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Climate Strategies and Sustainability Pathways of Italian Small and Medium-Sized Enterprises

Vera Palea *et al*

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ISSN 2523-8124 ISSN 2523-8132 (electronic)
Palgrave Studies in Climate Resilient Societies
ISBN 978-3-032-17453-6 ISBN 978-3-032-17454-3 (eBook)
https://doi.org/10.1007/978-3-032-17454-3

This work was supported by University of Bologna, Ca' Foscari University of Venice, University of Turin, University of Rome Tor Vergata and University of Pisa.

This Palgrave Macmillan imprint is published by the registered company Springer Nature Switzerland AG.
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Acknowledgements

The project was funded by the European Union—NextGenerationEU, Mission 4, Component 2, in the framework of the GRINS—Growing Resilient, INclusive and Sustainable project (GRINS PE00000018—CUP D13C22002160001). The views and opinions expressed are solely those of the authors and do not necessarily reflect those of the European Union, nor can the European Union be held responsible for them.

This monograph represents the outcome of extensive collaborative work encompassing literature review, research design, survey-based data collection, data analysis, and collective reflections on the academic and policy-making implications of the findings. Although this is a joint work, the initial drafting of the individual sections has been assigned to the following authors:

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The authors are deeply grateful to Debora Giannini, Giacomo Giusti, and Alessandro Rinaldi from the Centro Studi delle Camere di Commercio (Research Center) Guglielmo Tagliacarne for their technical support during the sampling phase and the survey.

The authors would also like to thank Silvia Gordano and Giulio Caldarelli, University of Turin, for their editorial coordination throughout the preparation of the monograph.

Competing Interests The authors have no competing interests to declare that are relevant to the content of this manuscript.

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Abbreviations

AMELIA	Data platform for the transfer of knowledge and statistical analysis
ATECO	Classification of economic activities adopted by ISTAT
BIS	Bank for International Settlements
CATI	Computer-Assisted Telephone Interviewing
CAWI	Computer Assisted Web Interviewing
CG	Corporate Governance
CNDCEC	National Council of Chartered Accountants and Accounting Experts
CONSOB	The regulatory authority in charge of supervising the Italian securities markets
COP	Conference of the Parties
COVIP	Italian Pension Funds Supervisory Commission
CRD	Capital Requirements Directive
CRR	Capital Requirements Regulation
CSDDD	Corporate Sustainability Due Diligence Directive
CSR	Corporate Social Responsibility
CSRD	Corporate Sustainability Reporting Directive
DIPE	Department for the Planning and Coordination of Economic Policy
DNF	Non-financial statement introduced by the NFRD
EBA	European Banking Authority
EC	European Commission
ECB	European Central Bank
EFRAG	European Financial Reporting Advisory Group
EIB	European Investment Bank
EIOPA	European Insurance and Occupational Pensions Authority
EMS	Environmental Management Systems

ESEF	European Single Electronic Format
ESG	Environmental, Social and Governance
ESMA	European Securities and Markets Authority
ESRS	European Sustainability Reporting Standards
EU	European Union
FNC	National Foundation of Chartered Accountants
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GRINS	Growing Resilient, Inclusive and Sustainable project
HR	Human Resources
IBIPs	Insurance-Based Investment Products
ICAAP	Internal Capital Adequacy Assessment Process
IEA	International Energy Agency
ISTAT	Italian National Institute of Statistics
IVASS	Institute for the Supervision of Insurance
KPI	Key Performance Indicator
MEF	Ministry of Economy and Finance
MUR	Ministry of University and Research
NFRD	Non-Financial Reporting Directive
NGFS	Network for Greening the Financial System
OECD	Organization for Economic Co-operation and Development
PAB	Paris-Aligned Benchmark
PNRR	Italy's National Recovery and Resilience Plan
PRI	Principles for Responsible Investment
RRF	Recovery and Resilience Facility
RRP	Recovery and Resilience Plan
SD	Sustainable Development
SDG	Sustainable Development Goals
SME	Small and Medium-sized Enterprises
TCFD	Task Force on Climate-related Financial Disclosures
TNFD	Task Force on Nature-related Financial Disclosures
UN	United Nations
WEF	World Economic Forum

