# Corporate governance and environmental innovation: an interdisciplinary literature review with bibliometric analysis

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**ABSTRACT**

In this review, we interrogate the unexplored nexus between corporate governance and environmental innovation. Based on our systematic literature review, coupled with a bibliometric analysis of 232 scholarly articles, we propose an integrative framework which explains the mechanisms that influence environmental innovation. The advanced framework centers on and connects the junctions of ownership and environmental policy with corporate governance, corporate social responsibility, and sustainability, which generate outcomes relevant to business strategy, capabilities, resources, and, ultimately, environmental innovation. We uncover future research directions at the strategic actor level and for research on outcomes from corporate governance. Our suggestions for further inquiries in the field are structured by strategic actor type and specific outcome. The review cross-fertilizes management theories, including institutional theory, stakeholder theory, resource-based view, and



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agency theory, with innovation theories, and also provides methodological recommendations for conducting research on the intersection of corporate governance and environmental innovation. Finally, we contribute to emerging research on the purpose-driven firm by theorizing how corporate governance practices could lead to environmental innovation in conjunction with for-profit optimization. Methodologically, we advance knowledge on how to conduct an interdisciplinary systematic literature review and connect distinct fields of inquiry via bibliometric analysis and clustering.

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**Keywords** Corporate governance, Environmental innovation, Sustainability, Systematic literature review, Bibliometric analysis

**Paper type** Research paper

# 1. Introduction

There is an emergent debate about the general purpose of the firm (Mayer, 2021) and, more specifically, about how organizations should play their part in addressing climate change, not merely as a consequence of their operating activities (e.g., reducing plastic, recycling) but as powerful actors in the globalizing world (The Economist, 2019). Firms are increasingly expected to play their part in environmental protection through environmental innovation and sustainable strategies. These expectations are often voiced by various stakeholders, including empowered shareholders, who use their influence to drive organizational efforts in the adoption of integrated reporting practices that would consider environmental imperatives (Dhifi and Lajnef, 2024). Consequently, more and more corporations make explicit environmental commitments within their Environmental, Social and Governance (ESG) frameworks that align more closely with sustainability benchmarks on a global scale (Alawadi *et al.*, 2024; Kenneth David *et al.*, 2024).

In this review, we examine *environmental innovation* (also referred to as eco-innovation), which is broadly defined as innovation consisting of "new or modified processes, techniques, systems and products to avoid or reduce environmental damage" (Horbach, 2008; Wang *et al.*, 2021). We aim to answer the following *research questions*:

*RQ1*. What are the emerging themes in the literature at the intersection between corporate governance, corporate strategies, firm-level sustainable environmental practices, and innovation?

*RQ2*. Which strategic actors are the most vital for environmental innovation?

*RQ2*. How can actor-centric theories, particularly those used in the corporate governance literature, be cross-fertilized by innovation theories?

We center our review on *strategic actors* or *upper echelons*, that is key actors who decide, implement, and monitor strategies facilitating environmental innovation. Strategic actors are broadly defined as strategic leaders, top management teams, executives, shareholders, owners, investors, founders, or entrepreneurs in line with existing literature (Hambrick and Mason, 1984). Their actions are orchestrated under the auspices of corporate governance.

Our initial scoping of the extant systematic reviews within the broad knowledge domains of corporate governance, sustainability, and innovation revealed that there are few studies at this intersection, thus leaving an important knowledge gap that our study seeks to address (Figure A1 and Table A1 in Appendix 1 provide further details of reviews within these domains). With our review, we capture the interdisciplinary aspect of this topic. On the one hand, we want to understand the phenomenon of environmental innovation, hence our inclusion of studies in journals that focus exclusively on green and sustainable sciences. On the other hand, we review the burgeoning literature on strategic actors, the role they play in strategy formulation and strategic delivery around environmental innovation, so that we can gauge how the studies on strategic management and corporate governance can be cross-fertilized with the studies on environmental innovation.

Our review is organized as follows. Section 2 elaborates on the methodology, which combines a systematic literature review with bibliometric analysis. Section 3 proposes an integrative framework that emerges from our data and content analysis, and which is complemented by elements identified as missing from the extant literature. The integrative framework is discussed by reference to six dominant clusters identified in the literature; we then break these clusters down by type of strategic actor. Section 4 proposes avenues for future research on strategic actors (at the level of owners, boards of directors, and managers) and its outcomes, before offering recommendations for extending theories and making methodological advancements. Section 5 concludes our review.

