line with the GRI Standards and also investor mindset as the adoption of such framework is shown to be positively linked to SR quality and sustainability performance, as found in Michelon, Pilonato, and Ricceri (2015), stock price performance gains (Guidry & Patten, 2010) and theoretically shape industry or market practice in SR in the presence of Cadeler's leading position in the offshore windfarm commissioning market on the EU level (see Moseñe et al., 2013). This strong disparity in reporting efforts and significance scores in preference alignment indicates that reported congruity with a stakeholder audience's preferences tends to assume away divergence among sub-groups' and/or individual reporting preferences through potential oversimplification, thereby confirming Puroila and Mäkelä (2019). Still, OEMs tend to emphasize non-economic topics and lawful business conduct, whereas windfarm developers show a relatively stronger propensity to report on economic performance. It should be noted, however, that the higher topic count can also be attributed to the sam-

ple size and potentially more comprehensive materiality matrices, though they were found similarly exhaustive among stakeholder groups with direct competitors, OEMs, and windfarm developers covering 17, 16 and 20 GRI Topics on average, respectively.

Economic SDGs are primarily driven towards integrity and access and commitment to lawful procedures and climate risk arising from Cadeler's underlying economic activity geared towards economic growth and value added for the organization, its employees, economic sustainability environment (i.e. industry and community) and innovation practices towards building eco-efficiency over time (Orsato, 2006). Therefore, Cadeler A/S is recommended to focus economic reporting around the SDGs (targets) 13 (13.1), 8 (8.1 and 8.2), 9 (9.1, 9.4, and 9.5), and 16 (16.3 and 16.5), adding the three latter items to Cadeler's SR portfolio (Cadeler A/S, 2021). Notably, the link to SDG 16 from the GRI Standards is rather conceptual as the SDG does not explicitly address compliance to economic regulation but rather access to justice. Reporting on such could be deemed optional since industry compliance can be regarded as a license to operate and not a competitive edge (Deegan, 2002; Global Reporting Initiative, 2020b). Therefore, organizations should not slavishly follow GRI recommendations but also review how well the SDG description fits the GRI element to avoid seemingly aligned reporting for the sake of signaling beyond-compliance behavior (Orsato, 2006; Power, 2009). In this case, however, the author deems the translation accurate and potentially worth reporting, though this decision should factor in a larger extent of managerial judgment.

The results on environmental standards show that DM consensus in Cadeler A/S considers Environmental Compliance, Energy, Emissions, and the newly introduced "Waste" standard most material when adopting GRI-compliant SR. This confirms Talbot and Boiral (2018) in that GHG emissions constitute a highly material topic due to its disclosure to a stakeholder audience. Contrary to the findings in the economic section, the most material topics exhibit higher consensus among DMs as indicated by their respective CVs, indicating that building common ground on constructing an agenda for GRI-compliant reporting may consume less of the resources that can be dedicated to data collection, building metrics, reporting, and stakeholder engagement (Baumann-Pauly et al., 2013; Buonocore et al., 2019; Whitehead, 2017).

Considering the materiality assessment on the stakeholder groups, direct competitors, taken together, tend to emphasize Emissions, Energy, and Environmental Compliance most frequently. The finding that compliance recurs less could be explained by either the sample (size) or rather by the mechanism in Deegan (2002) stating that compliance is an organization's license to operate which could be interpreted as a basic requirement that may not provide incremental informational benefit to informed readers. Follow-up interviews with Cadeler's sustainability management point at stringent and regular audits ensuring alignment to such policies as MARPOL or ISO requirements for certification and Green Club membership (Orsato, 2006). Since com-

pliance is still alluded to rather frequently, one can infer that emphasizing compliance signals lawful business conduct to recipients who are less savvy on the importance of compliance in offshore wind or can be interpreted as an act of self-commitment for gaining legitimacy (see Boiral & Heras-Saizarbitoria, 2017).