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CHAPTER 3

Conceptualizing Corporate Responses to Climate Change

Abstract This chapter develops the conceptual framework guiding the analysis of SMEs' strategic responses to climate-related risks. Building on the existing literature, it examines how organizational determinants influence firms' climate strategies and their outcomes through a double materiality perspective that captures both financial and environmental dimensions. The chapter provides a coherent analytical foundation for empirical analysis and offers insights relevant to academic research, managerial decision-making, and policy design.

Keywords Climate strategies • Climate risk management • Adaptation • Mitigation • Double materiality

This chapter sets out the conceptual framework guiding the analysis of how SMEs respond strategically to climate-related risks. Grounded in a review of the relevant literature, the proposed framework aims to explore the relationship between organizational factors of SMEs, strategic responses, and their outcomes through a double materiality lens. By linking internal drivers, strategic behavior, and financial and environmental impacts, the research offers an integrated perspective to inform academic research, management practice, and policymaking.

V. Palea et al., *Climate Strategies and Sustainability Pathways of Italian Small and Medium-Sized Enterprises*, Palgrave Studies in Climate Resilient Societies,
https://doi.org/10.1007/978-3-032-17454-3_3

3.1 Research Context and Conceptual Framework

In the face of accelerating climatic volatility and intensifying environmental disruptions, corporate resilience increasingly hinges on the capacity to internalize and strategically respond to climate-related risks (Aragón-Correa & Sharma, 2003). The IPCC warns that, if global greenhouse-gas emissions continue on their present trajectory, the planet is likely to reach a mean temperature anomaly of +1.5 °C sometime between 2030 and 2052. This projection triggered the landmark 2015 UN Conference of the Parties (COP 21), where 196 parties adopted the Paris Agreement. The accord commits signatories to an accelerated, concerted reduction of global emissions to hold the temperature rise below certain thresholds viewed as critical for safeguarding socio-economic systems from environmental disruptions. The proliferation of forward-looking scenarios that depict a troubling economic outlook has spurred the publication of numerous assessments of climate-related impacts at both the macro and micro levels. For example, across the EU, the European Environment Agency estimates that climate-related extremes inflicted €650 billion in economic losses between 1980 and 2022. Hydrological hazards accounted for roughly 42% of these damages, storms for 29%, and heatwaves for about 20%. Italy alone absorbed €111 billion in losses, the third-highest figure in Europe after Germany and France. These aggregate numbers foreshadow rising insurance costs, infrastructure disruptions, and productivity shocks that filter directly into corporate balance sheets.

As anticipated in Chap. 1, two main categories of climate risks are commonly acknowledged in the scholarly and policy domains: physical and transition risks. The former refers to the direct, tangible consequences of climate change manifested through acute weather events or through chronic environmental shifts, including prolonged heat waves and altered precipitation patterns. These phenomena expose firms to potentially severe economic losses by damaging assets, interrupting production processes, impairing infrastructure, and increasing operational and insurance costs. Particularly vulnerable are companies situated in high-risk geographies or those dependent on climate-sensitive supply chains. On the other hand, transition risks emerge from the multifaceted societal and regulatory shifts underway to curb GHG emissions and promote a low-carbon economy. These encompass regulatory changes (e.g., carbon pricing mechanisms), legal liabilities (e.g., climate-related litigation), technological evolution (e.g., the integration of clean technologies), market transformations (e.g.,

evolving consumer preferences), and reputational dynamics. Such transitions may engender financial repercussions for firms, including increased compliance costs, the obsolescence of carbon-intensive assets, and fluctuating investor confidence, ultimately affecting firm valuation and long-term viability (Dal Maso et al., 2024a, 2024b).

