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Towards a Biodiversity Positive Business Strategy: The MCRV (Monitoring, Conserving, Restoring, Valorizing) Framework

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ABSTRACT

Despite mounting regulatory pressure and growing scientific consensus on biodiversity loss, most corporate action remains reactive, fragmented, and strategically peripheral. Existing frameworks address *what* firms should report rather than *how* they can build the organizational capabilities required to act strategically. Drawing on interviews with SMEs and cross-disciplinary experts, and following the Gioia methodology, we develop the MCRV framework (*Monitoring, Conserving, Restoring*, and *Valorizing*) as a strategic configuration of Dynamic Capabilities for corporate biodiversity integration. Grounded in the Natural Resource-Based View, the framework maps each MCRV component against the sensing, seizing, and transforming dimensions of Dynamic Capabilities: *Monitoring* as a sensing process through which ecological conditions become strategically legible; *Conserving* and *Restoring* as qualitatively distinct expressions of seizing; and *Valorizing* as a transforming process translating ecological knowledge into new products, services, and business models. MCRV offers scholars a process-oriented account of biodiversity integration and managers a diagnostic instrument for directing strategic investment.

1 | Introduction

Companies across sectors are increasingly confronted with evidence that biodiversity loss poses material risks to their operations, supply chains, and long-term value creation (Testa, Di Minin, et al. 2025). Yet a striking and persistent paradox characterizes corporate engagement with this challenge: despite mounting regulatory pressure, a proliferating set of disclosure frameworks, and growing scientific consensus on the urgency of the problem, most corporate biodiversity action remains reactive, fragmented, and strategically peripheral (IPBES 2026; Panwar et al. 2023; Schaltegger et al. 2023; Testa, Tosi, et al. 2025). The stakes of closing this gap are substantial: consistently ranked among the top five long-run global risks by the World Economic Forum (2021, 2022, 2023), biodiversity degradation is estimated to reduce global GDP by $2.7 trillion annually by 2030 through the collapse of ecosystem services alone (Johnson et al. 2021), threatening the operating conditions of organizations across sectors and geographies (Richardson et al. 2023; Rockström et al. 2009; Zhou et al. 2026).

Part of this failure reflects genuine awareness gaps because individual firms often still lack specific, context-dependent knowledge of their own impacts and dependencies (Cinquini et al. 2026; IPBES 2026). However, even businesses that recognize the issue at the institutional level tend to default to offsetting mechanisms, compliance-oriented disclosure, and isolated initiatives rather than embedding biodiversity into their core strategic and innovation processes (Boiral et al. 2018). The challenge, in other words, is not only one of information: It is also one of organizational capacity. Companies lack a coherent strategic logic for translating biodiversity awareness, where it exists, into integrated and sustained action (Boiral and Heras-Saizarbitoria 2017; Leclère et al. 2020; Macellari et al. 2018; Panwar 2023; Testa, Di Minin, et al. 2025).

The response from research and practice has been vigorous, but it has largely converged on one side of the problem: understanding and disclosing the *what* of business–biodiversity relationships. Frameworks such as the mitigation hierarchy, the ACT-D approach, and biodiversity-specific GRI standards have advanced corporate disclosure and risk management considerably (Arlidge et al. 2018; Capitals Coalition 2026; TNFD 2023). Academic work has also developed sophisticated models for classifying corporate impacts and ecosystem service dependencies, aligning them with the double materiality logic of the CSRD (Cinquini et al. 2026; Houdet et al. 2012). Yet this stream of work stops precisely where the hardest organizational challenge begins. Disclosure frameworks tell firms *what* to report; classification models tell firms *what* to map. Neither explains *how* to build the organizational capabilities required to act strategically on that knowledge, nor through what mechanisms biodiversity considerations become embedded in strategic planning, innovation processes, and value creation logic. The transition from reactive mitigation to proactive biodiversity stewardship is fundamentally an organizational problem, and it has not yet received a satisfactory organizational answer (Kennedy et al. 2023; Rahman et al. 2022; Testa, Di Minin, et al. 2025; White et al. 2023).

A growing body of scholarship calls for strategic approaches that could help companies to overcome these issues by positioning them as embedded within wider ecological and social systems, capable of repeatedly translating socio-ecological complexity into strategic action (Bansal et al. 2025; Voegtlin et al. 2022). Our study responds to these calls by posing the following research question: *How can businesses strategically integrate biodiversity into their value creation processes?* To answer it, we rely on a qualitative study drawing on the Gioia methodology (Gioia et al. 2013), combining field observations with in-depth semi-structured interviews with SMEs and experts spanning natural sciences, environmental engineering, innovation, and sustainability policy.

From this empirical base, we develop the MCRV framework, which comprises *Monitoring*, *Conserving*, *Restoring*, and *Valorizing*, as a strategic configuration of Dynamic Capabilities for corporate biodiversity integration. The MCRV framework makes several contributions. First, grounded in the Natural Resource-Based View (Hart 1995), it establishes biodiversity as a biophysical condition that shapes firms' strategic constraints and dependencies, rather than as an external sustainability concern. Second, drawing primarily on the Dynamic Capabilities perspective (Teece et al. 1997, 2016), it interprets each MCRV component in terms of its dominant organizational orientation. *Monitoring* as a sensing process through which ecological conditions become strategically legible; *Conserving* and *Restoring* as qualitatively distinct expressions of seizing, differing in their governance logics and knowledge requirements; and *Valorizing* as a transforming process through which ecological knowledge is translated into new products, services, and business models. Third, by mapping each MCRV component against the sensing, seizing, and transforming dimensions of Dynamic Capabilities, the framework provides managers with a diagnostic instrument for assessing where their biodiversity-related capabilities are underdeveloped and where strategic investment should be directed. In doing so, MCRV moves beyond compliance-oriented approaches to offer firms a strategic logic for treating biodiversity not as a constraint, but as a source of long-term competitive advantage, innovation, and resilience.

2 | Theoretical and Literature Background

2.1 | Biodiversity and Corporate Strategy

Biodiversity, defined as the variability among living organisms and the ecological complexes they inhabit, is essential for sustaining ecosystems that provide fundamental services for human well-being, including water purification, food, materials, climate regulation, and cultural benefits (Dasgupta 2021). Yet biodiversity is being eroded at an alarming scale, with current extinction rates estimated to be between 100 and 1000 times higher than the natural baseline due to human-induced pressures (Ceballos et al. 2015; De Vos et al. 2015; Pimm et al. 2014). The primary drivers of this crisis, including land-use change, overexploitation of resources, invasive species, and pollution, are closely tied to economic activities (IPBES 2019), and the severity of these impacts extends well beyond ecological concerns, as biodiversity loss disrupts critical ecosystem services that underpin economic stability and social well-being (Boiral and Heras-Saizarbitoria 2017; Leclère et al. 2020; Macellari et al. 2018). Current models indicate that reversing biodiversity loss is possible, but that it requires urgent action across individual, organizational, and societal levels (Leclère et al. 2020; Steffen et al. 2015; Testa, Di Minin, et al. 2025). Despite the magnitude of their impacts and dependencies, corporate responses to this challenge remain largely inadequate and fragmented (Schaltegger et al. 2023). When action is taken, it is typically reactive and motivated by external pressures such as regulatory compliance or reputational risk, rather than by a genuine strategic commitment to biodiversity stewardship (Boiral et al. 2018; Smith et al. 2020). Most corporate efforts continue to focus on compensatory mechanisms such as biodiversity offsets, rather than embedding biodiversity considerations into core business functions (Panwar 2023), and this tendency is exacerbated by persistent barriers such as regulatory uncertainty, data gaps, and the absence of standardized frameworks (Stephenson and Walls 2022).