The increased emphasis on emissions and energy tends to be observed across industries yet tends to be of strategic importance to offshore windfarm constructors in that WIV operation is an inherently transitional activity as it lacks a low-carbon alternative due to technological and cost constraints (EU Technical Expert Group on Sustainable Finance, 2019). Notably, prioritizing GHG intensity within GRI 305 can be linked to the organization's aspiration to build trust with committed investors and improve market valuation and eco-efficiency (Serafeim, Park, Freiberg, & Zochowski, 2020). Consequently, WIV operators can reap economic benefits from innovation in implementing eco-efficiency solutions and improve their sustainability performance and chances of living up to sustainability criteria required from windfarm developers contracting WIV operators which tend to span across membership to the UNGC or SBT or reporting emissions data to the CDP. These commitments, however, are only observed among OEMs and windfarm developers which can be explained by an increased administrative burden overcome with sufficient slack (Rasche et al., 2020).

In the case of windfarm developers, some reports' materiality sections were cut from one year to another without replacement. One can thus argue that using SRs from different years may be less timely input though more comprehensive and explicit on which elements a reporting organization tends to prioritize. The reasons for such change can be both explained by strategic omissions and thus drawing reader attention to different elements (Talbot & Boiral, 2018) as a measure to potentially oversimplify a materiality analysis (Puroila & Mäkelä, 2018), or for drawing attention to more positive content source (Beske et al., 2020). In any case, the materiality screening can become more derivative and prone to misinterpretation and comparability challenges within and across industries (La Torre et al., 2018; Torelli et al., 2020). Applying the findings to the sustainable business model taxonomy in Bocken et al. (2014) and Cadeler's SD report shows that Cadeler's business model tends to be primarily technological due to its strong emphasis on ensuring compliance and going beyond to increase resource/GHG efficiencies and circularity of operative and strategic input goods such as alternative fuels, MGO, or jacking grease (Cadeler A/S, 2021).

Concerning the SDGs, Cadeler A/S should be mindful of the type of compliance alluded to in the SDGs' description as environmental compliance is not covered by SDG 16, but rather dealt with by SDG 12 and its target 12.4. Further results indicate that Cadeler A/S should pay special attention to the SDGs 7, 8, 13, 14, and 15 when reporting against emissions, energy usage, and pollution. These findings are largely consistent with Cadeler's 2020 CSR report, which indicates less challenges in setting priorities than in measuring data or constructing sustainability control systems, co-evolving them

with traditional management controls, and driving organizational routines towards stronger SR integration and related performance evaluation (George et al., 2016; Gond et al., 2012; Kiesnere & Baumgartner, 2019).

The results on social standards assessment show that in the aggregate case, Cadeler A/S should focus most on Occupational Health and Safety, Customer Health and Safety Public Policy, Supplier Social Assessment, and Employment, respectively. Ranking GRI 403 first confirms Eccles et al. (2014) in that indicators on safety measures, incidents, and disclosures on safety management systems tend to be disclosed frequently across industries, including offshore wind. Whereas the focus on the former topic is consistent across all stakeholder groups, Cadeler A/S ranks GRI 416 second, whereas this topic is ranked in the lower half or third of social topics across the stakeholder groups. This finding has three implications. First, stakeholder organizations may consider the safety of a construction, manufacturing, or development service less important to report because safety procedures face extensive regulation in offshore operations or may associate such safety measures with GRI 403 applied to client visits on project sites. The underlying reason for paying little importance to such and the organization's assumptions stated in reports is sketchy and requires further inquiry. Second, it is likely that the subcategory layer in this study's approach drives this topic's relative importance as it is only compared in relation to its subcategory-level peers.

Third, differences in sample sizes and the comprehensiveness of each organization's sustainability report could drive the findings as the external screening method tends to reward more comprehensive and distinguished reporting. OEMs and windfarm developers tend to prioritize GRI 401 similarly to Cadeler A/S, whereas direct competitors tend to rank it lower. Similar observations of alignment in regards to GRI 415, GRI 414, and GRI 413 can indicate that social SR preferences relating to the more material topics are more aligned with suppliers of projects and related input material and potentially (1) a stronger commitment to signal compatibility between Cadeler and the individual stakeholder groups and (2) improve managing sustainability and reputational risk with the former's self-commitment to partners' standards (Anderson, Anderson, & Able, 2009; Green, 2015).