At the policy level, the EU has embarked on a robust regulatory trajectory to mitigate climate change through the advancement of carbon pricing and the codification of sustainability standards, as discussed in Chap. 2. This legislative framework establishes detailed criteria for determining the environmental sustainability of economic activities, serving as a cornerstone for aligning corporate behavior with the EU's climate neutrality target for 2050. While the regulation is not directly binding for SMEs, its cascading externalities and impacts through supply chains and investor expectations indirectly compel SMEs to conform to emerging sustainability norms. SMEs, in particular, encounter unique vulnerabilities in this context. Their frequent localization in single markets, limited access to diversified customer bases, and constrained financial and organizational capacities render them especially susceptible to both physical disruptions and transition-related adjustments. Consequently, a proactive orientation toward climate risk management is not merely advisable but imperative for SMEs striving for continuity and competitiveness in a rapidly transforming global economy.

As discussed in Chap. 1, the research aims to support this orientation by assessing the degree of readiness and proactivity of SMEs to climate risks through mapping strategic responses across territories, examining key determining factors of higher proactivity, and thus allowing companies for the integration of a double materiality perspective into the assessment of strategic outcomes.

The conceptual framework underpinning our research is portrayed in Fig. 3.1. It unfolds in three sequential stages. It begins with a set of internal determinants drawn from the literature, including senior management's perception of climate-change risk (Todaro et al., 2021), corporate governance mechanisms (Asad et al., 2025), ownership structure (Berrone et al., 2010), financial resources (Voss et al., 2008), legal form (Kim et al., 2017) and the degree of climate-related education within the organization (Audebrand, 2010). Together, these factors influence both the awareness of climate challenges and the firm's capacity to respond to these risks. Building on this foundation, four strategic profiles are identified along an increasing scale of engagement with climate change: "Wait-and-see,"

Fig. 3.1 Conceptual framework. (Source: Own elaboration)

"Planners," "Foresighted," and "Proactive" firms. Each profile produces outcomes that are best interpreted through the lens of double materiality. On the financial side, strategic choices affect such indicators as cost of capital, cash-flow volatility, and broader risk-return metrics. On the impact side, the same choices influence contributions to SDG 13, manifesting in reduced greenhouse-gas emissions, more efficient use of land and water, and lower waste generation. The framework, therefore, links organizational determinants to strategic posture and, in turn, to both economic and environmental performance, offering a coherent perspective for management research and practice. The next sections discuss these three elements in more detail.

3.2 Sustainability Drivers and Determinants in SMEs

A growing body of academic literature has examined the factors that drive or hinder corporate investments in climate mitigation and adaptation. One of the most significant determinants is the perception of risk (Todaro et al., 2021). Firms that recognize climate change as a material and imminent threat are more likely to invest in protective or transformative measures. This perception shapes how the costs and benefits of climate investments are assessed: higher risk salience correlates with greater willingness to absorb upfront costs in anticipation of long-term gains

(European Investment Bank (EIB), 2021; Hoffmann et al., 2009; Pinkse & Gasbarro, 2019).

However, the mere recognition of risk is insufficient. The availability of financial resources critically influences the feasibility of climate-related investments (Voss et al., 2008). For SMEs in particular, limited access to external finance, constrained internal capital, and short planning horizons can hinder the implementation of effective strategies (EIB, 2022). This underscores the importance of supportive financial instruments, policy incentives, and public–private partnerships to enable climate action in resource-constrained contexts, as discussed in Chap. 2.

Another salient factor is organizational capability, including access to technical expertise and climate literacy. While awareness of climate impacts may be growing, many SMEs still lack the knowledge base and human capital to translate concern into concrete action (Alam et al., 2022). In this regard, corporate governance constitutes a critical supporting pillar (Asad et al., 2025). Evidence suggests that firms equipped with dedicated sustainability managers (Peters et al., 2019), environmental management teams (Jabbour et al., 2013; Palea et al., 2024), or sustainability-linked compensation systems (Flammer et al., 2019; Velte, 2024) are better positioned to design and implement effective climate strategies. Moreover, reporting mechanisms can contribute to fostering climate engagement. Sustainability reporting serves as a tool for internal decision-making, accountability, and stakeholder communication, thereby reinforcing corporate commitment to environmental goals (Massa et al., 2015; Tang & Higgins, 2022). Additionally, participation in multi-stakeholder initiatives—e.g., the UN Global Compact or the Science Based Targets initiative (SBTi)—can further drive environmental improvements by embedding firms in networks of shared learning and performance benchmarking (Berliner & Prakash, 2015; Romito et al., 2024).