## 2. Methodology

We adopted a systematic approach to past literature (Bodolica and Spraggon, 2009a) using content analysis to better understand the current conceptualization of the interrelationship between corporate governance and environmental innovation. Content analysis is a technique that allows to uncover the argument of studies notwithstanding the methodology they use. Thus, we were able to review theoretical, qualitative, and quantitative studies (Gaur and Kumar, 2018). We did not perform a meta-analysis because this method is restricted to quantitative research (Geyskens *et al.*, 2009). This is a serious limitation, especially for the emerging fields, where qualitative and conceptual studies abound due to lack of empirical data; and even if quantitative studies exist, explanatory variables are not operationalized in a standardized way as to allow meta-analytic tools to compare the significance of explanatory variables across studies.

We complemented our systematic literature review with bibliometric analysis to visualize and group the selected literature into clusters. While the systematic approach allows us to depart from the whole body of literature on the topic of interest, and only narrow it down to a relevant amount of studies to review in sequential steps (Aguinis *et al.*, 2023; Simsek *et al.*, 2023), the bibliometric analysis helps to group the studies by clusters and to extract the emergent themes from the body of literature which were not previously revealed by the keyword strategy (Ben Jaafar and Bodolica, 2024). This is particularly relevant for the analysis of a field characterized by interdisciplinarity (Battikh *et al.*, 2022) and helps us to make connections and cross-fertilization of theories and methods coming from different perspectives. Our literature review is

positioned at the intersection of two closely interrelated strategic disciplines, namely corporate governance and environmental innovation. One of the major contributions of our research design, because it integrates studies from different fields and journals, is to allow us to explain how different fields research this topic.

### *2.1 Defining the search terms*

We sought to interrogate the intersection between strategic governance, innovation, and firm-level sustainable environmental strategies. To extract papers for the study, we designed a 4-tier search string to include strategic actor-centered corporate governance terms at the first tier, innovation-related terms at the second tier, environmental practices-related terms at the third tier (this would include terms such as environmental performance or sustainable strategies, to increase the number of studies captured by the search), and targeted journals at the fourth tier. Worth noting is that by including keywords such as "*owner*", we automatically capture studies with combinatory terms such as state, family, VC, institutional, block or minority *owner*(s). Similarly, including strings, such as *environment** and *innovat**, automatically comprises studies that deal with financial reporting of environmental innovation.

We drew inspiration from previous reviews (Adams *et al.*, 2016; Aguilera *et al.*, 2021; Kurzhals *et al.*, 2020) to populate the first three tiers. The fourth tier was formed by selecting specific journals. In particular, the key innovation and broader management journals were identified, most of which are featured on the *Association of Business Schools (ABS)* list and are ranked as 3 and above in line with the existing guidance on systematic literature reviews (Denyer and Tranfield, 2009; Gaur and Kumar, 2018). However, mindful of the uniqueness of our study, in that no previous work has sought to bring together the three separate fields in one review, we broadened the search criteria to specifically include key environment-related journals guided by Scopus (cf. Table A2 for the list of journals).

### *2.2 Extracting articles' sample*

As commonly suggested in methods articles on how to conduct systematic literature reviews (Bodolica and Spraggon, 2018), we performed a "title, abstract, keywords" search of the Scopus database for publications by entering the keyword strings suggested above. The targeted journals were downloaded and stored (please see Table A2 in Appendix 2 for full details of the search strings). With a large collection of regularly updated scholarly works, Scopus is now accepted as one of, if not the most,

comprehensive databases from which to extract published research work (Rew, 2010). The search in Scopus returned a total of 2,118 resources. By further limiting the search to articles and reviews written in English, the sample was reduced to 1,692. The sample was further streamlined by filtering the results based on the area of specialization (i.e., Business, Management, and Accounting and Finance), which further reduced the sample to 721.

In the next step, each of the authors independently reviewed all the titles and abstracts to ensure that the papers met our inclusion criteria. From this, we selected the papers that focused on environmental innovation in business, firms, management, and organizations; this produced a final sample of 232 papers which served as the literature sample for further analysis. A CSV file, populated with key information on each article in the sample, such as author/affiliation details, title of the paper, abstracts, and keywords, was prepared and used as the main source of data.

### *2.3 Data analysis*

Our data analysis was comprised of two parts. We conducted initial data analysis, namely "keywords co-occurrence analysis" and "content analysis" (which is explained in Section 3).

*2.3.1 Initial data analysis.* Figure 1 illustrates the trend in publishing from 1979 to 2020, suggesting that research into the intersection of strategic governance,