Using the aggregation layer to mimic modularity can, on the one hand, reduce decision-making effort by reducing the number required pairwise comparisons yet tends to introduce considerable variability to the model. Taking the subcategories one by one, LPDW should focus on GRI 403 and GRI 401, where HR should focus on GRI 408 and GRI 409. Within SOC, emphasis should lie on GRI 415 and GRI 414, whereas within PR, the main priority is GRI 416. The insights from the sensitivity analysis considering both a subcategory and an aggregate perspective indicate that the latter leads to a significantly stronger discount in the value of information used for decision-making which is reflected in low robustness and accuracy linked to more frequent changes in ranks not only across items with a medium priority but also with a high one (Dubois & Prade, 1988; İbrahim Özkan & Türkşen, 2014).

The following example considers human rights coverage because anti-corruption, bribery, environmental, and employment topics requiring coverage according to the NFRD have been considered highly material across economic, environmental, and social categories (European Commission, 2014).

A rather surprising finding is that the aggregate materiality approach ranks mandatory human rights coverage in the middle of the topic ranking, whereas prioritization tends to look very different within subcategories. Cadeler's preferences on HR topics rank GRI 408, GRI 409, and GRI 406 highest; divergence in the aggregate ranking and that of their stakeholders is therefore likely to be driven by applying an intermediate subcategory aggregation layer that can either (1) state the relative importance of material items in alignment with Cadeler's strategic objectives, (2) overstate less material topics by applying the same subcategory weighting to them or promote the relative importance of subcategories with few items that are weakly prioritized over another, and (3) understate topics' relative importance due to a low subcategory weight or a larger number of items that require more material items to be assigned more relative importance. Put differently, the low robustness of social topics and disclosures on the aggregate level that mimics modularity by multiplying the subcategories' with their topics' local weights tends to stem from this aggregation step as it imposes a subcategory weight on every topic and disclosure that is part of it. This includes topics that are part of the same subcategory yet may be less important for Cadeler A/S to report than content elements from another subcategory. Consequentially, aggregate social priorities and robustness data should be interpreted and treated with caution prior to decision-making.

These pitfalls tend to limit the method's ability to compare alternatives across subcategories in terms of magnitude, though provide sensible guidance on how Cadeler A/s could prioritize content elements should they decide to cover all topics (disclosures) within a subcategory (topic). Practically, the topics ranked highest within "Human Rights", which constitutes a mandatory reporting element in the NFRD and Section 99a in Danish Accounting Law, are GRI 406, GRI 407, GRI 412, and GRI 408 for direct competitors, whereas the materiality sections of OEMs' reports show little coverage or preference for either topic (Authority, 2015; European Commission, 2014). Windfarm developers, on the other hand, also prioritize GRI 406, GRI 412, GRI 408, and GRI 409 among the highly material issues.

Depending on the policies applied for compliance to GRI 412, there is a chance that GRI 408 and GRI 409 are linked to this disclosure, meaning an adopting organization would have to consider these topics jointly. Such a process tends to be favored by delimiting the analytical scope to either "Human Rights" topics or by applying an additional pre-screening to the scope of GRI topics. The findings, however, could also be driven by reporting organizations' and their stakeholder audience's implicit assumption that reporting on incidences of child labor or compulsory labor may be strictly regulated and may not represent a major reporting concern resulting in less emphasis throughout the SR mandate, similarly to GRI

412. On the other hand, one can argue that even though the GRI Standards have a modular structure, some topics within subcategories may still be regarded as related which may be a remnant of the superseded GRI G4. For Cadeler, the procedure on prioritizing social SR can take two forms which are analogous to economic and environmental topics: They can either capitalize on global topics scores and consider above-average material items largely aligned with OEMs' and windfarm developers' priorities, or they could drill down the social hierarchy and select subcategory, topics, and disclosure priorities from their upper layers.

When looking at GRI compliance that may result in a "core" badge, the results for GRI 403 show that the two last disclosures on work-related incidents and illness are seen as most important. The disclosure ranking was conducted without priming DMs which disclosure would be required to report according to GRI to factor out desired compliance to that framework as a result driver. The findings are largely consistent with the organization's and industry's strong emphasis on Occupational Health and Safety represents an integral part of offshore windfarm commissioning and ensures that construction projects are completed on time and under highest standards (Cadeler A/S, 2021). Special emphasis lies on such information as procedures deployed to ensure work safety, programs intended to move beyond compliance, or the number of work incidents following noncompliance to HSEQ policies. The findings are consistent with the results obtained by Eccles et al. (2014) who find a positive link between organizational sustainability and reporting skill mappings and development strategies, the number of nearly missed and fatal accidents and the driving role of compliance to adopt such metrics, since HSEQ processes are frequently audited and certified to ensure operational safety (Cadeler A/S, 2021).