Finally, certain structural characteristics of firms also shape their climate responses. For example, firms with higher proportions of institutional ownership tend to exhibit lower emissions profiles (Benlemlih et al., 2023), while legal forms that embed social purpose, such as benefit corporations, may provide directors with a clearer mandate to pursue sustainability objectives (Kirst et al., 2021).

3.3 Climate Strategic Approaches

Effective economic value creation presupposes the systematic integration of risk management into corporate strategy. Research in this field (D'Onza, 2008; Zagaria, 2017) describes this integration as progressing through three phases: risk identification, evaluation, and mitigation.

In the identification phase, the organization monitors events that could compromise performance, analyzes the factors that precipitate those events and verifies the corresponding causal relationships. Once the risk landscape is delineated, each threat is evaluated by combining the probability of its occurrence with the potential scale of its consequences; exposure increases in step with the height of these two variables. The sequence concludes with mitigation, when management designs and implements measures intended to lessen overall vulnerability. The efficacy of such measures depends on cultivating an organizational "risk consciousness" that promotes their consistent application over time (Dal Maso, 2025).

In responding to climate-related challenges, firms typically deploy a combination of mitigation and adaptation strategies. Mitigation efforts are oriented toward reducing or offsetting emissions that contribute to global warming. Such interventions include investments in renewable energy, improvements in energy efficiency, carbon capture technologies, and participation in carbon offsetting schemes. These strategies help mitigate exposure to transition risks, particularly in regulatory environments where carbon pricing or emission ceilings are enforced.

Conversely, adaptation strategies are designed to strengthen organizational resilience against the physical manifestations of climate change. These may include diversifying product portfolios and geographical markets, enhancing operational flexibility, reinforcing infrastructure, and innovating in climate-resilient technologies or business models. As noted in the climate adaptation literature (Linnenluecke et al., 2013; Neil Adger et al., 2005), such measures aim to build firms' adaptive capacities and ensure business continuity under future climate scenarios.

The literature categorizes corporate responses based on their temporal orientation toward climate stimuli. Smit et al. (2000) conceptualize these responses as either reactive (implemented post-impact), concurrent (during impact), or anticipatory (pre-impact), while Gasbarro and Pinkse (2016) offer a parallel framework distinguishing between preemptive, reactive, continuous, and deferred adaptation behaviors. The degree of

	INVESTMENTS PLANNED (2024-26)	
INVESTMENTS MADE (2021-23)	NO	YES
NO	***Wait-and-see***	***Planners***
YES	***Foresighted***	***Proactive***

Fig. 3.2 Firms' climate change adaptation and mitigation strategies. (Source: Own elaboration)

organizational readiness and strategic foresight is critical in determining where firms fall within this spectrum (EIB, 2022).

Aligned with these taxonomies, this research project aims to assess the readiness levels of SMEs with respect to climate action. Drawing from empirical work, we propose, as shown in Fig. 3.2, a fourfold classification of SMEs based on their investment patterns in climate-related measures:

- "**Wait-and-See**" firms: These companies neither have a history of climate-related investment nor show intent to invest in the future. They represent a risk-averse posture, possibly due to low perceived exposure or limited resource availability.
- "**Planner**" firms: Businesses that have not yet invested but intend to do so are in a preparatory phase. They potentially signal growing awareness and the intention to incorporate climate objectives into corporate strategy.
- "**Foresighted**" firms: Firms that have previously undertaken climate investments but do not plan future initiatives. These organizations may lack long-term strategic commitment or face resource reallocation challenges.
- "**Proactive**" firms: Business organizations with a track record of investment and ongoing plans for climate action. These entities typically exhibit a long-term strategic vision and are more likely to integrate sustainability across multiple dimensions of operations.