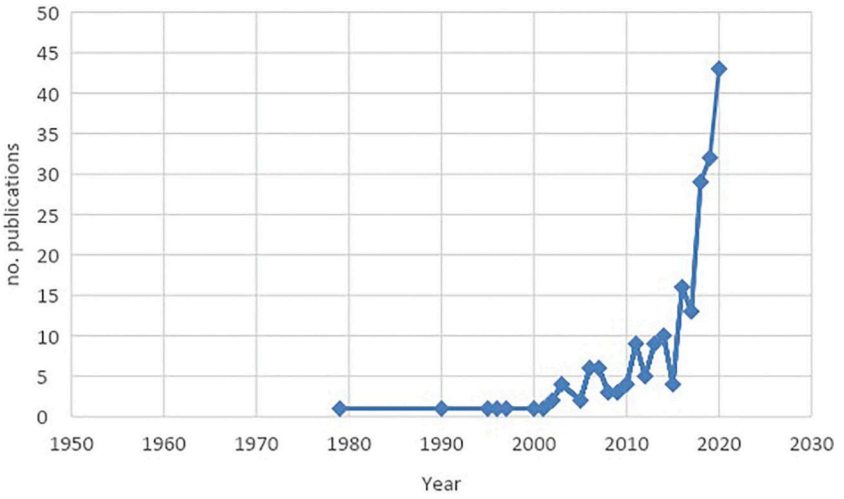


**Figure 1.** Publication trend

innovation, and sustainability is a recent phenomenon with plenty of scope for exploration. Development of this literature proceeded at a slow pace during its early evolution. However, recent years have been productive, with the number of published articles peaking at 43 in 2020. Our analysis of the scholarly outlets reveals that 34 journals are responsible for those 232 publications. Table 1 shows the top contributing journals, which include the *Journal of Cleaner Production* ($n = 85$), *Technological Forecasting and Social Change* ($n = 31$), *Business Strategy and the Environment* ($n = 26$), and *Research Policy* ($n = 14$). This tends to suggest that the conversation in this field of study is taking place in the arenas of innovation and sustainability rather than through a corporate governance lens, as can be observed by the sample's lack of significant representation of what might be described as mainstream management journals.

*2.3.2 Keywords co-occurrence analysis and research clusters identification.* The next stage of the analysis involved a keyword co-occurrence analysis to determine the main literature clusters in the sample of 232 articles. Keywords are important in that they can provide an overarching view of the key concepts in a paper (Rajagopal *et al.*, 2017). Co-occurrence analysis is premised on the assumption that a group of keywords may provide insight into the main themes in a literature and, as such, their co-occurrences could illuminate their relationship with those themes (Hu and Zhang, 2015). If two keywords are cited together in an article, then it can be construed that they have a semantic relationship. Studies have used co-occurrence analysis to reveal key literature trends in different research domains, such as sustainable enterprises and sustainable organizations (Lis, 2018).

The software tool VOSviewer (Van Eck and Waltman, 2013) was employed to generate the keywords and perform the network mapping of keyword co-occurrence to identify research clusters. In VOS, network analysis is achieved by employing a unified framework that brings together a multidimensional scaling technique (Van Eck and Waltman, 2010) for mapping with a variant of modularity-based clustering (Newman and Girvan, 2004). This makes it possible to identify small clusters when a sufficiently large value for the resolution parameter is chosen (Waltman *et al.*, 2010).

Application of the VOS clustering technique to the sample of 232 articles initially extracted 858 keywords with a citation count of at least one. Constraining the frequency of occurrence to 2 produced an 84-node co-occurrence network that represented 6 research clusters. The sizes of the clusters are as follows: cluster 1 ($n = 18$), cluster 2 ($n = 17$), cluster 3 ($n = 15$), cluster 4 ($n = 13$), cluster 5 ($n = 12$), and cluster 6 ($n = 9$), where n is the number of co-occurring keywords. The significance of

**Table 1.** Publication sources

| Journal | Impact factor 2021-2022 | No. of publications |
|---|---|---|
| *Journal of Cleaner Production* | 9.297 | 85 |
| *Technological Forecasting and Social Change* | 8.593 | 31 |
| *Business Strategy and the Environment* | 10.302 | 26 |
| *Research Policy* | 8.110 | 14 |
| *Strategic Management Journal* | 9.651 | 8 |
| *Academy of Strategic Management Journal* | 1.032 | 6 |
| *Corporate Social Responsibility and Environmental Management* | 4.542 | 6 |
| *Corporate Governance: An International Review* | 2.910 | 5 |
| *International Journal of Innovation and Sustainable Development* | 0.605 | 5 |
| *Journal of Business Venturing* | 11.720 | 4 |
| *Management Science* | 4.883 | 4 |
| *Journal of Management Studies* | 6.840 | 3 |
| *Journal of Product Innovation Management* | 6.070 | 3 |
| *Leadership Quarterly* | 10.517 | 3 |
| *Academy of Management Journal* | 10.194 | 2 |
| *Accounting Review* | 4.301 | 2 |
| *British Journal of Management* | 6.567 | 2 |
| *Entrepreneurship: Theory and Practice* | 10.075 | 2 |
| *Human Resource Management* | 5.078 | 2 |
| *Journal of Cultural Heritage Management and Sustainable Development* | 1.110 | 2 |
| *Journal of Management* | 11.790 | 2 |
| *Journal of Sustainable Tourism* | 7.968 | 2 |
| *Organization and Environment* | 6.116 | 2 |
| *World Journal of Entrepreneurship, Management and Sustainable Development* | 0.687 | 2 |
| *Academy of Management Perspectives* | 7.846 | 1 |