A significant part of this challenge concerns the lack of robust, decision-relevant monitoring and assessment systems. Existing sustainability frameworks continue to prioritize climate-related disclosures, often sidelining biodiversity concerns (OECD 2021; Schulte and Paris 2024). Institutional efforts to address this gap, however, are not missing. Target #15 of the Global Biodiversity Framework (GBF)[1] specifically requests companies to monitor, assess, and disclose their impact and dependencies on biodiversity. In the European Union, the Corporate Sustainability Reporting Directive (CSRD) (European Parliament and European Council 2022) obliges large multinational companies to disclose the impacts they have on people and nature, and its latest version includes a specific standard referring directly to biodiversity, thus embedding biodiversity reporting within the broader architecture of mandatory sustainability disclosure. At the international level, the Taskforce on Nature-related Financial Disclosures

(TNFD), launched in 2021 and later updated, provides guidance for companies to assess and disclose their relationship with nature through the L.E.A.P. approach, a structured methodology that asks firms to Locate their interface with nature, Evaluate their dependencies and impacts, Assess their nature-related risks and opportunities, and Prepare to respond and report on material nature-related issues (TNFD 2023). On a complementary note, the Capitals Coalition proposes the ACT-D framework, which guides firms through four stages: Assess, Commit, Transform, and Disclose (Capitals Coalition 2026). These instruments represent important steps forward and can be understood as forms of a mitigation hierarchy (Arlidge et al. 2018) that seeks to minimize damage to nature as it occurs and to offset residual harm after the fact. Yet, despite their contribution to standardizing disclosure and raising corporate awareness, these frameworks share a common limitation: they tell firms what to report and measure, but remain largely silent on how firms should build the organizational capacity to act strategically on biodiversity. The problem of proactive, sustained engagement with nature, as opposed to reactive disclosure, remains largely unaddressed. This observation is reinforced by persistent methodological challenges: inconsistent metrics, limited data accessibility, and the context-dependent nature of ecosystems continue to make it difficult for companies to evaluate their biodiversity footprint and to adapt strategies accordingly (Kennedy et al. 2023; Rahman et al. 2022; White et al. 2023), leading to superficial or fragmented action even when disclosure requirements are met (Stephenson et al. 2022; Westerlaken 2024).

Advancing biodiversity integration, however, is not only a matter of improving measurement tools or overcoming data limitations. It also requires transforming corporate mental models, moving from viewing biodiversity as an external cost or compliance issue to recognizing it as a foundational element of long-term resilience and value creation (Testa, Di Minin, et al. 2025). Recent scholarship underscores the importance of integrating biodiversity into business strategy through a systems-thinking approach that positions companies within broader ecological networks (Bansal et al. 2025; Schulte and Paris 2024; Voegtlin et al. 2022), a perspective that aligns with the notion of organizational-ecosystem embeddedness and the reciprocal relationship between businesses and natural systems (Winn and Pogutz 2013). This shift is supported by growing evidence that biodiversity is directly linked to economic sustainability: research on ecosystem services valuation and corporate financial resilience shows that companies dependent on ecosystem services demonstrate greater adaptability to environmental changes (Jiang and Ding 2025; Nedopil 2023), while biodiversity risk has been found to significantly influence firm performance, strengthening the economic rationale for corporate biodiversity strategies (Bach et al. 2025). In parallel, empirical studies have begun to examine corporate biodiversity strategies more systematically, revealing that institutional frameworks, financial incentives, and social pressures drive firms toward biodiversity-oriented practices (Atupola et al. 2023), that business models focused on conservation, restoration, and sustainable use can generate value through ecosystem services (Feger and Mermet 2022), and that governance structures and managerial cognition shape the extent to which biodiversity considerations are internalized within organizations (D'Amato et al. 2018; Issa and Zaid 2023; Roberts et al. 2022). Collectively, this body of work points toward biodiversity not merely as an external constraint but as a potential source of competitive advantage, innovation, and resilience (Snihur and Bocken 2022; Testa, Di Minin, et al. 2025; Torelli and Balluchi 2022; Winn and Pogutz 2013).

Yet, while this literature converges on the need for a transformative, embedded perspective on biodiversity (Schaltegger et al. 2023; Testa, Di Minin, et al. 2025), it remains less explicit about how firms can operationalize such integration over time, particularly under conditions of uncertainty, limited ecological knowledge, and fragmented organizational responsibility. The existing scholarship is largely descriptive, documenting what firms do without theorizing how the organizational capacity for repeated, adaptive biodiversity integration develops. Addressing this gap requires theoretical lenses that can jointly explain (i) why biodiversity becomes strategically consequential and (ii) how firms develop the organizational capacity to repeatedly translate socio-ecological complexity into strategic action. In the next subsection, we draw on the Natural Resource-Based View to establish why biodiversity constitutes a strategic condition for firms, and on the Dynamic Capabilities perspective as the primary theoretical lens through which we explain how firms develop, organize, and deploy the organizational capacities required to engage with that condition.

2.2 | Natural Resource-Based View and Dynamic Capabilities

The Natural Resource-Based View (NRBV) provides a foundational strategic rationale for treating biodiversity not as an external context variable, but as a biophysical condition that shapes firms' constraints, dependencies, and opportunity spaces. By inserting the natural environment into the logic of sustained advantage, the NRBV links competitive outcomes to capability domains that enable environmentally sustainable economic activity, rather than to generic resource possession alone (Hart 1995). This move is particularly relevant for biodiversity because ecological degradation affects both the impacts firms generate across operations and value chains and the resilience of the ecosystem services on which firms depend for continuity and value creation (Dasgupta 2021; IPBES 2019). Recent work on biodiversity risk strengthens this grounding by clarifying what, exactly, is at stake: biodiversity-related materiality is not limited to reputational exposure or compliance pressure but also reflects operational vulnerability generated by dependencies on natural capital and ecosystem services, which remain less recognized and managed compared to impact-related risks (de Carvalho et al. 2023). The NRBV thus establishes why biodiversity is strategically material and why organizational capability is the relevant unit of analysis. It does not, however, explain the processes through which firms build, renew, and transform those capabilities under conditions of ecological change and uncertainty.

The Dynamic Capabilities perspective provides this logic, and it is the primary lens through which this study interprets corporate biodiversity integration. Dynamic capabilities explain how firms integrate, build, and transform internal and external competencies in environments characterized by change and uncertainty (Teece et al. 1997, 2016). Competitive advantage is understood as rooted in distinctive organizational processes of coordination, learning, and transformation, shaped by asset positions and evolutionary paths, such that organizational history both enables and constrains future strategic options (Teece et al. 1997, 2016). The distinction between ordinary capabilities, which concern doing things efficiently in stable conditions, and dynamic capabilities, which concern changing what the firm does and how it does it, helps explain why biodiversity integration often stalls when treated as an add-on to existing systems (Teece 2018; Schaltegger et al. 2023). Under deeper uncertainty, where outcomes cannot be reliably modeled and causal relations are only partially knowable, organizational agility becomes a capability problem centered on sensing emerging conditions, seizing viable strategic responses, and transforming routines and operating models to sustain alignment over time (Teece et al. 2016). In biodiversity contexts, these dynamics are amplified because the underlying socio-ecological system is complex and nonlinear: firms must repeatedly interpret evolving ecological signals and reorganize practices accordingly, rather than simply optimize against fixed targets (Kennedy et al. 2023).

Taken together, these two perspectives form the architecture of this study. The NRBV establishes the strategic stakes of biodiversity integration by grounding competitive relevance in biophysical constraints, ecosystem dependencies, and exposure to systemic ecological change (Hart 1995; de Carvalho et al. 2023). Dynamic Capabilities provide the analytical framework through which we explain how firms develop the organizational capacity to respond to those stakes, through processes of sensing, seizing, and transforming that are enacted through distinct mechanisms and with different intensities across the domains of biodiversity engagement (Teece et al. 1997, 2016). This integrated lens guides the interpretation of the empirical findings presented in the following sections.

3 | Research Methodology

Given the novelty of the topic and the limited empirical and theoretical understanding of how firms meaningfully integrate biodiversity into business value creation, we adopted an exploratory qualitative research approach (Corbin and Strauss 2014; Gioia et al. 2013). This approach is well-suited to investigating complex and underexplored phenomena and to generating theory where existing concepts remain fragmented or insufficiently developed (Yin 2003). We selected a qualitative methodology to capture the depth, contextual richness, and processual dynamics of biodiversity integration, focusing on meanings and practices rather than on testing predefined hypotheses (Corbin and Strauss 2014; Maxwell 2013). To ensure methodological rigor, we followed the Gioia methodology (Gioia et al. 2013) and grounded theory principles, iterating systematically between data and theory to identify emerging patterns and higher-order constructs in a context where relevant concepts are still evolving (Corbin and Strauss 2008).

