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

Vera Palea *et al*

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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 7

Implications and Guidelines for Stakeholders

Abstract Building on the empirical evidence of limited climate-risk awareness and preparedness among Italian SMEs, this chapter outlines contributions to the literature on corporate sustainability and climate strategy. It also develops targeted recommendations for policymakers, firm managers, and financial institutions, with a focus on governance mechanisms, capability building, and access to sustainable finance.

Keywords Climate proactivity • Climate awareness • Capacity-building • Stakeholder guidelines

The chapter discusses the implications of the research project. Based on the limited awareness and preparedness to climate risks emerging from the empirical analysis, we outline theoretical contributions alongside targeted policy and managerial recommendations, with a focus on overcoming structural barriers, enhancing governance, and promoting climate-resilient business models.

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7.1 Discussion of Findings

The empirical evidence described in the previous sections reveals a strikingly moderate perception of climate risk among Italian firms, with 53% of the sample falling into the low-perception cluster. This aligns with prior studies indicating that businesses, especially in non-financial sectors, often underestimate climate-related risks unless they face immediate regulatory or reputational pressures (Abhayawansa & Adams, 2021). The finding that only 8% of firms are "very much concerned" about climate risks points to a latent skepticism toward climate change, a pattern that continues to hinder corporate engagement in sustainability transitions. Such skepticism is troubling, especially considering the growing scientific consensus that climate risks, both physical and transitional, are increasingly material to firm performance, resilience, and survival (Fard et al., 2020; Li, 2024).

The breakdown of perceptions by risk type offers further granularity. Chronic risks, such as gradual temperature increases or shifts in precipitation, are perceived as less concerning than acute risks or transition risks, suggesting a cognitive and strategic tendency to address threats with immediate visibility or tangible manifestations. This mirrors the "saliency bias" identified by behavioral research also in corporate performance management settings, where firms prioritize problems that are temporally and spatially proximate (Cristofaro et al., 2023). As a result, organizations may underestimate the urgency or importance of addressing these slow-moving climate risks, which could lead to insufficient preparation and greater vulnerability over time.

Geographic variability in risk perception further reinforces the importance of local context and organizational learning. The slightly higher sensitivity to acute physical risks in areas prone to environmental hazards, such as floods, droughts, and landslides, aligns with the theory of experiential learning in risk management (Cook et al., 2022). Localized traumatic experiences appear to function as catalysts for risk awareness, especially among firms in environmentally vulnerable regions like Veneto. This suggests the idea that lived experience may serve as a powerful driver of climate salience in corporate decision-making. Conversely, the uniform perception of transition risks across regions reflects the national scope of regulatory frameworks and market mechanisms, which influence firms regardless of their location.

Interestingly, firm size emerged as a more robust determinant of risk perception than sector eligibility under the EU taxonomy. While large

firms generally exhibited higher levels of climate awareness, no significant differences were observed between eligible and non-eligible sectors. This finding contrasts with assumptions embedded in the EU Green Deal and related frameworks, which posit that regulatory classification will act as a lever for climate leadership within targeted sectors. In line with authoritative literature on the topic (e.g., Chowdhury et al., 2022), internal organizational factors, such as top management commitment, resource availability, and absorptive capacity, may override sectoral characteristics in shaping sustainability engagement. This finding suggests the importance of capacity-building and firm-specific engagement strategies in driving corporate changes toward sustainability (Bhatia et al., 2024).

Investment patterns offer a meaningful narrative about the strategic posture of firms toward climate risks. The prioritization of insurance (55%) over more structural or transformational investments, like innovation, diversification, or relocation, suggests a predominant reliance on risk transfer mechanisms. This preference reflects a defensive attitude where the focus is on minimizing short-term financial exposure rather than proactively adapting to or mitigating systemic risks. While such strategies may appear rational from a cost-benefit perspective in the near term, they do little to enhance long-term resilience and may delay the adoption of more sustainable business models. As Surminski and Oramas-Dorta (2014) caution, excessive reliance on insurance can act as a substitute for adaptation investments, thereby perpetuating organizational inertia and vulnerability.