5.2. Handling Uncertainty and Stakeholders

In the sensitivity analyses, across all subcategories, topics, and disclosures, materiality scores tend to converge with increasing decision uncertainty across different forms of DM bias. Global preferences are mostly over 60% robust to changes in collective DM bias and TFNs' fuzziness. Convergence can be explained with the concept in Dubois and Prade (1988) that uncertainty, fuzziness, or vagueness introduced to a decision-making process tends to discount the value of the information used for setting a preference to compensate for undesired consequences from deciding on an alternative. This mechanism would also explain observed changes in ranks among alternatives that are much alike in terms of their materiality score. A higher-ranked alternative loses value (materiality) with increasing uncertainty which is used to compensate for relative importance that may have mistakenly been cut from a lower-ranked alternative. With similar rankings, a change in ranks thus becomes more likely and may appear at a lower level of uncertainty in the presence of DM bias, which, to an extent, tends to decrease the value of information. This would imply that an unbiased perspective in a fuzzy setting tends to entail more decision-making

uncertainty than a pessimistic setting, which would assign higher value to the informational situation.

What remains unclear is which case is the more truthful scenario. Although crisp figures are a desirable means of simulating a higher confidence level in decision-making (Dubois & Prade, 1988), there is a possibility that its certainty could be constructed and may not accurately proxy the degree of (un-)certainty on the organizational level. Importantly, the observed trends can also be driven by assuming that all DMs aggregate share the same bias and attribute the same value to the information they use for preference setting (Calabrese et al., 2016). When introducing heterogeneity to the pool of DMs, it is likely that, on average, uniform extremely high or low decision-making uncertainty may not be representative of the DMs' collective informational perspective. Varied stances may result in a more balanced picture that could be more resemblant to the base case with different biases or uncertainty levels (partially) cancelling out. Present the low consistency ratios in DMs' preferences and that most respondents rarely used the more extreme ends in the linguistic preference scale, Fuzzy AHP tends to be the more appropriate means to capture different interpretations of verbal cues which classical AHP would assume away (Chan, Sun, & Chung, 2019). The method's ex-post suitability, in turn, could have been driven by cultural factors (Scholtens & Sievänen, 2013). Fuzziness (vagueness) in responses, on average, tends to positively drive rank changes in medium-ranked alternatives more than changes in DM bias alone. Varying DM bias and fuzziness simultaneously tends to accelerate rank reversals among the same alternative and partly to high-ranking priorities.

5.3. Implications for Management

The study suggests several measures for Cadeler's management to drive the organization from a transitional state between compliance-driven and peripheral sustainability integration beyond the latter and a synergistic ecosystem between management and sustainability controls and measurement used for incentive management and enhanced through employees' feedback. Given that the materiality assessment is based on topics that can be voluntarily adopted, the baseline GRI Standards 101, 102, notably 102-46 and 102-47, and GRI 103 along with detailed reporting on Cadeler's sustainable business model should be covered to build an informative and transparent foundation for materiality-driven and GRI-compliant SR (Bocken et al., 2014; La Torre et al., 2020; Machado et al., 2021). Importantly, the scope of material topics is not limited to GRI elements and can (and should) be extended to industry-specific issues to render proprietary SR more comparable. Doing so is recommended by setting a benchmark priority list based on Cadeler's sustainability strategy. Top managers will have to be engaged more extensively to treat control hotspots arisen from preference screening towards stakeholder centricity (Adams & Whelan, 2009).

Increasing technical knowledge and sensitivity among top managers to manage control hotspots to optimize sustainability information processing across hierarchical levels can

increase HSEQ's influence on SCS integration (Adams & Mc-Nicholas, 2007; George et al., 2016) and leverage specialist knowledge and learning economies with aligned interest to capitalize on higher willingness to engage on task specifics rather than over-aggregating preferences concealing them (Herremans & Nazari, 2016). Aligning control design towards truthful SR should be incentivized more intensely in reward systems (Battaglia et al., 2016).