We advanced our analysis through five interconnected phases (Figure 1). First, we conducted an extensive review of academic literature and practitioner reports on biodiversity and business strategy to identify key themes and inform the selection of knowledgeable informants (Step 1). Second, we explored biodiversity-related practices through 20 preliminary interviews

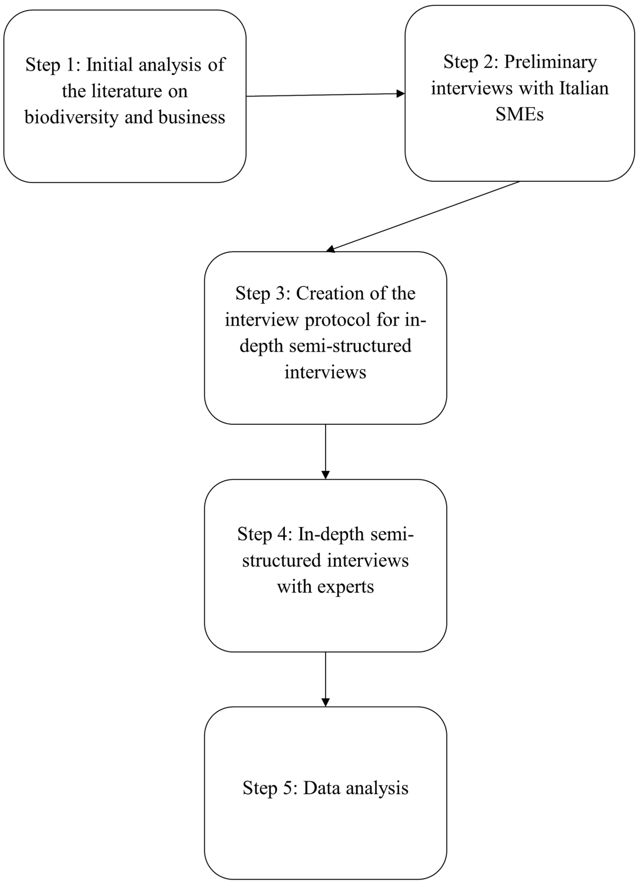

FIGURE 1 | Methodological process. The figure shows all the steps we followed in the data collection and analysis. Authors' own elaboration.

with SMEs engaged in biodiversity-oriented activities (Step 2). Third, we used the content of the preliminary interviews to refine the interview protocol for in-depth analysis (Step 3). Fourth, we conducted nine in-depth semi-structured interviews with Italian experts in biodiversity, natural sciences, environmental engineering, innovation, and policy (Step 4). We identified interviewees primarily through the National Biodiversity Future Center (NBFC) network and complemented this selection through snowball sampling (see the Table S1 for more details). Each interview lasted approximately 1 h, was conducted online between 2022 and 2023, and was fully transcribed for analysis. We enriched the primary data with secondary sources, including webinars, conferences, and workshops, to enable triangulation (Table 1). Finally, we analyzed the data using an open coding process that moved from first-order categories to second-order themes and aggregate dimensions (Step 5). We identified 18 s-order themes, aggregated in four dimensions of biodiversity management: *Monitoring*, *Conserving*, *Restoring*, and *Valorizing*, which constitute the foundation of our framework (Figure 2).

4 | Findings

The analysis revealed four critical and interrelated thematic dimensions that represent the foundation of an integrated strategic framework for how companies can engage with and contribute to biodiversity regeneration: *Monitoring*, *Conserving*, *Restoring*, and *Valorizing* (MCRV). The MCRV approach

TABLE 1 | Data sources and their use in the analysis.

Source of data	Type of data	Use in the analysis
Primary data	20 preliminary interviews with Italian SMEs engaged in biodiversity-oriented activities from diverse sectors (20 pages).	They served as an exploratory foundation for the study. They informed the initial framing of the research and were used iteratively to benchmark emerging interpretations and support data triangulation.
	9 in-depth semi-structured interviews with biodiversity experts involved in management projects (40 pages).	They constituted the core empirical material for identifying and developing the primary concepts related to biodiversity management practices.
Secondary data	Technical reports from relevant international organizations on biodiversity and society (200 pages). Relevant press release on biodiversity loss events and consequences. Relevant EU policy webpages (20 pages)	Secondary data were initially used to build a comprehensive understanding of the international research context. Subsequently, they supported the triangulation of empirical findings, enhanced the robustness of interpretations, and helped contextualize observed processes, particularly in relation to the design of biodiversity-related activities.
Observations	Unstructured notes and memos from events and webinars on biodiversity reporting, biodiversity and finance, biodiversity credits schemes, and conservation technologies (50 pages).	These observational data supported the research by helping to refine the research focus and identify relevant domains of inquiry. They also complemented interview data by providing real-time insights into practices and discourses, contributing to triangulation and enhancing the ecological validity of the findings.

(key concepts summarized in Table 2) offers a strategic and action-oriented structure that enables businesses to rethink their role and integrate biodiversity into their capabilities and decision-making processes. Each of these dimensions encompasses distinct principles and operational implications, guiding organizations in navigating the complex and evolving interface between business activity and biodiversity. The following sections delve into each area, highlighting their specific contributions to comprehensive, forward-looking biodiversity strategies.

4.1 | Monitoring

Monitoring activities generate the essential data required for effective biodiversity management, transforming that data into actionable metrics that support the sustained implementation of biodiversity strategies over time. Organizations' engaged involvement in monitoring the ecosystem includes a wide range of technologies, from low-tech to advanced solutions. For instance, remote sensing techniques, drones, and environmental DNA (eDNA) analysis represent cutting-edge tools currently used to enhance biodiversity monitoring efforts (Liddicoat et al. 2022). Organizations can collect, analyze, and forecast data related to biodiversity, such as species populations, ecosystem health, and ecosystem services.

A compelling example of the effectiveness of monitoring activities is provided by the case of Yellowstone National Park. As one expert observed, "Yellowstone National Park for 20 years produced all the base research on wolves, with fundamental importance on the knowledge we have on the ecology and biology of wolves. It is obvious! That information has a value that transcends Yellowstone. How this will influence and modify the management of Protected areas depends on them" (ID7).

Following the reintroduction of wolves to Yellowstone in 1995, scientists discovered that the species functions as an ecosystem engineer (Jones and Gutiérrez 2007), exerting a profound influence on the park's ecological dynamics, including its physical geography. This phenomenon is an example of a trophic cascade (Pace et al. 1999): while wolves prey on numerous animals, their presence indirectly enables the flourishing of other species, supports forest regeneration, and contributes to reducing soil erosion (Creel et al. 2005; Fortin et al. 2005).

The implementation of targeted initiatives by companies illustrates how *Monitoring* can unfold in practice. For example, some firms have been tracking pollinating insects, such as bees, on their agricultural lands, often in collaboration with technology startups. These efforts are increasingly being enhanced through the use of sensors and advanced models to gather quantitative data on pollinator abundance and the effectiveness of biodiversity measures. Those data can support the evaluation of ecosystem impacts and inform necessary adjustments to land management practices.