The empirical classification of firms into "Wait-and-see," "Planners," "Foresighted," and "Proactive" categories offers a nuanced and multidimensional perspective on corporate climate engagement. This typology allows us to move beyond simplistic binary distinctions between leaders and laggards and to examine the interplay between perception, investment, and organizational characteristics. The predominance of the wait-and-see strategy, especially in response to acute and chronic risks, is consistent with behavioral patterns observed under high uncertainty and low perceived self-efficacy (Zayadin et al., 2022). Only 14% of firms adopt a proactive stance for transition risks, with even fewer doing so for physical risks (10% acute, 4% chronic), underscoring a widespread reluctance to invest in resilience-oriented strategies that typically offer delayed or uncertain returns.

Firm size again emerges as a critical differentiator in strategic posture. Larger firms show a markedly higher tendency toward proactive or

foresighted behavior, reinforcing the resource-based view of the firm (Barney et al., 2021), which holds that access to financial, human, and informational resources enhances a firm's capacity to innovate and adapt under uncertainty. These firms are more likely to possess dedicated sustainability units, participate in voluntary disclosure initiatives, and integrate climate-related metrics into corporate governance. Moreover, they tend to be subject to greater scrutiny from institutional investors, regulators, and civil society actors, all of whom demand credible and transparent climate action (Eccles et al., 2014). By contrast, SMEs, often resource-constrained and more focused on short-term survival, report structural and cognitive barriers to engagement, including lack of expertise, risk assessment tools, and climate-related financial data. These findings echo earlier work by Noci and Verganti (1999), who identified firm capabilities and absorptive capacity as core determinants of environmental innovation.

Our findings further elucidate the motivational architecture and perceived barriers that shape corporate engagement with climate-related investments. Managerial values and personal environmental commitment emerged as the primary internal motivators, cited by 40% of firms. This underscores the continued relevance of leadership in fostering environmental stewardship and driving sustainability initiatives (Egri & Herman, 2000). In line with transformational leadership theory, firms where top managers exhibit a strong commitment to environmental values tend to demonstrate greater strategic alignment with sustainability goals, including more proactive risk management, integrated reporting, and employee engagement (Pellegrini et al., 2018; Ullah et al., 2019; Wenzig et al., 2022). However, among firms categorized as "proactive," external factors, particularly regulatory requirements, customer expectations, and energy price volatility, appear to gain salience, suggesting that internal motivations are necessary but not sufficient for scaling and institutionalizing climate action (Nielsen, 2017).

The interplay between internal and external drivers aligns with Oliver's (1991) typology of strategic responses to institutional pressures, which posits that organizations navigate institutional complexity through strategies of acquiescence, compromise, avoidance, or manipulation. Our data suggest that many firms, especially those in transition from "planner" to "foresighted," are situated in an intermediate state, combining normative commitment with instrumental responsiveness to stakeholder expectations. This hybrid logic is particularly visible in firms facing dual pressures

from investors seeking ESG performance and regulators enforcing compliance.

On the barrier side, financial constraints remain paramount. High upfront costs, long payback periods, planning uncertainties, and limited access to green finance were consistently reported as major deterrents. These findings reaffirm the view that market failures, particularly the inadequate internalization of environmental externalities, continue to hinder private-sector adaptation and mitigation (Cohen & Winn, 2007; Stern, 2008). The paradox is that firms most vulnerable to climate risks, such as SMEs located in hazard-prone areas, are often the least equipped to invest in resilience-enhancing measures. This points to an urgent need for differentiated policy instruments, such as concessional financing, credit guarantees, and capacity-building programs tailored to firm size and sectoral exposure (Lamperti et al., 2021).

Encouragingly, proactive firms are more likely to adopt long-term climate goals, including net-zero targets for 2050. This reflects a more strategic and integrated approach to sustainability, one that transcends compliance and seeks to anticipate regulatory, technological, and societal shifts (e.g., Hahn et al., 2014). Yet even among these firms, sectoral differences remain muted, and taxonomy eligibility appears unrelated to target-setting. This raises important questions about the motivational efficacy of existing classification systems and underscores the need to embed climate targets into broader governance structures, such as strategic planning cycles, capital allocation frameworks, and executive remuneration policies (Kovacs et al., 2025).