This classification will underpin the empirical analysis developed in subsequent stages of the project, serving as a foundation for identifying barriers, enablers, and best practices across different sectors.

3.4 Strategic Outcomes: A Double Materiality Perspective

Materiality refers to identifying the issues that matter most to a company's business and stakeholders. It represents a key accounting and reporting principle, since focusing on material matters ensures companies report on the most crucial issues and communicate what is useful for stakeholders' decision-making processes. However, reporting is only the last step of a more complex path. Upstream, materiality is crucial in defining business strategies (Whitehead, 2017), identifying and managing business risks (Matsumura et al., 2024), stakeholder engagement (Gromis di Trana et al., 2024), and business planning and control activities (Eccles & Youmans, 2016).

In 2019, the EC formally introduced "double materiality" as the approach that organizations must adopt to disclose information on sustainability matters, including climate-related issues (EC, 2019). The double materiality concept acknowledges that sustainability risks and opportunities can be material from both a financial and non-financial perspective. Specifically, double materiality combines financial and impact materiality (Fig. 3.3). Based on this approach, a sustainability matter is

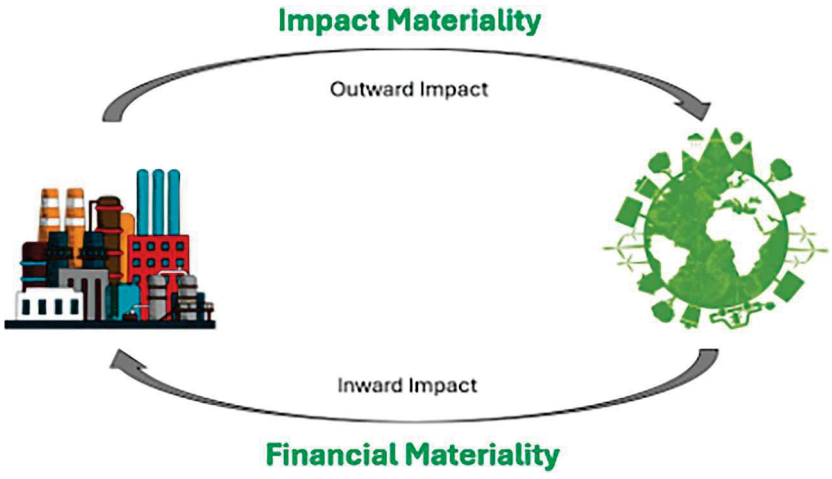

Fig. 3.3 The double materiality in climate change risks. (Source: Own elaboration)

material when it meets the criteria defined for financial materiality, impact materiality, or both (EFRAG—ESRS 1 (2022), par. 28).

Financial materiality reflects an outside-in perspective. Precisely, it focuses on the impact of sustainability factors (e.g., climate risks) on an entity's financial position, performance, or cash flow (EU, 2022). Hence, organizations must assess, measure, and report risks and opportunities that could substantially affect their operations, earnings, physical assets, and other aspects contributing to their enterprise value. Dependence of businesses on natural, human, and social resources may trigger effects in two possible ways (ESRS 1, par. 50). On the one hand, it may influence companies' ability to continue to use or obtain the resources in their business processes, as well as the quality and pricing of those resources. On the other hand, it may affect companies' ability to rely on relationships needed in their business processes on acceptable terms. Precisely regarding climate risk exposure, several studies provide evidence that it negatively affects firm financial performance in different ways, such as determining higher earnings volatility (Huang et al., 2018), higher cost of debt (Palea & Drogo, 2020), lower profitability (Palea & Santhià, 2022), and lower market evaluations (Palea & Santhià, 2022; Zhang, 2022). However, implementing specific corporate mitigation/adaptation strategies can attenuate negative impacts (Cadez et al., 2019; Palea & Drogo, 2020; Palea & Santhià, 2022). Considering the financial implications of climate risks is not only a prerequisite for companies to address broader social and environmental issues (Biondi et al., 2023) but also relevant to financial institutions for managing financial risks stemming from climate change (Mähönen & Palea, 2024).