(*continued*)

**Table 1.** Continued

| Journal | Impact factor 2021-2022 | No. of publications |
|---|---|---|
| *Asian Academy of Management Journal* | 1.074 | 1 |
| *Contemporary Accounting Research* | 2.026 | 1 |
| *Journal of Accounting and Economics* | 3.753 | 1 |
| *Journal of Finance* | 6.201 | 1 |
| *Journal of Financial Economics* | 6.988 | 1 |
| *Journal of International Business Studies* | 11.382 | 1 |
| *Organization Science* | 5.000 | 1 |
| *World Review of Entrepreneurship, Management and Sustainable Development* | 0.690 | 1 |
| *Grand Total* | | 232 |

a keyword can be assessed by its frequency count or total link strength (TLS) in VOS. In a keyword co-occurrence network, the TLS metric is an indication of how well a given keyword is connected to another keyword (van Eck and Waltman, 2020). Thus, the more important and influential keywords tend to have a higher TLS. The top keywords for each cluster on the basis of TLS are shown in Table 2, and the labelling of each of the clusters was informed by these influential keywords. Figure 2 represents the keyword co-occurrence networks of clusters 1, 2, 3, 4, 5, and 6, respectively. The node sizes are relative to their weights as measured in TLS; a larger node indicates higher TLS of a keyword. Lines between keywords represent links, and the keywords that are the most influential on a network are denoted with thicker edges, reflecting the most important research area of that cluster.

The VOS clustering technique allows us to reveal the main themes in the literature and the relationships among these themes. Some clusters may emerge due to growing academic interest in particular subfields. New regulations and laws, such as the European Union Corporate Sustainability Reporting Directive, may also be contributing to clusters of research related to environmental policy.

In particular, we observe six clusters or themes of studies which are depicted in different colors and are numbered 1 to 6. Some of these clusters are more related to each other than others, which is illustrated by their proximity to each other in Figure 2. For instance, clusters 1 and 3 are closely related, which means they have more

**Table 2.** Clusters of high-frequency words

| Cluster 1 (17 items) | F | LS | Cluster 2 (14 items) | F | LS | Cluster 3 (13 items) | F | LS | Cluster 4 (11 items) | F | LS | Cluster 5 (12 items) | F | LS | Cluster 6 (9 items) | F | LS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Business model innovation for sustainability | | | Environmental innovation technologies | | | Sustainable innovation capabilities in different contexts | | | Corporate governance, CSR and firm performance | | | Corporate su stainability | | | Environmental policy | | |
| Business model | 6 | 8 | Cleaner production | 3 | 3 | Biomass | 2 | 2 | Barriers | 2 | 3 | Academic entrepreneurship | 3 | 2 | Big data | 2 | 8 |
| *Business model innovation* | 5 | 7 | Electric vehicles | 2 | 2 | *Capabilities* | 3 | 6 | *Corporate governance* | 8 | 16 | *Bottom of the pyramid* | 2 | 4 | *Business strategy* | 2 | 8 |
| Environment | 3 | 6 | Environmental innovations | 6 | 5 | *Circular economy* | 6 | 10 | Corporate social responsibility | 10 | 20 | Clean technology | 2 | 6 | Emerging technology | 2 | 1 |
| Environmental entrepreneur | 5 | 12 | *Environmental strategy* | 3 | 6 | Climate change | 2 | 4 | Crowdfunding | 3 | 6 | Corporate sustainability | 3 | 5 | Environmental dynamism | 2 | 6 |
| *Exploration* | 2 | 4 | Environmental technology | 2 | 5 | *Corporate strategy* | 2 | 4 | Drivers | 3 | 3 | Development | 2 | 5 | Environmental policy | 4 | 13 |
| Family firms | 2 | 2 | Green innovation | 7 | 7 | Eco-design | 2 | 6 | Environmental management | 4 | 13 | Diffusion | 2 | 1 | Environmental sustainability | 2 | 5 |
| Innovation | 19 | 29 | Green technology | 2 | 3 | Eco-innovation | 5 | 6 | Firm innovation | 2 | 2 | Inclusive innovation | 2 | 5 | *Organizational learning* | 2 | 2 |
| *Institutional Logic* | 2 | 4 | *Institutional theory* | 3 | 6 | Economic crisis | 2 | 2 | Firm performance | 3 | 6 | *Shared value* | 2 | 5 | *Stakeholder engagement* | 3 | 8 |
| *Leadership* | 2 | 1 | Renewal energy | 3 | 5 | Entrepreneurship | 11 | 22 | Firm value | 3 | 3 | *Social capital* | 2 | 4 | Sustainable development | 13 | 31 |
| New product development | 2 | 2 | *Resource-based view* | 2 | 4 | Geographic distance | 2 | 2 | *Ownership concentration* | 2 | 2 | Start-ups | 2 | 5 | | | |
| Process | 2 | 2 | Socially responsible investment | 2 | 3 | R&D | 2 | 2 | Social entrepreneurship | 3 | 7 | Sustainable development goals | 3 | 5 | | | |
| *Stakeholders* | 3 | 4 | *Stakeholder theory* | 2 | 1 | SMEs | 3 | 7 | | | | Technology transfer | 2 | 6 | | | |