7.2 Theoretical Implications

This research has several theoretical implications. First, based on the analysis of existing literature on management perception of climate change risk (Kolk & Pinkse, 2005; 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 level of climate education within organizations (Audebrand, 2010), we refined and described four possible main approaches of firms to climate risks, which enrich the theory of bounded rationality (Gigerenzer & Selten, 2002; Simon, 1990) and gradual commitment to sustainability (Szekely & Strebel, 2013), and provide a valuable basis for future empirical analyses of corporate sustainability strategies and practices.

Second, research findings support the neo-institutional theory (Hwang, 2023) by demonstrating that firms' propensity to address climate issues is strongly influenced by some institutional factors, mainly regulatory or normative. On the external hand, these factors primarily concern the current regulation and its evolution over time, the volatility of energy prices, and the pressure from suppliers, customers, and financial institutions. Furthermore, results confirm the behavioral model of sustainability: from an internal perspective, cultural awareness of climate impacts (Todaro et al., 2021), managers' perception of climate-change risk (Todaro et al., 2021), and climate-related education (Audebrand, 2010) are the key drivers leading firms' sustainability strategies and practices. Precisely, higher awareness of climate impacts and higher risk perception foster the implementation of specific sustainability governance mechanisms (Arnell & Delaney, 2006), essential to adapting business models to climate challenges through implementing policies and practices appropriate to each firm's particular characteristics.

Third, this research provides empirical support for the theoretical significance of financial materiality and impact materiality as dual and complementary drivers of corporate sustainability strategies. Within the double materiality perspective, our analysis highlights both enabling factors and barriers. Moreover, our firm classification framework enables a systematic examination of impacts through the lens of double materiality. Precisely, the framework we outlined and adopted can be valuably implemented also by future studies to enlarge the analysis of the outcomes of different climate strategies in terms of both financial materiality (e.g., profitability, resilience to shocks, access to capital) and impact materiality (e.g., GHG emissions reduction, circularity, biodiversity protection). Indeed, this dual perspective allows scholars to explore whether and how corporate sustainable practices translate into measurable performance improvements and resilience outcomes.

Finally, this study offers some insights regarding regional and contextual specificities as well. On the one hand, results show preliminary evidence that more radical sustainability investments, particularly in the agri-food sector in Southern regions, may yield positive effects on economic performance. On the other hand, local vulnerabilities and contexts are demonstrated to shape SMEs' readiness and responses to climate challenges. This latter evidence aligns with contingency theory (Mahmud et al., 2021). Climate change introduces multiple contingencies, such as regulatory changes or supply chain disruptions, which require firms to adapt their strategies, organizational sets, and operational practices. To approach climate-related challenges, no single solution exists: each firm's

approach strictly depends on the economic environment in which it operates, which in turn is shaped by several institutional factors, including the industry and the geographical location.

7.3 Policy and Practical Implications

7.3.1 For Policymakers

This research has also different practical implications for policymakers. More specifically, our analysis suggests that many Italian SMEs underestimate climate-related threats, especially with the chronic risks, despite mounting evidence of their materiality and the severity of the impacts generated (Pinkse & Gasbarro, 2016). This gap in the perception of climate-change-related exposure underscores the importance of (systematic) training programs related to the effects of climate change on firms' operations and vice versa. In particular, territorial business associations and chambers of commerce, as already trusted intermediaries, could deliver modular courses that combine basic risk-assessment techniques with case studies drawn from recent local disasters. Evidence from Veneto and Emilia-Romagna, where repeated floods have revealed the impact of such acute events, further strengthens the case for prevention and underscores the urgency of adopting adaptation measures. These extreme events, which are related to the climate change effects on local bio-ecosystems, and the correlated production systems, also highlight that wait-and-see strategies are ineffective, while also isolated firm-level initiatives are insufficient to ensure the ecological transition. Our project shows that what is required is large-scale, forward-looking interventions launched well before emergencies arise. These programs should be coupled with sustained capacity-building programs that equip local authorities, businesses, and communities with the skills and resources needed to anticipate risks and implement resilient solutions.