Impact materiality represents an inside-out perspective. It entails assessing the impacts of business activities on sustainability factors (EC, 2022). Based on ESRS 1, a sustainability matter is material from an impact perspective when it pertains to a company's material actual or potential, positive or negative impacts on people or the environment over the short, medium, or long term. Impacts include those connected with a company's operations and its upstream and downstream value chain, including through its products, services, and business relationships. Business relationships include those in the company's upstream and downstream value chain and are not limited to direct contractual relationships. Hence, impact materiality is essential to inform corporate stakeholders on how a business entity comprehensively affects the environment and society (Global Reporting Initiative, 2022) and to evaluate its alignment with

planetary boundaries (Mähönen & Palea, 2024). For instance, business operations generate interrelated impacts on climate change and biodiversity, defined as "the variety of life in all its forms" (Dasgupta, 2021, p. 52). Biodiversity loss exacerbates climate vulnerability, while climate change accelerates the degradation of ecosystems and species extinction, thus generating a relevant relation to consider in business activities between impacts on, and dependences on, biodiversity (Cinquini et al., 2024). In this context, firms can play a dual role by contributing to climate change mitigation, for example through the reduction of carbon emissions, and by undertaking biodiversity-focused initiatives. Such measures may include employee training programs, the creation of protected areas such as ecological corridors, donations and sponsorships, restoration and site rehabilitation (Boiral & Heras-Saizarbitoria, 2017).

Considering both the financial and the impact perspectives together, corporate management of climate risks requires recognizing that the organization contributes to and is affected by climate change.

References

Alam, A., Du, A. M., Rahman, M., Yazdifar, H., & Abbasi, K. (2022). SMEs respond to climate change: Evidence from developing countries. *Technological Forecasting and Social Change, 185*, 122087.

Aragón-Correa, J. A., & Sharma, S. (2003). A contingent resource-based view of proactive corporate environmental strategy. *Academy of Management Review, 28*(1), 71–88.

Asad, S., Hennig, J. C., Oehmichen, J., Wolff, M., & Haas, V. (2025). From attention to action: How board environmental expertise influences corporate environmental performance. *Strategic Organization, 23*(2), 259–284.

Audebrand, L. K. (2010). Sustainability in strategic management education: The quest for new root metaphors. *Academy of Management Learning & Education, 9*(3), 413–428.

Benlemlih, M., Arif, M., & Nadeem, M. (2023). Institutional ownership and greenhouse gas emissions: A comparative study of the UK and the USA. *British Journal of Management, 34*(2), 623–647.

Berliner, D., & Prakash, A. (2015). "Bluewashing" the firm? Voluntary regulations, program design, and member compliance with the United Nations global compact. *Policy Studies Journal, 43*(1), 115–138.

Berrone, P., Cruz, C., Gomez-Mejia, L. R., & Larraza-Kintana, M. (2010). Socioemotional wealth and corporate responses to institutional pressures: Do

family-controlled firms pollute less? *Administrative Science Quarterly, 55*(1), 82–113.

Boiral, O., & Heras-Saizarbitoria, I. (2017). Managing biodiversity through stakeholder involvement: Why, who, and for what initiatives? *Journal of Business Ethics, 140*, 403–421. https://doi.org/10.1007/s10551-015-2668-3

Biondi, Y., Haslam, C., & Malberti, C. (2023). *ELI guidance on company capital and financial accounting for corporate sustainability.* Report of the European Law Institute.

Cadez, S., Czerny, A., & Letmathe, P. (2019). Stakeholder pressures and corporate climate change mitigation strategies. *Business Strategy and the Environment, 28*(1), 1–14.