Other companies are also developing strategic frameworks for monitoring and evaluation, which include clearly defined Key Performance Indicators (KPIs) to assess progress towards goals to improve biodiversity outcomes. These may cover aspects such as the number of wild plant species in cultivated areas, trends in pollinator populations, land area dedicated to agroforestry, and emissions avoided. In some cases, these biodiversity KPIs are integrated into broader sustainability or impact reporting,

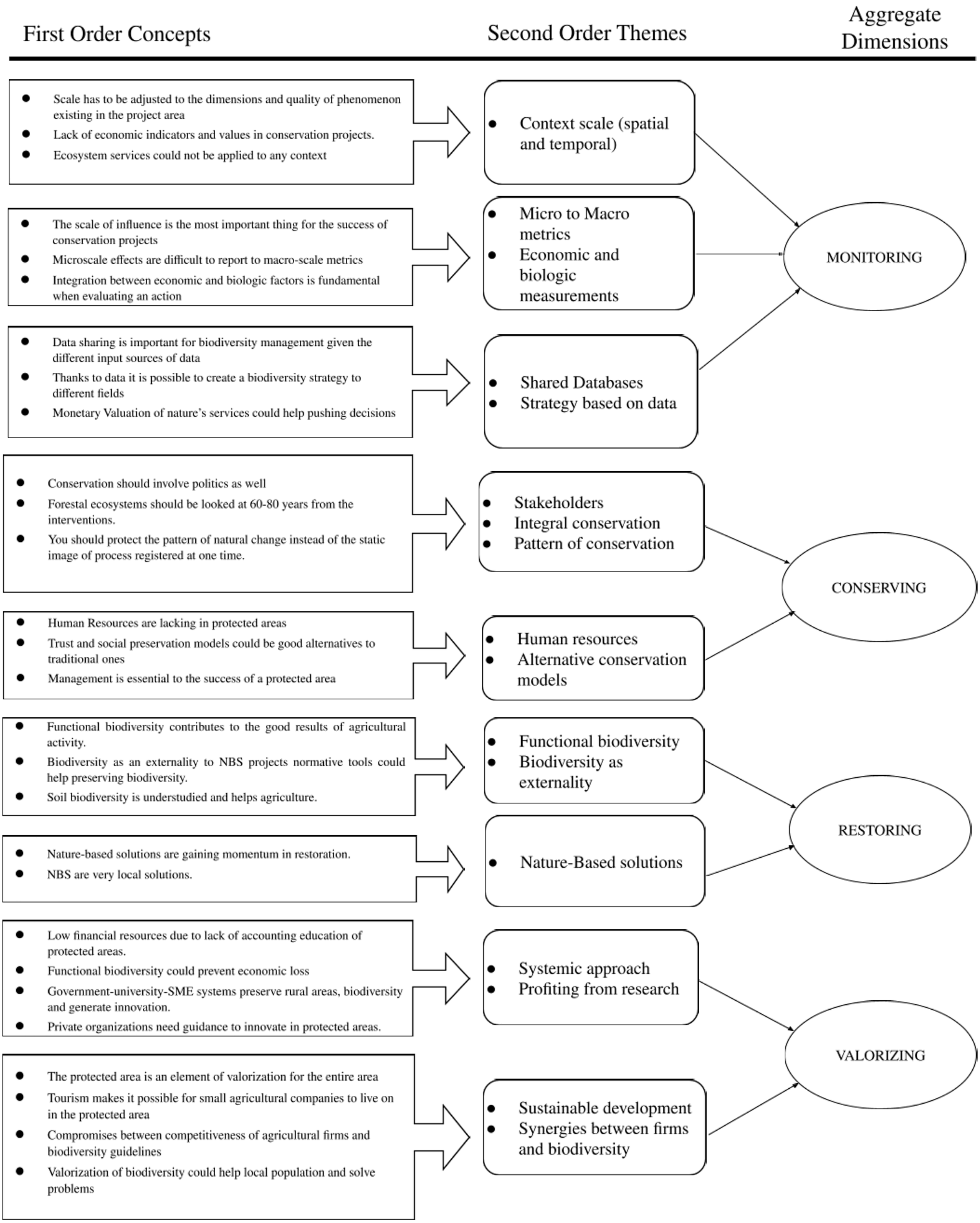

FIGURE 2 | Data Structure. The figure illustrates the Gioia Coding Scheme, starting from first-order concepts and leading to aggregate dimensions. Authors' own work.

TABLE 2 | MCRV summary.

Dimension	Definition	Included activities	Key specificities
Monitoring	Collecting, analyzing, and controlling biodiversity-related data to support business decisions and to build corporate awareness.	Context mapping, data collection, data analysis, metric development, and ongoing monitoring.	Requires advanced technologies (e.g., sensors, eDNA), shared databases among stakeholders, and multidimensional metrics (micro, macro, socio-economic). Defining spatial and temporal context is essential.
Conserving	Actively protecting areas of high ecological value through the establishment of conservation regimes and the implementation of targeted initiatives.	Creation and management of protected areas, rule-setting, and active stakeholder engagement.	Involves coordinating local stakeholders to protect ecosystem integrity while avoiding landscape crystallization, understood as the rigid preservation of land uses or spatial configurations that prevent ecosystems from continuing to evolve, regenerate, and adapt. In this phase, human capital is often the scarcest resource.
Restoring	Actively rehabilitating degraded ecosystems to recover ecological functionality and biodiversity.	Species reintroduction, green corridor installation, nature-based solutions, and reforestation.	Requires a multidisciplinary approach (engineering, ecology, informatics). Emphasizes functional biodiversity and co-design techniques.
Valorizing	Sustainable use of biodiversity to generate both firm and societal economic and environmental value.	Bio-inspiration, biomimicry, regenerative agriculture, eco-tourism, pharmaceutical and nutraceutical production, and multi-actor governance.	Requires a systemic approach. Promotes new sustainable business models. Valorization can transform regions through branding strategies and community-driven innovation.

ensuring alignment between stated goals and communicated results. These strategies are often treated as dynamic documents, revised periodically to incorporate new scientific insights, policy developments (e.g., updated EU regulations), and feedback from ongoing monitoring efforts.

More generally, *Monitoring* activities typically encompass the following components: (i) context mapping, (ii) data collection, (iii) data analysis, (iv) the creation of metrics, and (v) the longitudinal control of these metrics. These components can strengthen existing management strategies or inform new approaches better suited to the specific needs of a given area. In this sense, biodiversity monitoring enables organizations to build ecological and strategic knowledge about ecosystem conditions, species dependencies, and emerging biodiversity risks, and to develop sensing and interpretive capabilities that help anticipate and respond to environmental shocks, such as sudden ecosystem degradation, loss of critical species, or regulatory and supply-chain disruptions linked to biodiversity loss, thereby supporting the construction of science-based biodiversity strategies.

A robust monitoring strategy does not rely solely on ecological indicators but systematically integrates biodiversity data with social, economic, and geopolitical information by tracking how ecological conditions interact with land-use patterns, economic activities, and institutional dynamics over time. In this way, *Monitoring* captures biodiversity not merely as species presence within an ecosystem, but as a socio-ecological phenomenon shaped by human activities, governance structures, and spatial interdependencies:

"The scale must be commensurate with the size and quality of the phenomena existing in our project area. Sometimes it is enough to have a 10km buffer area, other times we have to look much further afield, i.e., the whole geopolitical context in which the area is embedded. For example, a protected area in a war zone requires different attention than another" (ID 6).

Another important concept is the dimensionality of biodiversity metrics. Effective biodiversity management requires the ability to connect micro-level ecological information, which captures critical species interactions and functional roles, with macro-level assessments used for strategic planning and reporting. While micro-level metrics are essential for understanding ecosystem functioning and identifying leverage points for intervention, macro-level indicators often abstract away from these interactions, reducing biodiversity to aggregated measures that obscure ecological dynamics. This tension creates a significant challenge for firms seeking to base strategic decisions on biodiversity data.

To be decision-relevant, biodiversity metrics must therefore operate across scales and be explicitly linked to socio-economic considerations. Rather than treating ecological and economic indicators as separate domains, firms need integrative metrics that allow them to compare alternative land-use or operational options in terms of both their biodiversity outcomes and economic feasibility. Such an approach supports strategic prioritization by enabling firms to assess trade-offs and complementarities between ecological integrity and value creation.

This suggests that biodiversity metrics are most useful when they function not only as descriptive tools, but as comparative and directional devices that guide choices among multiple viable activities. By evaluating biodiversity returns alongside economic performance, firms can identify options that deliver relatively higher ecological benefits without undermining socio-economic viability. This reinforces the role of *Monitoring* as a strategic capability that reduces ecological uncertainty, supports informed decision-making, and underpins subsequent conservation, restoration, and valorization efforts.