Moreover, according to our results, regional differentiation emerges as an equally critical lever. Embedding granular exposure data into policy interventions can help policymakers move beyond the conventional "one-size-fits-all" approach, enabling them to target resources more effectively toward firms genuinely exposed to physical and transition risks (Martínez-Ferrero & García-Meca, 2020; Lamperti et al., 2021). However, detailed risk data generates tangible benefits only when firms have the capacity and knowledge to interpret and integrate this information into their

decision-making processes. GRINS tackles this by combining place-based drivers and barriers to climate resilience adaptation with continuous capacity building. Accordingly, specific initiatives such as joint training courses run with trade associations, chambers of commerce, and local universities translate regional exposure maps into firm-level day-by-day decisions. The same logic drives the AMELIA portal in the GRINS Project, which potentially may let companies test their own exposure and compare results with peers on climate strategies. A growing body of evidence—confirmed by the results of the GRINS Project—shows that management sensitivity to climate issues is the single strongest predictor of whether a firm moves from intention to actual investment (Egri & Herman, 2000; Audebrand, 2010; Todaro et al., 2021). Firms led by managers with high climate risk awareness invest more in adaptation and mitigation than similar companies (Todaro et al., 2021; Cristofaro et al., 2023). This finding further underlines the strategic value of targeted training; by raising executives' and middle managers' awareness, these capacity-building programs can unlock investment even when financial incentives are already in place. Embedding training programs would therefore magnify the impact of public support and accelerate the diffusion of resilient business practices. Moreover, this territorial analysis stresses that these initiatives foster social and entrepreneurial engagement in these public research interventions.

Secondly, governance and organizational shortcomings remain a second-order but pervasive constraint. In fact, fewer than one SME in six has appointed a sustainability manager or issued any structured ESG report. This evidence is relevant for the understanding of the status quo of the sensibilization for sustainability and ESG-related managerial practices. Moreover, prior studies show that governance structure, and the formalization of responsibility for sustainability, strongly predict subsequent investment in mitigation and resilience (Sullivan & Gouldson, 2016; Termeer et al., 2016). In this regard, the presence of minimal governance safeguards—such as board oversight of climate targets or annual disclosure aligned with CSRD requirements—could convert voluntary good practice into a widespread managerial norm, preparing firms for the trickle-down effects of European regulation without adding disproportionate red tape (Accountancy Europe, 2024).

Thirdly, another element that emerges from the GRINS findings is the role of energy costs as a driver for climate-related investments. On one hand, volatility and rising prices for fossil-based energy sources have motivated many firms to consider renewable energy adoption or efficiency

measures, as they seek to stabilize operational expenses and hedge against future shocks (Wang & Sueyoshi, 2018). On the other hand, high current energy costs drain liquidity and reduce SMEs' capacity to allocate financial resources to other long-term investments, especially among firms with limited access to external financing. This effect is particularly acute in energy-intensive sectors and for smaller firms, which face higher relative energy costs but often lack the capital or scale to benefit from energy transition incentives (International Energy Agency, 2023). Therefore, this reinforces the importance of designing policies that simultaneously relieve short-term cost pressures—i.e., through targeted subsidies or tax relief on energy-saving investments—and promote structural shifts toward renewable energy sources and efficiency upgrades of production plants. Without coordinated support addressing both the immediate and structural dimensions of energy costs, there is a risk that firms will defer necessary investments, locking themselves into outdated, carbon-intensive technologies (Pinkse & Kolk, 2012).