(*continued*)

**Table 2.** Continued

| Cluster 1 (17 items) | F | LS | Cluster 2 (14 items) | F | LS | Cluster 3 (13 items) | F | LS | Cluster 4 (11 items) | F | LS | Cluster 5 (12 items) | F | LS | Cluster 6 (9 items) | F | LS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sustainability | 25 | 32 | *Sustainable strategy* | 2 | 2 | Sustainable innovations | 4 | 4 | | | | | | | | | |
| Sustainability transition | 2 | 6 | Sustainable technology | 3 | 3 | | | | | | | | | | | | |
| Sustainable entrepreneur | 8 | 22 | | | | | | | | | | | | | | | |
| Technology | 3 | 8 | | | | | | | | | | | | | | | |
| Value creation | 3 | 4 | | | | | | | | | | | | | | | |

**Note(s):** Six clusters based on co-occurrences of words, listing frequencies (F) and link strength (LS). The link strength indicates the influence of a term with respect to the number of links it has with other terms, we use these metrics to justify the labelling of the clusters. Key terms with a higher link strength and/or frequency are indicated in color. Theoretical constructs are indicated in italic font. Corporate governance and strategy terms appear in italic font

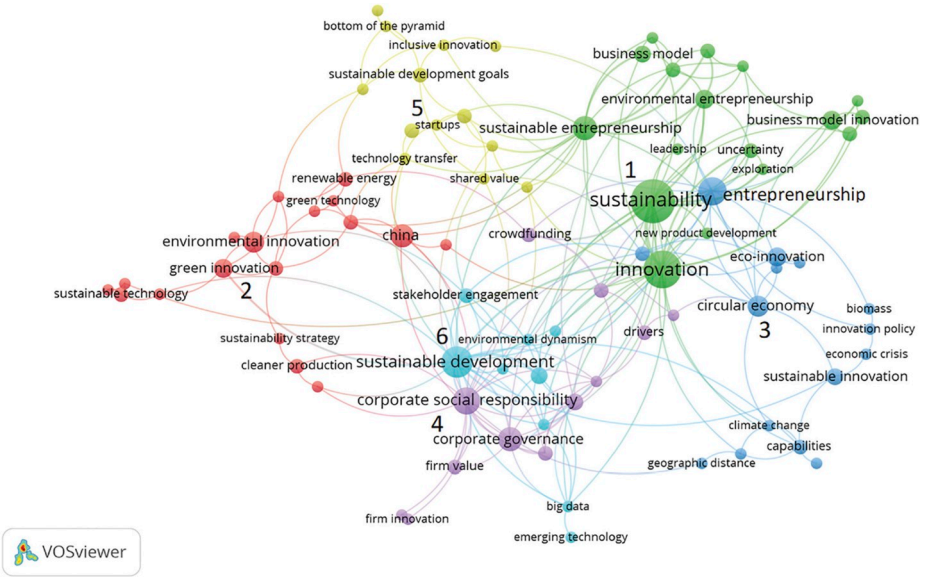


**Figure 2.** Keyword co-occurrence network

**Note(s):** The keywords occur at least 2 times. The distance between two items in the visualization approximately indicates the relatedness of the items in terms of co-citation links. In general, the closer two items are located to each other, the stronger their relatedness. The strongest co-citation links between items are also represented by lines

co-occurring terms, but cluster 2 is less related to cluster 1, as the distance between the clusters is longer. In Table 2, we take the analysis further by labelling each of the clusters (cluster 1: "*Business model innovation for sustainability*"; cluster 2: "*Environmental innovation technologies*"; cluster 3: "*Sustainable innovation capabilities in different contexts*"; cluster 4: "*Corporate governance, corporate social responsibility (CSR), and firm performance*"; cluster 5: "*Corporate sustainability*", and cluster 6: "*Environmental policy*") and listing 9-13 most co-occurring keywords in the studies of each cluster (the labels of these clusters are themselves informed by the most co-occurring keywords). Strategic governance-related concepts frequently appear in each cluster (highlighted in italic font in Table 2), confirming that we have captured the studies that have sufficient focus on these fields. While some concepts correspond to the keywords entered *ex ante* (e.g., ownership concentration), others emerge from the search strategy *ex post*, such as exploration, corporate strategy, business strategy, bottom of the pyramid, shared value, etc. It is worth recognizing, however, that the software relies on keyword selection, which may reflect dominant discourse trends rather than an exhaustive representation of the field.