Cinquini, L., Pigatto, G., Tenucci, A., & Braico, N. (2024). A Systemic Model of the Relationships between Companies, Biodiversity, and Ecosystems to Manage the Environmental Performance. Retrieved from: https://www.iris.sssup.it/bitstream/11382/578932/1/ssrn-5024161.pdf

D'Onza, G. (2008). *Il sistema di controllo interno nella prospettiva del risk management.* Giuffrè Editore.

Dal Maso, L. (2025). *Cambiamento climatico e valore d'azienda. Implicazioni teoriche e strumenti operativi per l'apprezzamento del rischio climatico.* (ISBN 9788835171737). Franco Angeli.

Dal Maso, L., Gianfagna, L., Maglione, F., & Lattanzi, N. (2024a). Going green: Environmental risk management, market value and performance. *Corporate Social Responsibility and Environmental Management, 31*(1), 122–132.

Dal Maso, L., Kanagaretnam, K., Lobo, G. J., & Mazzi, F. (2024b). Does disaster risk relate to banks' loan loss provisions? *European Accounting Review, 33*(3), 825–854.

Dasgupta, P. (2021). *The economics of biodiversity: The Dasgupta review.* Hm Treasury.

EC. (2019). *Guidelines on non-financial reporting: supplement on reporting climate related information.* Retrieved June 6, 2025, from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019XC0620(01)

EU. (2022). *Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting, PE/35/2022/REV/1, OJ L 322, 16.12.2022, 15–80.*

Eccles, R. G., & Youmans, T. (2016). Materiality in corporate governance: The statement of significant audiences and materiality. *Journal of Applied Corporate Finance, 28*(2), 39–46.

EFRAG—ESRS 1. (2022). Exposure draft: European Sustainability Reporting Standard 1—General Requirements (ED ESRS 1). https://www.efrag.org/sites/default/files/sites/webpublishing/SiteAssets/ED_ESRS_1.pdf.

EIB. (2021). *European firms and climate change 2020/2021: Evidence from the EIB Investment Survey.*

EIB. (2022). *What drives firms' investment in climate action? Evidence from the 2021–2022 EIB Investment Survey.*

Flammer, C., Hong, B., & Minor, D. (2019). Corporate governance and the rise of integrating corporate social responsibility criteria in executive compensation: Effectiveness and implications for firm outcomes. *Strategic Management Journal, 40*(7), 1097–1122.

Gasbarro, F., & Pinkse, J. (2016). Corporate adaptation behaviour to Deal with climate change: The influence of firm-specific interpretations of physical climate impacts. *Corporate Social Responsibility and Environmental Management, 23*(3), 179–192.

Global Reporting Initiative. (2022). *Understanding materiality can unlock accountability.* https://www.globalreporting.org/news/news-center/understanding-materiality-can-unlock-accountability/

Gromis di Trana, M., Fiandrino, S., Tonelli, A., & Devalle, A. (2024). The interplay between stakeholder engagement and sustainability materiality assessment: A circular perspective. *Social Responsibility Journal, 20*(10), 2100–2118.

Hoffmann, V. H., Sprengel, D. C., Ziegler, A., Kolb, M., & Abegg, B. (2009). Determinants of corporate adaptation to climate change in winter tourism: An econometric analysis. *Global Environmental Change, 19*(2), 256–264.

Huang, H. H., Kerstein, J., & Wang, C. (2018). The impact of climate risk on firm performance and financing choices: An international comparison. *Journal of International Business Studies, 49*(5), 633–656.

Jabbour, C. J. C., Santos, F. C. A., Fonseca, S. A., & Nagano, M. S. (2013). Green teams: Understanding their roles in the environmental management of companies located in Brazil. *Journal of Cleaner Production, 46*, 58–66.

Kim, H., Park, K., & Ryu, D. (2017). Corporate environmental responsibility: A legal origins perspective. *Journal of Business Ethics, 140*(3), 381–402.

Kirst, R. W., Borchardt, M., de Carvalho, M. N. M., & Pereira, G. M. (2021). Best of the world or better for the world? A systematic literature review on benefit corporations and certified B corporations contribution to sustainable development. *Corporate Social Responsibility and Environmental Management, 28*(6), 1822–1839.