Fourthly, experience shows that (financial) incentives are most effective when firms commit to clear, time-bound emission-reduction goals that look beyond the year-by-year budgeting cycle. Yet only 10% of the businesses surveyed have set quantitative targets, and most plan simply to repeat past actions, thus adopting a mimetic strategic approach, while a slight increment is registered with references to future planned investments. Studies on the adoption of specific goal-setting measurement systems demonstrate that even voluntary targets, once announced and monitored, create a self-reinforcing drive for improvement (Hale et al., 2021). Evidence from "Foresighted" and "Proactive" firms further indicates that medium- and long-term milestones, typically framed around 2030 and 2050 horizons, help managers redesign production processes, redirect capital toward renewable energy and spur stakeholder engagement (Wang & Sueyoshi, 2018).

Moreover, the uptake of green finance remains modest since only 11% of the SMEs we surveyed have accessed dedicated instruments. In line with this reasoning and results, the recent work by the Italian Sustainable Finance Roundtable[1] (2024) has sought to close this gap: the "Sustainability

[1] For more information on this initiative, you can visit the Ministry of the Economy and Finance webpage at the following link: https://www.dt.mef.gov.it/en/attivita_istituzionali/sistema_bancario_finanziario/finanza_sostenibile/dialogo_sostenibilita/index.html?__element=head

Dialogue between SMEs and Banks" sets out a common set of climate-risk and performance indicators to guide credit discussions and reduce the information asymmetries that Berg et al. (2022) identify. The GRINS Project team may act as a potential flagship partner in these future initiatives for institutions like the MEF and the Bank of Italy, providing the underlying data architecture, training capability and scientific-advisory support. In practical terms, the project has already built a public dashboard within the AMELIA platform where both lenders and firms can view regional risk maps, find ESG-related indicators, and download the information provided by the surveys. Linking streamlined loan applications and partial public guarantees to those shared metrics and information would lower transaction costs for banks and borrowers alike, while climate-related information delivered through AMELIA would ensure that finance is coupled with the capacity-building needed to turn credit into more credible transition plans (Christensen et al., 2021).

Finally, because the GRINS survey can be rerun at regular intervals, the dashboard could also become a living observatory of territorial resilience, tracking how industrial districts evolve in response to new shocks and policy incentives. Finally, as a further proposal for the research agenda, extending the same (or an adapted) questionnaire and data collection model to other European institutions would make it possible to build an EU-wide map of SME readiness, potentially offering the Commission a powerful tool for aligning sustainable-finance policies across member states.

7.3.2 For SME Managers

Beyond the practical policy implications, this study also offers managerial implications. From a managerial standpoint, the results point to the decisive role of internal capabilities. "Proactive" and "F" firms, according to our classification, are characterized by twice the presence of staff with explicit responsibility for climate strategy, confirming the resource-based view that specialized knowledge underpins superior adaptive performance (e.g., Li, 2024). According to our results, the presence of sustainability managers, cross-functional teams, and sustainability-oriented entrepreneurs can deliver a coherent implementation of sustainability strategies, provided they receive targeted training and clear operating mandates. Empirical evidence from the GRINS survey shows that SMEs which have put in place sustainability-oriented organizational assets—i.e.,

integrated performance-measurement dashboards, formal planning and control routines, sustainability accounting tools, structured stakeholder engagement, externally assured disclosure, and certification—are the firms most likely to belong to the "proactive" cluster, confirming the link between robust management-control architectures and advanced sustainability behavior already noted by prior literature (Hsiao et al., 2022). This view has been reinforced by a recent assessment of the adequacy of administrative-accounting systems in light of the CSRD Directive (EU, 2022) and the Omnibus package (e.g., CNDCEC & FNC, 2023; CNDCEC, 2025). More specifically, the firms best positioned to meet the new disclosure demands—and higher expectations with reference to climate resilience—are those whose owners show a strong sustainability orientation, who recognize that forward-looking planning is a source of competitive advantage, and who can close the significant information gap that still affects decision-making processes (Mattei & Caccialanza, 2025).