While the six research clusters identified through the VOS clustering technique provide a structured overview of the literature, it is important to examine the potential overlaps and gaps between them. The interconnected nature of sustainability themes means that some clusters share conceptual ground. For instance, cluster 1 ("Business model innovation for sustainability") and cluster 3 ("Sustainable innovation capabilities in different contexts") both emphasize innovation-driven approaches to sustainability, with shared keywords such as "innovation" (frequency = 19, strength = 29) and "eco-innovation" (frequency = 5, strength = 6). This suggests a strong conceptual linkage between sustainable entrepreneurship and innovation capabilities across different settings. Similarly, cluster 4 ("Corporate governance, CSR, and firm performance") and cluster 5 ("Corporate sustainability") exhibit some overlap, as both include governance-related keywords such as "corporate social responsibility" (frequency = 10, strength = 20), "corporate sustainability" (frequency = 3, strength = 5) or "value" (as in firm value or shared value). These overlaps highlight the necessity of cross-disciplinary perspectives when analyzing environmental innovation at the firm level.

Regulatory frameworks such as the EU Corporate Sustainability Reporting Directive (European Commission, 2024) and the US Task Force on Climate-related Financial Disclosures (Financial Stability Board, 2017) have reinforced the need for governance research on sustainability performance, transparency, and corporate accountability. The increasing integration of sustainability reporting requirements into global financial markets has further fueled scholarly interest in the intersection of governance and CSR. Specifically, Harjoto and Jo (2011) argue that firms with stronger governance mechanisms are more likely to adopt meaningful CSR initiatives. Eccles *et al.* (2014) demonstrate that sustainability-focused firms outperform their peers in financial markets, reinforcing investor-driven demand for ESG disclosures. Matten and Moon (2008) discuss institutional differences in CSR adoption, emphasizing how global financial markets shape governance practices through sustainability requirements. In this vein, Zaman *et al.* (2022) adopt a national business systems approach to map how research on corporate governance and CSR has evolved across different institutional settings. It systematically categorizes the relationship between corporate governance and CSR into two main strands: CSR as a function of corporate governance – examining how governance structures, such as board composition and ownership patterns, shape CSR strategies; and a reverse relationship – exploring how CSR initiatives influence governance practices, including transparency and stakeholder engagement. These studies provide

empirical evidence that governance structures and CSR are becoming increasingly intertwined due to regulatory pressures and investor expectations, as we observe from the overlap between the eponymous clusters.

Conversely, gaps between clusters highlight potential areas for further integration. Cluster 2 ("Environmental innovation technologies") appears somewhat isolated from cluster 5 ("Corporate sustainability") and cluster 6 ("Environmental policy"), despite the role of corporate sustainability and policy frameworks in shaping environmental innovation. While keywords such as "green innovation" (frequency = 7, strength = 7) and "environmental innovations" (frequency = 6, strength = 5) are central to cluster 2, their connection to broader governance and policy frameworks remains limited. Similarly, while cluster 6 ("Environmental policy") includes key governance-related terms such as "environmental policy" (frequency = 4, strength = 13) and ``stakeholder engagement'' (frequency = 3, strength = 8), it lacks strong connections to cluster 3 and cluster 5, suggesting a potential divergence between policy discourse and firm-level sustainability strategies. While policy-related research is critical in shaping regulatory landscapes, its limited connectivity to clusters focused on business and innovation suggests an opportunity for further integration of policy impacts into sustainability scholarship.

The clustering identified in this study reflects broader forces shaping sustainability-related research, including policy imperatives, funding trends, and shifts in academic priorities. For instance, the prominence of cluster 1 ("Business model innovation for sustainability") and cluster 3 ("Sustainable innovation capabilities in different contexts") aligns with global policy initiatives such as the European Green Deal and the United Nations' Sustainable Development Goals (SDGs), which emphasize innovation and entrepreneurship as key drivers of sustainability transitions. Specifically, initiatives under the European Green Deal, such as the European Union Green Deal Investment Plan (which aims at making the European Union the first climate-neutral area in the world by 2050) and Horizon Europe's Green Deal Call, provide funding and incentives for startups, small and medium enterprises (SMEs), and businesses developing sustainable technologies, circular economy solutions, and eco-innovations (European Commission, 2020). These targeted financial incentives have accelerated the academic focus on innovation-related themes, as evidenced by their strong representation in the clustering analysis.