Thirdly, the availability of adequate systems to collect, store, and share data among managers and operators is essential for effective biodiversity management. As one expert explained, data are often collected on a project basis and shared opportunistically to create synergies between stakeholders. For instance, a practitioner might approach a soil expert with mapped data relevant to ecosystem services, enabling the expert to conduct analyses that would otherwise be difficult due to time or data constraints. This dynamic creates a "win-win" scenario where shared interests lead to mutual benefits and stronger collaboration.

This kind of data-sharing infrastructure also strengthens strategic decision-making. As the same expert noted, "You have all this information behind you that allows you to say: if you work in agriculture, I advise you to do this and this. In the end, you have a very clear vision because the areas correspond to different models" (ID5). In other words, when strategies are supported by comprehensive, shared databases, interventions can be more precisely tailored, their effects on biodiversity more easily achieved and monitored.

4.2 | Conserving

Conserving biodiversity involves establishing formal regimes to protect ecosystems, grounded in rules and guidelines that maintain the evolutionary processes of a specific area and the implementation of targeted initiatives. Such regimes typically take the form of Protected Areas or Other Effective Area-Based Conservation Measures (UNEP-WCMC and IUCN 2024). By enabling ecological systems to function with minimal disturbance—allowing nature to take its course—conservation can support long-term resilience.

A critical limitation of many conservation practices lies in their focus on preserving static landscape configurations rather than analyzing the ecological and socio-economic processes that originally shaped them. Landscapes such as mountain pastures and mosaic ecosystems often emerge through long-term interactions between human land use—such as grazing or small-scale agriculture—and natural dynamics. When these practices cease, secondary ecological processes, including natural reforestation, are triggered. Conservation strategies that attempt to preserve these historical patterns in the absence of the processes that generated them risk ecological stagnation and policy inconsistency.

For example, prioritizing the funding of grazing activities over the protection of mountain ecosystems reflects an effort to maintain a declining spatial process rather than supporting a natural transition toward a different ecological configuration. Rather than preserving form, effective conservation should prioritize the protection of the pattern of change in which an ecosystem is found, supporting the continuity of ecological patterns and accepting landscape transformation as part of ecosystem resilience. This process-oriented perspective also legitimizes rewilding approaches, which can restore ecological functionality even when the resulting spatial configurations diverge significantly from historical baselines.

A central insight emerging from the data is the pivotal role of stakeholder engagement. Conservation is not a purely ecological endeavor, but a fundamentally socio-ecological one, requiring collaboration with local communities, businesses, and public authorities. As one expert (ID7) observed, in the Arabuko Forest in Kenya, surrounding villages initially contributed to forest degradation. However, a government initiative enabled locals to capture and breed butterflies for export, transforming conservation from a source of conflict into a source of income. "This made the aversion to conservation become a driver," the expert noted. A similar shift occurred in Italy's Parco d'Abruzzo, where residents benefited economically from conservation through nature-based tourism. These cases illustrate the importance of including local stakeholders as co-beneficiaries of conserving initiatives, not excluded as external actors. These dynamics point to the need for adaptive governance arrangements capable of responding to ecological uncertainty, socio-economic change, and evolving stakeholder expectations. Adaptive governance emphasizes flexible decision-making, iterative learning, and distributed responsibility across public, private, and civil society actors, allowing conservation strategies to adjust over time as ecological conditions and institutional contexts evolve (OECD 2024).

Human resources emerged as another limiting factor. Conservation regimes depend on skilled professionals to manage protected areas, engage stakeholders, and monitor ecological outcomes. Yet, as one expert (ID9) pointed out, "Money must be transformed into human resources, which are lacking in the parks." This reflects a broader institutional weakness where financial investments do not translate into operational capacity on the ground.

Experts pointed to the emergence of alternative governance models for conservation. In some contexts, conservation areas are being managed by large membership-based organizations that combine public visibility, technical expertise, and lean organizational structures. These actors, often rooted in civil society, are seen as more agile and politically effective than traditional public administrations. As one expert (ID7) explained, these models offer "a leaner and more efficient management apparatus," capable of achieving conservation goals through a combination of public support, operational flexibility, and strategic capacity. In the United States, similar roles are played by conservation trusts—groups of private individuals who collectively acquire and manage land to protect ecological value. These examples suggest that non-state actors can make significant contributions to biodiversity protection, particularly when they operate with clear goals, scientific grounding, and participatory approaches.

Conservation efforts increasingly extend beyond traditional protected areas to encompass working landscapes where biodiversity and production systems coexist. Companies engaged in sustainable agriculture are implementing practices such as crop rotation, intercropping, and agroforestry to maintain ecosystem functions and prevent biodiversity loss associated with monocultures. Some also invest in preserving genetic diversity by cultivating heirloom or local plant varieties and studying their intraspecific variation through genetic barcoding or population-level research. These practices not only support ecological resilience but also help preserve regionally adapted genetic lines that may prove essential for future food security. Furthermore, a more holistic approach to conserving biodiversity involves designing farms as agroecosystems, where both wild and cultivated species are monitored and managed to sustain long-term ecological balance. *Conserving*, in this sense, is not about freezing landscapes in time but about enabling living systems to adapt, regenerate, and thrive.

In summary, effective conservation requires more than legal designations or preserved appearances. It demands inclusive, process-based approaches, adequate human capacity, and adaptive governance models capable of responding to ecological complexity and socio-political realities. These emerging governance models share several defining characteristics: multi-actor coordination across public, private, and civil society domains; operational flexibility enabled by lean organizational structures; scientific grounding through partnerships with research institutions; and participatory legitimacy derived from stakeholder inclusion. For example, land trusts in the United States operate through collective ownership arrangements that enable long-term ecosystem protection while mobilizing private capital, whereas membership-based conservation organizations combine public visibility and technical expertise to implement landscape-scale initiatives beyond traditional administrative boundaries.

4.3 | Restoring

Restoring is the activity of actively rehabilitating degraded ecosystems to recover ecological functionality and biodiversity. It encompasses the recovery of degraded ecosystems to improve their ecological integrity and support biodiversity regeneration. As anthropogenic pressures such as deforestation, pollution, and habitat fragmentation continue to accelerate ecological degradation, restoration has become a critical component of conservation and sustainable development strategies. Restoration efforts aim to re-establish key ecosystem functions and services while enhancing biodiversity resilience at multiple spatial scales.

These initiatives are highly context-dependent and draw on interdisciplinary knowledge to design and implement effective interventions. Restoration techniques can range from reintroducing native species and stabilizing soil through natural materials to the construction of artificial habitats. For example, restoring degraded wetlands not only improves water quality and mitigates erosion but also expands habitats for aquatic and terrestrial species. Importantly, restoration is increasingly seen not only as an ecological imperative but also as an economic opportunity, particularly in sectors such as sustainable tourism, fisheries, and agriculture.

An important concept within this domain is functional biodiversity, referring to the integration of biodiversity within productive activities in ways that generate ecological benefits as externalities. One expert noted how agricultural systems can incorporate "the management of non-cultivated areas to promote both environmental value and farming success. Functional biodiversity contributes to the success of farming" (ID2). For example, introducing a different type of plant in a non-cultivated area adjacent to olive trees can attract parasitoid wasps into the ecosystem. These wasps are natural enemies of the olive fly, a dangerous pest for the plant. This provides farmers with a solution that does not rely on pesticides or other costly alternatives (Moonen and Barberi 2008). This perspective frames biodiversity not as a constraint on productivity but as an asset that enhances system resilience and long-term efficiency.

Nature-based Solutions (NBS), meaning cost-effective and sustainable actions inspired by nature, like urban green roofs, are also playing an increasingly prominent role in restoration strategies. These approaches combine ecological integrity with engineering functions to deliver environmental and socio-economic benefits. NBS are typically resource-efficient, locally adapted, and systemic in scope. As one expert explained, "We work a lot with Nature-Based Solutions… They operate at the limit between engineering and nature. We start with a vegetation base to ameliorate biodiversity and all the ecosystem services of that habitat" (ID3). Examples include green corridors in urban planning, ecosystem-based disaster risk reduction, and biodiversity-enhancing infrastructure.