Secondly, setting explicit emission-reduction or energy-efficiency targets offers a low-cost catalyst for such organizational learning. Firms that articulate even modest goals report higher levels of investment planning and easier dialogue with lenders (Ameli et al., 2019) and customers (Goettsche et al., 2016). Managers should therefore embed quantifiable, time-bound, and climate-related objectives into strategic plans, using them to steer this commitment and provide positive spillover effects on firms' value (Eccles et al., 2014). More specifically, a growing empirical literature shows that strong environmental performance and climate resilience are more than a reputational asset for firms, since they are also a measurable driver of cheaper capital and higher operating returns (Asad et al., 2023; Othman et al., 2011; Chowdhury et al., 2022). In fact, eurozone firms with lower carbon footprints pay smaller credit spreads, an effect that intensifies when climate-related disclosures are transparent and governance structures are robust (Palea & Drogo, 2020). Moreover, translating climate-risk exposure into an explicit, forward-looking estimate of enterprise value is arguably the most difficult stage of any sustainability assessment (Dal Maso et al., 2024). As Dal Maso (2025) shows, valuation models can incorporate physical and transition risks through several techniques, if the availability of data allows this implementation. However, SMEs are structurally more vulnerable from this perspective, since their limited scale and financial slack reduce their ability to absorb climate shocks and to finance costly adaptation measures (Voss et al., 2008). On one hand, ignoring climate-related risks and these dynamics

leads to a systematic undervaluation of (climate) risk exposure and, by extension, of the long-term financial damage that unmitigated exposure can inflict. On the other hand, incorporating climate metrics into standard valuation practice is therefore not an academic add-on but a prerequisite for realistic capital allocation and for safeguarding the long-term viability of Italian and Europe's competitiveness (Dal Maso, 2025; Perdichizzi et al., 2024). Consequently, anticipating formal EU disclosure requirements offers an additional strategic advantage: it prompts managers to map their critical supply relationships, open channels to discuss climate exposures, and explore appropriate responses and investments that will support the sustainable transition of their business models (Cristofaro et al., 2023). These approaches not only reduce costs in the long term but also strengthen business ties, enhancing competitiveness in increasingly sustainability-oriented markets (Vachon & Klassen, 2008; Mattei & Caccialanza, 2025).

Together, these insights depict an intertwined agenda: public authorities can tilt the playing field through targeted incentives, regulatory foresight, and accessible finance; however, the decisive momentum must come from firms that invest in skills, set measurable objectives, and cultivate resilient networks. This project demonstrates that, when these elements converge, SMEs shift from reactive postures to strategic engagement, laying the groundwork for a more climate-resilient and competitive Italian economy. This perspective also suggests the direction for the further development of this study in order to guarantee the higher comparability of climate-resilience measures. Developing a targeted and specific tool could provide access to a benchmarking system that compares each firm's climate strategy, green-investment effort, and organizational set-up with peers in the same region (or industry) and would give managers a clear snapshot of their competitive position and highlight managerial practices to implement and information gaps to close. To meet this need, future development of this research may develop a benchmarking module that could be integrated into the AMELIA platform realized at the end of the project. Drawing on the survey database and publicly available disclosures, the tool could therefore generate dashboards showing how a company scores against sector medians and best-in-class performers on key metrics such as emission-reduction targets, carbon intensity, governance mechanisms, and access to sustainable finance. These expectations suggest that comparability of this kind may accelerate the diffusion of good practices by turning abstract standards into tangible performance differentials.

Consequently, based on the GRINS Project's evidence and by embedding this module in AMELIA, the proposed research agenda will offer SMEs and local stakeholders an up-to-date, evidence-based reference point for setting priorities and tracking progress over time.

7.3.3 For the Banking and Financial System

The double materiality principle introduced in the previous chapters applies to the banking and financial system as well (Gourdel et al., 2022). The collapse of certain ecosystems and the changes in environmental patterns pose a threat to entire value chains across the globe and, therefore, could generate a cascade effect on a significant portion of a financial institution's assets (i.e., financial materiality). Mundaca and Heintze (2024), for example, estimate that for every euro of banks' equity holding, 26 cents are potentially highly dependent on—and therefore exposed to—ecosystem services. This exposure, ultimately, is not a problem only for a single institution, but for the financial and banking system at large (Wu et al., 2024; Wang et al., 2024). However, the banking and financial sector, through their capital allocation choices, can move their counterparts toward a greener economy (i.e., the impact materiality). Green securities, green investments, climate finance, carbon finance, green insurance, green credit, and green infrastructural bonds are all examples of green products that the banking and financial system can implement to steer the economy toward sustainable development (Akomea-Frimpong et al., 2021).