# 3. An integrative framework on strategic governance and environmental innovation

Our systematic review and analysis of the content of past studies on corporate governance and environmental innovation revealed new insights into how strategic actors achieve sustainable goals through innovation. Our integrative framework is presented in Figure 3. The framework resulted not only from our review of the existing literature and bibliometric analysis but also from our identification of future research and conceptual framing of the mechanisms that impact environmental innovation and its outcomes. The framework is presented in four compounds. At the first level, *Ownership dimensions* are positioned as antecedents of *Corporate governance, CSR and corporate sustainability.* Ownership categories, which we observe from the literature, are family, state, entrepreneurs/VCs, managerial and institutional owners. The nature of ownership plays a crucial role in shaping the corporate, social, and sustainable practices of a company. *Environmental policy*, one of the clusters identified in the VOS co-occurrence analysis (cluster 6), also acts as an antecedent to these corporate practices. The governments have the ability to impose environmental rules and regulations on firms, which translates into the adoption of particular corporate, social and sustainable practices.

Ascending to the next level, *Corporate governance, corporate social responsibility and corporate sustainability*, represents two principal dimensions: *Corporate governance and corporate social responsibility* (corresponding to cluster 4) and *Corporate sustainability* (cluster 5). These corporate practices impact the next level, *Strategy, Capabilities and Resources*, which is segmented into three parts: *Business*

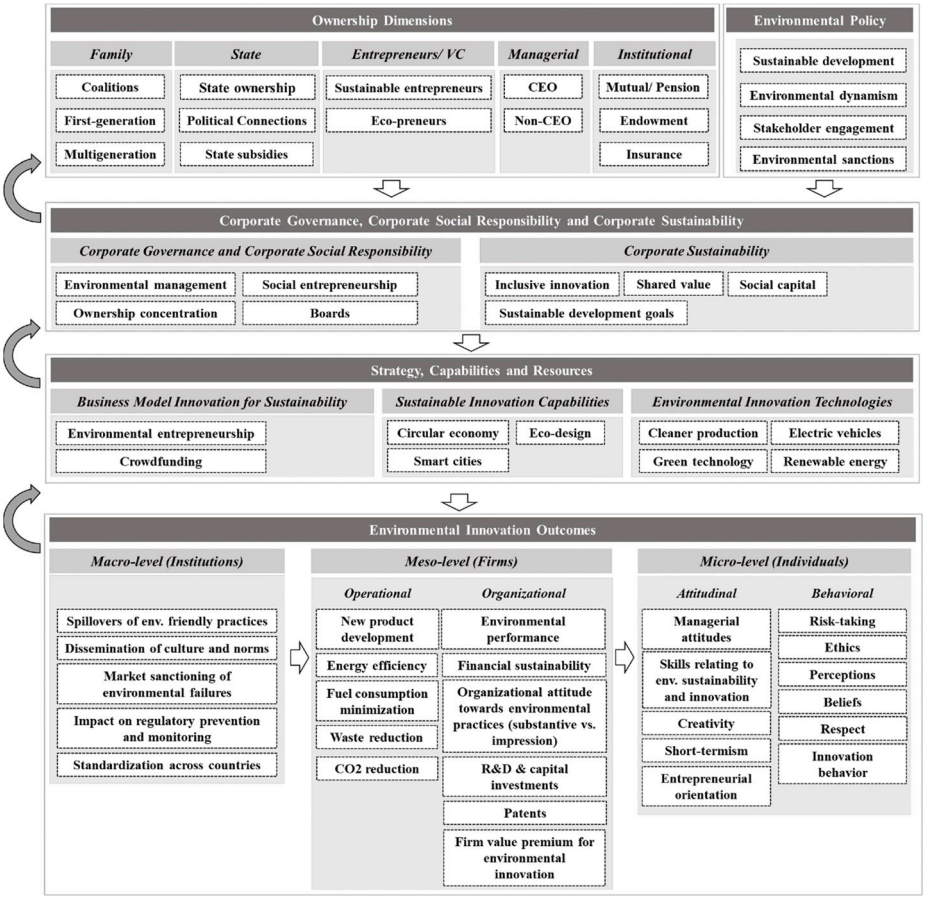


**Figure 3.** An integrative framework of environmental innovation

*model innovation for sustainability* (cluster 1), *Sustainable innovation capabilities* (cluster 3), and *Environmental innovation technologies* (cluster 2).