Linnenluecke, M. K., Griffiths, A., & Winn, M. I. (2013). Firm and industry adaptation to climate change: A review of climate adaptation studies in the business and management field. *WIREs Climate Change, 4*(5), 397–416.

Mähönen, J. T. , & Palea, V. (2024). *Analyzing Double Materiality Through the Lens of the European Political Constitution: Implications for Interoperability and Standards-Setting. University of Oslo Faculty of Law Research Paper No. 2024–05, Nordic & European Company Law Working Paper No. 24-03* (Available at SSRN: https://ssrn.com/abstract=4731089).

Massa, L., Farneti, F., & Scappini, B. (2015). Developing a sustainability report in a small to medium enterprise: Process and consequences. *Meditari Accountancy Research, 23*(1), 62–91.

Matsumura, E. M., Prakash, R., & Vera-Muñoz, S. C. (2024). Climate-risk materiality and firm risk. *Review of Accounting Studies, 29*(1), 33–74.

Neil Adger, W., Arnell, N. W., & Tompkins, E. L. (2005). Successful adaptation to climate change across scales. *Global Environmental Change, 15*(2), 77–86.

Palea, V., & Drogo, F. (2020). Carbon emissions and the cost of debt in the eurozone: The role of public policies, climate-related disclosure and corporate governance. *Business Strategy and the Environment, 29*(8), 2953–2972.

Palea, V., & Santhià, C. (2022). The financial impact of carbon risk and mitigation strategies: Insights from the automotive industry. *Journal of Cleaner Production, 344*, 131001.

Palea, V., Migliavacca, A., & Gordano, S. (2024). Scaling up the transition: The role of corporate governance mechanisms in promoting circular economy strategies. *Journal of Environmental Management, 349*, 119544.

Peters, G. F., Romi, A. M., & Sanchez, J. M. (2019). The influence of corporate sustainability officers on performance. *Journal of Business Ethics, 159*(4), 1065–1087.

Pinkse, J., & Gasbarro, F. (2019). Managing physical impacts of climate change: An attentional perspective on corporate adaptation. *Business & Society, 58*(2), 333–368.

Romito, S., Vurro, C., & Pogutz, S. (2024). Joining multi-stakeholder initiatives to fight climate change: The environmental impact of corporate participation in the science based targets initiative. *Business Strategy and the Environment, 33*(4), 2817–2831.

Smit, B., Burton, I., Klein, R. J. T., & Wandel, J. (2000). An anatomy of adaptation to climate change and variability. *Proceedings of the International Workshop on Adaptation to Climate Variability and Change*, 223–251.

Tang, S., & Higgins, C. (2022). Do not forget the "How" along with the "What": Improving the transparency of sustainability reports. *California Management Review, 65*(1), 44–63.

Todaro, N. M., Testa, F., Daddi, T., & Iraldo, F. (2021). The influence of managers' awareness of climate change, perceived climate risk exposure and risk tolerance on the adoption of corporate responses to climate change. *Business Strategy and the Environment, 30*(2), 1232–1248.

Velte, P. (2024). Archival research on sustainability-related executive compensation. A literature review of the status quo and future improvements. *Corporate Social Responsibility and Environmental Management, 31*(4), 3119–3147.

Voss, G. B., Sirdeshmukh, D., & Voss, Z. G. (2008). The effects of slack resources and Environmentalthreat on product exploration and exploitation. *Academy of Management Journal, 51*(1), 147–164.

Whitehead, J. (2017). Prioritizing sustainability indicators: Using materiality analysis to guide sustainability assessment and strategy. *Business Strategy and the Environment*, *26*(3), 399–412.

Zagaria, C. (2017). *L'Enterprise Risk Management: Gestione integrata del rischio, profili di comunicazione ed evidenze empiriche*. ISBN 9788892112056. Giappichelli.

Zhang, S. Y. (2022). Are investors sensitive to climate-related transition and physical risks? Evidence from global stock markets. *Research in International Business and Finance*, *62*, 101710.