In the past few years, we have been observing an increasing regulatory effort to push the financial and banking system to account for such new risks (ECB, 2020; OECD, 2021; EBA, 2025; NGFS, 2022; Galletta & Mazzù, 2023), and the sector is indeed showing progress in materiality assessments, risk management, and stress testing (Elderson, 2025). In fact, it is essential for financial institutions to adopt forward-looking climate and environmental scenarios and sectoral risk assessments to evaluate portfolio exposure and guide capital allocation. Moreover, banks need to consider incorporating physical climate risks into their credit risk models to keep up with the Basel III developments (Pozdyshev et al., 2025) and the ECB requirements (Elderson, 2025). Furthermore, central banks and supervisory authorities must push for the integration of climate and environmental risks into prudential frameworks, stress testing, and macro-financial surveillance (Roncoroni et al., 2021).

The EBA's (2025) guidelines on ESG risk management in banking authorities introduce several new and expanded requirements. By taking its premises from the EU Commission's renewed Directive 2013/36/EU (Capital Requirements Directive, CRD) and Regulation (EU) No 575/2013 (Capital Requirements Regulation, CRR), the EBA's guidelines aim at enhancing the identification, measurement, management, and monitoring of ESG risks by institutions to support their safety and soundness against the short-, medium-, and long-term impact of ESG factors. For what concern environmental risks, "institutions should consider a sufficiently large scope of environmental factors that includes at least climate-related factors, degradation of ecosystems and biodiversity loss" (EBA, 2025, p. 19).

According to the EBA's guidelines, institutions shall undertake a materiality assessment of ESG risks, returning a view on the financial materiality of ESG risks for its business model and risk profile, supported by a mapping of ESG factors and transmission channels to traditional financial risk categories. Moreover, ESG factors shall be integrated into the internal capital adequacy assessment process (ICAAP) materiality assessment. Institutions shall further ensure that "the scope of their materiality assessment sufficiently reflects the nature, size and complexity of their activities, portfolios, services, and products. Institutions should consider the impact of ESG risks on all traditional financial risk categories to which they are exposed, including credit, market, liquidity, operational (including litigation), reputational, business model and concentration risks" (EBA, 2025, p. 18).

To comply with the EBA's Guidelines, Italian banks will need to gather and use the information necessary to assess, manage, and monitor both current and forward-looking ESG risks to which they may be exposed through their counterparties. Accordingly, they will have to collect client- and asset-level data at an appropriately granular level (EBA, 2025, p. 21). Considering that SME-level ESG data are scarce and fragmented (OECD, 2021), and that the financial literacy of SMEs is still limited (cfr. The GRINS survey), this is likely to pose a significant challenge for the Italian financial and banking system. Banks are making notable strides forward on these issues, but a lot more effort is still needed (Elderson, 2025).

Although the OECD (2021) and the EBA (2025) emphasize the importance of financial innovation in supporting SME sustainability and ESG management, the results of our survey underscore the limited uptake of green finance among Italian SMEs, with only 11% accessing green financial instruments between 2021 and 2023. This might be a consequence of the scarce green finance literacy of SMEs or a persistent misalignment of the

banking sector with decarbonization objectives (ECB, 2024; Lu et al., 2020). Given the scarcity of SME-level ESG data, in fact, banks find it troublesome to integrate climate risks into cost-of-debt considerations. Therefore, if a bank cannot delineate the climate profile of a specific SME, it may find it difficult to offer a green financial product under favorable financial conditions (Ge et al., 2025; Ding et al., 2025; Martinez-Meyers et al., 2024; OECD, 2024; Reghezza et al., 2022).