Implementing effective restoration strategies requires a multidisciplinary and collaborative approach. Expertise from ecology, engineering, spatial data science, and environmental policy must be integrated to address the complexity of degraded ecosystems. Co-design processes—where scientists, practitioners, and local stakeholders collaborate—are particularly effective in ensuring that restoration projects are context-specific, adaptive, and socially legitimate.

Restoring is not merely a corrective measure but a strategic investment in ecological infrastructure. When grounded in sound ecological knowledge and supported by cross-sectoral collaboration, restoration can simultaneously improve biodiversity outcomes and generate sustainable economic value. It represents a forward-looking, innovation-driven pillar of biodiversity management that supports systemic change rather than isolated remediation.

4.4 | Valorizing

Valorizing biodiversity refers to the generation of economic, social, and environmental value through the sustainable use of natural resources. Rather than treating biodiversity solely as a constraint or risk, valorization reframes it as a strategic asset—one that can inform innovation, support local livelihoods, and drive regional development. This involves leveraging existing knowledge, organizational capabilities, and ecosystem-based resources to create products, services, and experiences rooted in ecological sustainability.

One key mechanism through which valorization occurs is the translation of ecological knowledge into innovation. Bioinspiration, bioimitation, and biomimicry offer powerful pathways for deriving technological solutions from nature. As extensively discussed in the literature (Bar-Cohen 2006; Fayemi et al. 2017; Lurie-Luke 2014), these processes enable firms to replicate nature's adaptive and efficient designs in fields such as robotics, material science, and sustainable engineering. Classic examples include Velcro, inspired by burrs clinging to animal fur (Benyus 2009), and soft-robotic arms modelled on octopus movement (Laschi et al. 2012). These instances illustrate how biodiversity can fuel innovation that is both technically advanced and ecologically aligned.

Valorizing is also evident in emerging models of regenerative agriculture, sustainable aquaculture and fisheries, eco-tourism, and nature-based product development. These activities often draw from local biodiversity and traditional ecological knowledge while incorporating scientific insights and sustainability principles. They enable businesses and communities to derive tangible benefits from biodiversity without depleting its underlying ecological base.

A particularly illustrative example of this systemic approach comes from the Emmental region of Switzerland. As one expert explained, a coordinated effort between government, universities, and small farmers enabled the creation of a decentralized seed production model. Farmers were supported to produce their own seeds, rather than relying on external suppliers, while universities ensured seed quality through laboratory testing. "They removed the middleman, left the profit from the seed in the hands of the producers, had very good grain products, and supplemented family income" (ID1). This multi-actor collaboration not only improved local economic resilience but also reinforced biodiversity conservation (by keeping farmers in rural areas through a new income source, they were able to contribute to landscape management and consequently the biodiversity present there) and knowledge exchange, demonstrating how valorization can stimulate regional transformation.

Moreover, valorizing biodiversity also means recognizing and mobilizing its ecological, biochemical, cultural, and economic potential. Companies increasingly position biodiversity not as a constraint, but as a driver of innovation and competitive advantage. This includes investing in research on bioactive natural compounds, such as secondary plant metabolites with pharmacological properties, that can be used in health, wellness, or cosmetic products. In doing so, firms tap into biodiversity's molecular richness while also preserving traditional knowledge and stimulating product innovation. Valorization also extends to education and cultural engagement: some organizations run school programs, museum initiatives, and community workshops that elevate biodiversity as a public good and deepen its perceived value among citizens. Strategic alignment between biodiversity goals and business models is becoming more explicit, with some companies integrating biodiversity KPIs into their sustainability reports, industrial plans, and innovation strategies. By participating in broader innovation ecosystems, including collaborations with startups and research institutions, companies transform biodiversity from a compliance topic into a core business enabler and source of shared value creation.

Valorizing can also drive broader shifts in territorial development. In some contexts, conservation regimes have catalyzed the emergence of new business models based on eco-tourism and territorial branding. For instance, in the Maremma region of Italy, the creation of a protected area initially met with local resistance. Over time, however, the park's visibility attracted non-traditional tourist flows—nature tourism, cycling tourism, and agritourism—that reshaped the local economy. As one expert explained, "agricultural activity has become complementary to tourism-oriented models that emerged around biodiversity and conservation infrastructure" (ID8). The Maremma case eventually served as a template for other parts of Tuscany, illustrating how biodiversity valorization can scale beyond its original context and influence regional trajectories.

These examples highlight that valorizing biodiversity is not about commodifying nature indiscriminately but about designing systems in which ecological, social, and economic value can co-evolve. Doing so requires strong institutional coordination, long-term investment, and a commitment to participatory governance. When implemented strategically, valorization supports the emergence of new business models, fosters cross-sector collaboration, and embeds sustainability into local and regional development pathways.

5 | Discussion

5.1 | The MCRV Framework as a Configuration of Dynamic Capabilities

The MCRV framework can be interpreted as a configuration of interdependent organizational orientations through which firms embed biodiversity into their strategic and innovation processes and generate long-term value. MCRV represents a set of strategic functions whose conceptual relationship to dynamic capabilities varies in both kind and intensity. To make this relationship explicit and analytically tractable, Table 3 presents a matrix that maps each MCRV component against the three core dimensions of dynamic capabilities identified by Teece et al. (1997, 2016): sensing, seizing, and transforming. Each cell specifies both the nature of the alignment and its intensity, classified as either Primary or Contributory. Primary denotes the dominant Dynamic Capability orientation through which each MCRV component is strategically enacted, while Contributory denotes a genuine but secondary role, one that remains organizationally significant even where it is not the defining logic of that component.

The matrix offers a way to reinterpret MCRV not merely as a collection of biodiversity-oriented actions but as an expression of how firms organize themselves strategically in relation to their ecological context. By mapping each MCRV component against

TABLE 3 | MCRV framework and dynamic capabilities: Intensity of alignment across strategic dimensions.

MCRV dimension	Sensing	Seizing	Transforming
Monitoring	Primary—Reveals biodiversity conditions, dependencies, and strategic exposure, building the interpretive capacity needed to make biodiversity visible and actionable across ecological and socio-economic scales	Contributory—Provides the evidence base for prioritizing interventions and directing conservation and restoration efforts. Data infrastructure supports early governance choices and resource allocation	Contributory—Comprehensive monitoring systems and strategic data platforms can underpin new sensing-based business strategies and value chain repositioning, establishing the ecological knowledge base that enables later transformation
Conserving	Contributory—Generates feedback on ecosystem conditions, stakeholder expectations, and governance needs, refining ongoing monitoring and strategic interpretation.	Primary—Protects critical ecosystems through coordinated action, governance mechanisms, and resource commitment, thereby stabilizing the firm–environment relationship and mitigating exposure to biodiversity-related risks	Contributory—Reshapes organizational routines and internal accountability structures, providing the governance grounding and legitimacy required for future biodiversity-based innovation
Restoring	Contributory—Deepens ecological understanding of organizations through experimentation, adaptive management, and regenerative learning, strengthening the firm's sensing capacity over time.	Primary—Mobilizes resources toward regenerative action aimed at recovering ecosystem functions and improving socio-ecological resilience; requires selective commitment under partial knowledge and integration of interdisciplinary expertise	Contributory—Builds regenerative capabilities and cross-functional learning that transform operational practices through nature-based solutions and collaborative design, enabling broader strategic renewal.
Valorizing	Contributory—Requires continuous interpretation of ecological, market, and innovation signals to ensure that biodiversity-based products, services, and business models remain credible, adaptive, and ecologically grounded.	Contributory—Involves the implementation of new routines, partnerships, and operational arrangements needed to capture biodiversity-related opportunities.	Primary—transforms the firm's value creation logic by translating ecological knowledge and ecosystem functions into new products, services, and business models. Driving strategic renewal aligned with long-term biophysical conditions.