Performance measurement systems are recommended to be equipped with GRI metrics to promote efficient decision-making towards legitimacy-building SR, alignment with salient stakeholders' priorities, and goal congruence fostering lower-cost decision-making (Hubbard, 2009) and complementarily to the present focus on HSEQ, Human Resources, and a broad scope of environmental metrics to be substantiated with more technical detail (Cadelor A/S, 2021). Impact-weighted accounts could potentially improve the explanatory power of processes and reported sustainability information (Serafeim et al., 2020). Importantly, expansion in fleet, project scope and requirements in information-processing should be accompanied by increases in related capacity, headcount, and communication channels and to balance the scale of the organization at the point at which coordination costs become substantial and growth detrimental to performance due to failure to incorporate learnings from expansion paths (Okhuysen & Bechky, 2009; Vermeulen & Barkema, 2002).

External stakeholder engagement will likely increase in relevance and result in more comprehensive SR. Still, the author recommends starting with the most material content elements and respond to stakeholder feedback by providing informational supplements or more comprehensive report. Assuming a longer-term horizon and a growing stakeholder audience, it seems unlikely that increasing SR comprehensiveness can be avoided without evoking thoughts of impression management and involving stakeholders (Beske et al., 2020; Jespersen & Olmsted, 2019). Importantly, the suggested priorities are dynamic over time in response to underlying operations and changing stakeholder groups. To limit cognitive effort, it is recommended to assess them for their salience (Mitchell et al., 1997). On the other hand, doing so keeps SR more subjective and potentially oversimplifies complex stakeholder relations; given the shortcomings of over-aggregated materiality matrices, it is recommended to balance segmenting stakeholder groups with preserving competitive edges (Machado et al., 2021; Puroila & Mäkelä, 2019). Changes in methodology, replacements and omissions, and reference points should be quantified through adjustments or avoided, respectively, to preserve SR's comparability, traceability, and transferability to a different state of Cadelor A/S (Puroila & Mäkelä, 2019; Talbot & Boiral, 2018).

To stress beyond-compliance behavior, it may be sensible to look beyond the GRI and NFRD and consider reporting against the EU Taxonomy's TSCs. As a recent development, legal guidance will become mandatory in late 2022 yet is presently unspecific on offshore wind. However, applying the latest draft material on their own and competitors'

NACE Codes can provide valuable insights into data requirements and filing requests for review in case there is a misfit between the requirements and their assigned NACE code. So far, only a handful of windfarm developers with a longer history in and more resources for SR have adopted the policy that may become a selection requirement for future offshore windfarm construction projects. Further requirements could be include a GRI reporting badge or UNGC membership for signaling further commitment at the cost of an increased administrative burden (Rasche et al., 2020).

Depending on the market location, Cadelor A/S may also consider adopting a more investor-oriented and ready-to-use framework such as SASB to engage overseas stakeholders and in the presence of offshore wind gaining significant uptake in the US. Entering assurance engagements despite its cost and potentially emerging risk factors in the assessment can reduce long-term litigation risk and render information collection and processing more tailored to the organization's underlying activities and more efficient (Porter & Kramer, 2011). Finally, though compliance is integral to functioning operations and legitimacy building (Deegan, 2002), Cadelor should refrain from overemphasizing it to avoid appearing as risk-averse and compliance-driven, and instead incorporate climate risk scenario analyses into their reporting under the TCFD's recommendations, which pose further challenges to determining material climate risks and verification by external assurers (O'Dwyer & Unerman, 2020; Power, 2009). A structured materiality assessment should advance to an organizational routine carried out periodically to update Cadelor's sustainability strategy and refine responsiveness to their stakeholders' needs (Beske et al., 2020).