At both the EU-level and the Italian-level, we are seeing important initiatives that go in the direction of creating a simple, coherent, and replicable set of ESG indicators that SME could produce for external reporting and engagement with financial institutions. For example, the EU Voluntary Small and Medium Enterprise European Sustainability Reporting Standard (VSME ESRS) is a simplified sustainability reporting standard that could be used as a basis point in the bank-SME interaction. Moreover, in 2024 the Italian Sustainable Finance Roundtable[2] issued the document "Sustainability Dialogue between SMEs and banks,"[3] containing a set of indicators on physical and transition risks, energy and emissions, pollution, water management, and biodiversity and ecosystems useful for banks and SMEs to reach a coherent and trustworthy set of information to use for improving the SMEs' competitiveness and access to financial capital (EU, 2024). While most Italian SMEs will remain formally exempt from CSRD for several years, preparing data flows now—i.e., using (simplified) ESRS-linked indicators—can avert last-minute compliance costs and position firms as reliable partners for larger customers and financial institutions. Even performance-led indicators or essential dashboards tracking greenhouse-gas intensity, water use, or waste generation create a foundation for continuous improvement and facilitate participation in public green-finance schemes (Flammer, 2021).

Nonetheless, our survey reveals alarming gaps in SMEs' knowledge and perception of climate risks, sustainability regulations, ESG practices, and environmental accountability requirements. Only 47% of firms report literacy in sustainable finance, and just 15% have an environmental manager. There is urgency for financial institutions to expand their advisory and supporting role, helping SMEs navigate complex frameworks such as the CSRD, VSME ESRS, and EU Taxonomy. For example, banks and financial intermediaries can collaborate with public institutions, chambers of commerce, and

[2] In Italian language: Tavolo per la Finanza Sostenibile.
[3] In Italian language: Il Dialogo di Sostenibilità tra PMI e Banche.

research networks (e.g., the GRINS Foundation) to offer capacity-building programs, ESG toolkits, and digital platforms that support SMEs in developing sustainability strategies and reporting mechanisms. Moreover, the integration of advisory services into financial products (e.g., green loans bundled with ESG consulting), coupled with internal training for the workforce of financial institutions, could enhance both uptake and effectiveness of sustainable, climate-resilient practices in SMEs.

Finally, the systemic nature of climate and environmental risks challenges traditional financial risk models. These risks involve the existence of tipping points, the irreversibility of some environmental impacts, and the nonlinearity of climate scenarios and biodiversity loss that conventional models are ill-equipped to capture (TCFD, 2020; TNFD, 2022). Also,

Table 7.1 Policy recommendations by stakeholder level

Stakeholder	*Barriers identified*	*Recommended policies/ guidelines*	*Expected impact*
EU and national policymakers	Low perception of chronic climate risks; limited access to green finance	Gradual extension of disclosure obligations (CSRD, taxonomy); fiscal incentives and dedicated funds for SME green investments; public–private partnerships	Stronger resilience of SMEs; alignment with EU green Deal targets
Financial institutions	Lack of SME climate literacy; difficulty in assessing risks	Development of green credit scoring; training programs for banks and SMEs; conditionality of credit on ESG performance	Improved access to sustainable finance; reduced credit risk
Business associations and chambers of commerce	Limited awareness and managerial competences	Capacity-building initiatives; regional sustainability observatories; knowledge--sharing platforms (geo--referenced maps, benchmarking)	Territorial ecosystems strengthened; diffusion of best practices
SMEs (firms and managers)	Cultural resistance; scarcity of resources; weak governance	Appointment of environmental/sustainability officers; integration of climate risk into governance and remuneration; adoption of net-zero targets; use of risk management tools	Increased competitiveness, resilience, and supply-chain integration

climate and environmental risks compound one another and are intertwined. The fact that only one out of two SMEs report either a "fair" or a "high" concern should ring a bell not only for banks and financial institutions but also for central banks and supervisory authorities.

The following Table 7.1 provides a structured synthesis of policy guidelines and summarizes the proposed measures by stakeholder level.

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