Note: Primary denotes the dominant dynamic capability orientation of each MCRV phase; Contributory denotes a functionally relevant but subordinate role. Authors' own elaboration.

the sensing, seizing, and transforming dimensions of Dynamic Capabilities, it becomes possible to read biodiversity activities through a strategic logic: a monitoring initiative is not simply a data collection exercise but a sensing process through which ecological conditions become strategically legible; a conservation activity is not simply a protection measure but a seizing process through which the firm stabilizes its relationship with the natural environment and commits resources under uncertainty; a restoration intervention is not simply an ecological repair but a form of seizing that deepens organizational competence through adaptive action; and a valorizing activity is not simply a commercial opportunity but a transforming process through which biodiversity knowledge is translated into new forms of value creation. This facilitates how the MCRV activities are understood by situating them within a coherent account of organizational strategy rather than being treated as peripheral sustainability initiatives.

Monitoring holds a primary orientation toward sensing. In the terms established by Teece et al. (1997), sensing involves the capacity to identify, filter, and interpret signals from the environment that carry strategic significance, drawing on both internal scanning and external knowledge infrastructures. *Monitoring* enacts this function through the construction of biodiversity-relevant data systems, metric development across ecological and socio-economic scales, and the longitudinal interpretation of ecosystem conditions and dependencies. The formative role of indicators in shaping managerial attention and internal accountability, emphasized by Addison et al. (2020) and Stephenson et al. (2022), finds direct expression here: *Monitoring* does not merely describe ecological conditions but actively constructs biodiversity as a strategically legible concern, reducing uncertainty and providing the cognitive basis for organizational decision-making (Kennedy et al. 2023).

Importantly, *Monitoring* does not require full internalization of scientific expertise; firms may depend on external knowledge partners and shared data infrastructures while retaining interpretive and strategic responsibility (Testa, Di Minin, et al. 2025). *Monitoring* also carries a contributory role in seizing, insofar as the evidence base it generates guides the prioritization of interventions and informs early governance choices, and in transforming, insofar as strategic data architectures and sensing-based platforms can themselves become the foundation of new business strategies and value chain repositioning.

Conserving holds a primary orientation toward seizing. Seizing, in the dynamic capabilities framework, refers to the mobilization of resources and the design of organizational arrangements in response to identified strategic opportunities and threats, requiring commitment under uncertainty and the construction of governance structures capable of sustaining that commitment over time (Teece et al. 1997). Conservation activities enact this function through the establishment of formal and informal protection regimes and the coordination of multi-actor governance arrangements. The dependence of conservation outcomes on inclusive governance, human capacity, and adaptive institutional design reflects the broader argument that firms' environmental strategies are embedded in socio-ecological systems rather than enacted in organizational isolation (Winn and Pogutz 2013; Schulte and Paris 2024). Conservation also carries a contributory sensing role, insofar as ongoing ecological feedback within conservation regimes sustains and refines strategic interpretation, and a contributory transforming role, insofar as process-based conservation reshapes organizational routines and internal accountability structures in ways that generate the governance grounding and legitimacy on which more advanced biodiversity-based innovation depends (de Carvalho et al. 2023).

Restoring holds a primary orientation toward seizing, though its seizing profile is qualitatively distinct from that of *Conserving*. Whereas *Conserving* seizing is oriented primarily toward governance stabilization, *Restoring* seizing involves the commitment of resources under conditions of partial knowledge, high interdisciplinary complexity, and nonlinear ecological dynamics, requiring what Teece et al. (2016) describe as organizational agility to adapt commitments as new information emerges. This corresponds to the broader argument in the Dynamic Capabilities literature that seizing in uncertain environments is not a one-time allocation decision but a recurrent organizational challenge shaped by evolving ecological and institutional conditions (Kennedy et al. 2023). *Restoring* also carries a distinctive contributory role in sensing: rather than generating sensing capacity through systematic data collection, as *Monitoring* does, *Restoring* deepens ecological understanding through experimentation, adaptive management, and regenerative learning, strengthening the firm's interpretive capacity as a byproduct of action rather than as a prior condition for it. This aligns with insights from research on absorptive capacity and organizational learning, which show that knowledge development in complex environments often proceeds through practice-based discovery rather than front-loaded assessment (Alkaraan et al. 2024). Its contributory role in transforming reflects the fact that restoration builds cross-functional capabilities and nature-based operational competencies that begin to alter how the firm relates to its ecological context, even where full strategic transformation has not yet occurred.

Valorizing holds a primary orientation toward transforming. Transforming, in the terms of Teece et al. (2016), refers to the transformation of the firm's value creation logic, the restructuring of its asset and capability base, and the realignment of its operating model with changing environmental conditions. In the context of biodiversity integration, this involves the translation of accumulated ecological knowledge and ecosystem functions into new products, services, business models, and territorial development strategies, combining biodiversity-related assets with organizational capabilities, technological infrastructure, and relational networks in ways that generate economic and social value without depleting the ecological base from which that value derives. This finding extends recent research on ecosystem services and biodiversity-positive business models, which identifies the potential for firms to construct competitive positions grounded in ecological integrity rather than in the exhaustion of natural capital (Feger and Mermet 2022; Jiang and Ding 2025; Torelli and Balluchi 2022). Valorization denotes the process through which biodiversity-related knowledge and ecosystem functions are made usable and translated into societal or economic value (Voglhuber-Slavinsky et al. 2023). From a Dynamic Capability perspective, *Valorizing* reflects a process of strategic transformation in which firms transform their value creation logic to align with biophysical conditions and long-term resilience rather than short-term optimization (Teece et al. 2016; Schaltegger et al. 2023). *Valorizing* carries contributory roles in both sensing and seizing: its sensing contribution reflects the requirement for continuous and sophisticated ecological and market interpretation to keep biodiversity-based strategies credible and adaptive, while its seizing contribution reflects the organizational effort required to implement new routines, partnerships, and operational arrangements that capture biodiversity-related opportunities by integrating and recombining capabilities across all MCRV dimensions.

A comprehensive reading of the matrix reveals a consistent and coherent pattern that lends support to the broader theoretical claim that biodiversity integration, conceptualized through the MCRV framework, entails a structured configuration of Dynamic Capabilities. While these capabilities exhibit distinct dominant orientations, they remain inherently interdependent and mutually conditioning. The framework thereby provides a relational and analytically differentiated account of how firms can embed ecological considerations into strategy and innovation, moving beyond compliance-oriented approaches toward the kind of organizational transformation that the literature increasingly identifies as necessary for meaningful biodiversity stewardship (Panwar 2023; Schaltegger et al. 2023; Testa, Di Minin, et al. 2025).

5.2 | Theoretical Contributions

This study developed the MCRV framework to address a central gap in the literature: the lack of empirically grounded, operational guidance for firms seeking to move beyond compliance toward proactive and strategic biodiversity engagement (Panwar 2023; White et al. 2021). While the NRBV provides the foundational rationale for treating biodiversity as a biophysical condition that shapes firms' constraints, dependencies, and opportunity spaces rather than as an external sustainability concern (Hart 1995; Winn and Pogutz 2013), the primary theoretical contribution lies in applying the Dynamic Capabilities perspective to explain how firms develop the organizational capacity to act on that condition (Teece et al. 1997, 2016). The framework interprets *Monitoring*, *Conserving*, *Restoring*, and

Valorizing not as parallel or interchangeable categories but as organizationally distinct configurations of Dynamic Capabilities, each characterized by a dominant strategic orientation and a set of contributory relationships with the other capability dimensions. As elaborated in the matrix presented in Table 3, this differentiated mapping makes it possible to situate biodiversity activities within a coherent strategic logic, showing how sensing, seizing, and transforming operate with different intensities and through different mechanisms across the MCRV components. This responds to calls to move beyond fragmented biodiversity practices and toward integrated, strategy-relevant approaches that clarify the organizational logic of biodiversity engagement (Schaltegger et al. 2023; Testa, Di Minin, et al. 2025).

The framework also contributes to theory by addressing persistent organizational barriers to biodiversity integration identified in prior research, including perceived complexity, limited strategic relevance, entrenched managerial mindsets, and the absence of pragmatic pathways for action (Schaltegger et al. 2023; Schulte and Paris 2024). By specifying the capability dimensions that underpin each MCRV component and their relative intensities, the framework clarifies how biodiversity-related knowledge can be progressively internalized, coordinated, and mobilized within firms. In this sense, it complements and extends existing work on indicators, impacts, and dependencies (Addison et al. 2020; Cinquini et al. 2026; Panwar et al. 2023) by foregrounding the dynamic interaction between ecological knowledge and organizational change, rather than treating biodiversity primarily as a reporting or measurement challenge.