5.4. Limitations

The following limitations pertain to the study. First, the structured materiality approach only considers the scope of the GRI Standards and is aimed at finding out which minimum reporting requirements to prioritize if Cadelor adopts this framework. There is a risk that this approach omits (may include) potentially important industry- or investor-level topics that should have been added (removed) to (from) the framework due to their relevance (temporal inapplicability). In addition, aggregating stakeholders into groups can be silent on more specific requirements that may go beyond the GRI. Undertaking these changes would add substantial subjectivity to the analysis and may provide a potentially inaccurate objectification or construction of perception, which is why a foundational structure was imposed for the analysis. This includes the introduction of managers' relative importance, which was assumed equal yet can also have driven the results to a considerable extent. Similarly, there is a possibility that when setting their preferences, managers took operative and strategic perspectives that are not captured by the survey. Subjectivity remains inherent to the materiality assessment and is unlikely to be ruled out when founded on managerial judgment (Beske et al., 2020). The analysis further assumes similar DM bias and value attributed to information that may both vary considerably. Importantly,

Cadeler's present reporting and stakeholder environment may not be transferable to competitors or future offshore wind market conditions and SR requirements (Puroila & Mäkelä, 2019).

The analysis further entails similar trade-offs to the ones stated in Calabrese et al. (2017) and may not be representative of organizational preference based on the sample size of DMs. A certain degree of simplification and subjectivity through aggregation of both internal and stakeholders' preferences tends to remain in the data and the method due to the topic's nature. Under this consideration, the solutions and implications may not be definitive and require further examination and are unlikely to relieve Cadeler A/S from future SR obligations. This holds especially for the stakeholders' SR screening as it assumes equal levels of stakeholder salience, which will have to be examined further with similar MCDM tools as the one applied in this study and may be based on subjective data and translations based on a framework dictionary. In part, stakeholders' preferences may have been misinterpreted or over- or understated. In terms of frameworks and regulation, inefficiencies in regulation and frameworks call for voluntary self-commitments in organizations which can, despite objectification, result in inefficient decision-making and opportunistic behavior. Importantly, the method applied does not provide a true and optimal solution inherent to complex linear programming setups, but rather a suggestive point of departure for adopting materiality-driven SR based on GRI that may not require clear-cut suggestions present human factors in this approach. In addition, it may ignore potential interdependencies between disclosures, topics, and SDGs though the applied tool follows the "drill-down" approach suggested by GRI.

5.5. Avenues for Future Research

The author concludes with potentially fruitful avenues for future research. To start with, further testing and development of data-driven materiality assessments is required to not only structure quantitative and relatively weakly standardized procedures, but also taking informative reporting mainstream at a greater level of convenience (Calabrese et al., 2017, 2016). Using GRI metrics for performance evaluation and measurement can shed more light on whether the integration of such a framework renders decision-making more efficient as a result of increased congruity and incentive effects and how well materiality-driven SR enhances frameworks such as the SBSC or the more recent MBSC (Feltham & Xie, 1994; Guix & Font, 2020; Hubbard, 2009; Ikäheimo, Kallunki, Moilanen, & Schiehl, 2018).

Broader application of group-based MCDM techniques could be used or developed to test group behavior in adopting reporting and improving internal resource efficiency in SR integration (George et al., 2016; Wang & Elhag, 2007). This could be supported by introducing importance scoring models for weighting DMs' influence on organizational processes and further econometric analyses on GRI-based metrics, their comparability, and their contribution towards SD.

Further investigations on reporting trade-offs between conciseness and comprehensiveness could further increase our understanding on how organizations and investors provide and are given an optimal amount of content that enables efficient decision-making. On the market level, further event studies could increase our knowledge on drivers of GRI materiality and its impact on investors' decision-making and stock price informativeness in European markets (see Grewal et al., 2020; Schiehl & Kolahgar, 2020). Further empirical testing and longitudinal industry-level studies on developments in GRI adoption and its interplay with regulatory practice or on quantitative materiality assessments can broaden our knowledge on whether the latter leads to improvements in organizational sustainability and stock market performance across sectors and markets such as the offshore wind value chain. Finally, the suggested avenues along with the recent scope of coverage should emphasize practical implications for assurance providers to develop more powerful assessment toolkits and complement wide-spread principle-driven assurance standards with tightened ruling to increase SR efficiency and hold reporting organizations more accountable, especially on future reporting against emerging regulation such as the EU Taxonomy. In many ways, the road towards efficient SR and the EU Green Deal targets is long and ambitious and is likely to require abundance in theories of change to navigate open pathways. The author hopes to have aroused some doubts about the apparent representativeness and objectivity of best efforts to construct credible SR and conduct structured materiality assessments.

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