From an interdisciplinary perspective, this study advances earlier calls to integrate insights from the natural sciences into strategy and organization theory (Winn and Pogutz 2013). By drawing on empirical insights from experts in ecology, environmental engineering, and biodiversity science, the MCRV framework demonstrates how scientific knowledge about ecosystems can be translated into management-relevant strategic responses. This contributes to a more nuanced understanding of the firm–environment relationship, in which responsibility for biodiversity loss and capacity for solution development are both recognized as organizational concerns rather than externalities (Winn and Pogutz 2013; Schulte and Paris 2024).

The study further extends research on ecosystem services and biodiversity-related value creation by showing how firms can generate economic value while maintaining or enhancing ecological integrity (Feger and Mermet 2022; Jiang and Ding 2025). MCRV strengthens the theoretical foundations of biodiversity-positive business models and illustrates how conservation and competitiveness can be mutually reinforcing rather than antagonistic (Torelli and Balluchi 2022). The empirical examples presented in the findings, such as territorial branding, circular production models, and multi-actor governance arrangements, illustrate how locally embedded innovation trajectories can emerge from biodiversity-oriented strategies.

Finally, this study contributes to broader debates on strategic renewal by reframing biodiversity not as an external constraint but as a driver of organizational transformation under ecological instability (Winn and Pogutz 2013; Roberts et al. 2022). The MCRV framework shows that biodiversity-related activities are central to how firms generate, sustain, and capture value in contexts characterized by environmental uncertainty and systemic risk. By linking biodiversity impacts and dependencies to processes of learning, transformation, and value creation, the study advances a dynamic conceptualization of corporate biodiversity integration that aligns strategic management theory with the realities of socio-ecological change.

5.3 | Managerial Implications: Towards a Biodiversity-Positive Business Strategy

Rather than prescribing context-independent operational procedures, which would be misleading given the complexity and place-specificity that the MCRV framework is explicitly designed to navigate, the implications developed in this section offer managers a capability-diagnostic logic for identifying where strategic investment is most needed. The primary operational instrument is Table 3, which enables managers to assess their current capability profile across the sensing, seizing, and transforming dimensions and identify which MCRV components are underdeveloped relative to their ecological context and organizational situation.

A firm whose biodiversity engagement is concentrated in monitoring-intensive activities may recognize that its sensing capacity is well developed while its seizing and transforming orientations remain underdeveloped, suggesting where strategic attention and resource allocation should be directed. Conversely, a firm that has established governance and restoration commitments but has not yet translated ecological knowledge into new products or business models may identify transforming as the next organizational priority. The matrix thereby functions not only as a theoretical device but as a diagnostic instrument for managers seeking to understand and develop their firm's biodiversity-related Dynamic Capabilities.

From a managerial perspective, we propose the MCRV framework as a strategic and action-oriented structure that equips managers with a structured account of how biodiversity activities can be organized and understood as expressions of organizational strategy rather than as isolated initiatives. Our approach can offer practical guidance for devising corporate biodiversity management plans in line with the guidelines set forth, for instance, by the IUCN and other standards on biodiversity performance structured to support defining baselines, setting targets, designing sampling strategies, and ensuring data governance (Stephenson and Carbone 2021). This involves establishing clear goals, objectives, and indicators to effectively manage and monitor biodiversity impacts and dependencies stemming from corporate activities. Aligning corporate monitoring systems with such standards reduces the risk of fragmented or low-quality data collection and enhances comparability, credibility, and decision relevance over time.

At the same time, firms should be aware that biodiversity reporting may be susceptible to selective disclosure and impression management dynamics (Hassan et al. 2020). Transparent communication of both positive and negative biodiversity outcomes, and where appropriate, the use of independent third-party assurance can strengthen legitimacy and prevent biodiversity initiatives from becoming symbolic rather than substantive.

Integrating biodiversity metrics with socio-economic indicators further enhances strategic decision-making. Rather than treating ecological and economic performance as separate domains, firms can adopt a nested measurement architecture that links site-level ecological indicators (e.g., habitat condition, species trends, functional diversity) with corporate-level exposure metrics (e.g., operations in ecologically sensitive areas, ecosystem-service dependencies) and socio-economic variables such as local livelihood impacts, cost structures, and regulatory risk (Cinquini et al. 2026). Evaluating alternative actions through multi-criteria comparison enables firms to prioritize interventions that generate meaningful biodiversity gains while maintaining economic viability and social legitimacy.

Moreover, consistent with recent critiques of nature-based solutions, managers should ensure that biodiversity-based initiatives are embedded within broader environmental transition strategies and adhere to recognized guardrails (e.g., the IUCN Global Standard for Nature-Based Solutions). Restoration and valorization initiatives should complement, not substitute for, the reduction of core environmental pressures, thereby avoiding the risk that biodiversity investments function as reputational offsets rather than drivers of systemic change (Seddon 2022).

By situating biodiversity activities within a strategic capability framework, managers, entrepreneurs, and R&D leaders can move beyond compliance-oriented responses and engage with biodiversity as a genuine source of organizational competence, innovation, and long-term value creation.

6 | Conclusion, Limitations and Future Research

This study set out to address a central gap in the literature on business and biodiversity: how firms can move beyond fragmented, compliance-driven approaches and strategically integrate biodiversity into their value creation processes. Drawing on qualitative evidence from firms and experts, we developed the MCRV framework as a structured configuration of Dynamic Capabilities through which biodiversity becomes embedded in corporate strategy. By grounding the MCRV framework in Dynamic Capabilities and situating it within the broader context established by the NRBV, we explain both why biodiversity is strategically consequential and how firms can develop the capabilities to act upon it.

At the same time, several limitations must be acknowledged. First, the study draws on a qualitative, inductive design based on expert interviews and exploratory interactions with SMEs. This approach is appropriate for theory building in an emerging domain, where constructs and relationships remain insufficiently specified, but it does not aim at statistical generalization. Second, the empirical material is primarily situated within a European, and specifically Italian, context, where institutional arrangements, policy frameworks, and biodiversity practices may differ from those in other regions. While this provides a grounded setting for observing how firms engage with biodiversity, further research is needed to examine the transferability of the MCRV framework across diverse institutional environments. Moreover, while the MCRV framework is theorized at the level of organizational capabilities and therefore applicable across firm sizes, the empirical base of this study is primarily drawn from SMEs and regionally embedded experts. Future research should examine how the sensing, seizing, and transforming orientations of MCRV vary in intensity and governance complexity across large multinational firms with extended value chains and distributed ecological footprints.

These limitations open several avenues for future research. Quantitative studies could be developed to operationalize and measure the different capability dimensions identified in the MCRV framework, enabling the assessment of their relationship with firm performance and biodiversity outcomes. Comparative research across sectors and institutional contexts would help to examine how MCRV configurations vary depending on industry characteristics, regulatory pressures, and ecological dependencies. Longitudinal studies could further explore how firms develop and recombine these capabilities over time, particularly under conditions of ecological uncertainty and regulatory change. Finally, future work could investigate the organizational and governance mechanisms through which biodiversity-related knowledge is integrated into strategic decision-making and innovation processes, including the role of partnerships, data infrastructures, and cross-sector collaboration.

Overall, this study suggests that integrating biodiversity into corporate strategy requires a shift from treating it as an external constraint to recognizing it as a biophysical condition that shapes firms' strategic choices, dependencies, and opportunities. The MCRV framework provides a structured account of how this shift can be operationalized through the development and alignment of sensing, seizing, and transforming processes across *Monitoring*, *Conserving*, *Restoring*, and *Valorizing* activities. By articulating how biodiversity-related practices can be organized as part of a coherent strategic logic, the framework contributes to a more grounded understanding of how firms can engage with ecological complexity in ways that support both organizational adaptation and long-term value creation.

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Endnote

[1] https://www.cbd.int/gbf/targets/15.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Appendix S1:** Data on the selected experts for the interviews.