Most of the existing literature at the nexus of strategic governance and environmental innovation is positioned at the Strategy, Capabilities and Resources pillar (3 clusters of studies out of 6). Finally, we conceptualize the 'Outcomes of environmental innovation', across three hierarchical levels: *Macro-level (Institutions)*, *Meso-level (Firms)* and *Micro-level (Individuals)*. At the macro (institutional) level, environmental innovation can lead to significant structural, regulatory, and cultural changes, such as spillovers of environmentally friendly practices from one firm to others in the sector, dissemination of eco-friendly culture and norms, regulatory

prevention, standardization, and also sanctioning of environmental failures. At the meso (firm) level, environmental innovation has both operational benefits, such as energy efficiency and waste reduction, and organizational effects, such as enhanced environmental performance and research and development (R&D) investments. Finally, at the micro-level, environmental innovation influences individual attitudes and behaviors, fostering new competencies and altering perceptions and beliefs related to sustainability. Though the framework comprehensively outlines the interplay between various dimensions and their impacts, it is important to note that the listed dimensions and concepts are not exhaustive, signaling the scope for further exploration within each category.

In the next sections, we review the literature following the integrative framework, starting with the literature that focuses on key categories of strategic actors.

### *3.1 Analysis by type of strategic actor*

Since ownership dynamics and structures are crucial determinants of corporate governance, and because we also observe several studies on environmental innovation that differentiate or specifically focus on a particular owner, we further structure our review around the main categories of strategic ownership (Cuervo-Cazurra *et al.*, 2025).

*3.1.1 Venture capital and entrepreneurial firms.* Entrepreneurship is often considered as a solution to, rather than a cause of, environmental degradation (York and Venkataraman, 2013). In the current era of climate change, entrepreneurial firms are attempting to combine value creation with conservation and social protection (Crecente *et al.*, 2021). Studies have started to investigate the phenomenon of environmental entrepreneurship (sometimes referred to as "ecopreneurship"), which is defined as "the process of entrepreneurship applied in order to create businesses that solve environmental problems or operate sustainably" (Piwowar-Sulej *et al.*, 2021). It is important to highlight that, in much of the ecopreneurship literature, activities aimed at developing innovative solutions to environmental issues and those concerned with implementing sustainable business practices are often aggregated and treated as a homogeneous category. Most probably, this tendency is driven by the boundless affordances available to entrepreneurial ventures, even though their overall scale of impact may be constrained by the inherent limitations associated with their smallness.

Drawing on a qualitative analysis of 25 renewable energy companies, York *et al.* (2016) discuss how individuals in environmental entrepreneurship navigate between

commercial and ecological logics, impacting their venture goals and stakeholder interactions. This study adds depth to the understanding of hybrid organizing and entrepreneurship identity in the context of environmental goals. Depending on the coupling of their commercial and ecological identities, entrepreneurs may prioritize these goals differently and adopt distinct strategies for stakeholder engagement, ranging from inclusive to exclusive or co-created approaches.

Hörisch *et al.* (2017) examine the determinants of entrepreneurs' environmental orientation, providing insights into how personal and contextual factors shape the environmental focus of entrepreneurial activities. Their work contributes to a multilevel analysis of environmental entrepreneurship, which can inform venture capital strategies focused on environmental impacts.

Interestingly, most research on entrepreneurial firms relates to their business models (Artamoshina *et al.*, 2023) and how business model innovation can make them more sustainable. Sustainability entrepreneurs often rely on innovative approaches and novel business models to build a commercial logic for achieving social or environmental goals (Hahn *et al.*, 2018).

In terms of the constraints faced by entrepreneurial firms in developing sustainable innovations, research has been divided. Some studies have argued that policy actions may crowd out environmental innovation efforts (Hunt and Fund, 2016), while others have found that environmental policy facilitates innovation and investing in sustainable innovations is more favorable in regions with sustainability policies, such as California, certain European countries (Kahupi *et al.*, 2021), or "sustainable valleys" where the community becomes a driver for the green innovations of start-ups (Cohen, 2006). Access to capital for sustainable startups is another area of research focus. Despite their high investment risks, sustainable startups, such as cleantech, are increasingly attracting investors, such as corporate venture capital. SMEs are active corporate venture capital investors, while larger firms invest in sustainable startups to maintain competitive advantage through the process of "corporate greening" (Hegeman and Sørheim, 2021).

*3.1.2 Family firms.* In view of the prevalence of family-owned firms (Dupuis *et al.*, 2021) in different regulatory contexts (Bodolica *et al.*, 2015; Shirokova *et al.*, 2024) and the increasing importance of environmental sustainability, a few studies focus on the effect of family ownership on environmental innovation (Dangelico, 2017; Dangelico *et al.*, 2019) and family business motivations to engage in these activities (Bendell, 2022; Veiga, 2025). Bammens and Hünermund (2020) found that family ownership increases the value attached to firm reputation, which in turn engenders

higher levels of eco-innovation. This effect is strongest when family owners have transgenerational intentions, that is when the owners plan on passing their business down to the next generation. Xiang *et al.* (2019) used a sample of hi-tech Chinese firms to test whether family-owned firms display more efficient use of innovation resources than non-family firms. They found that family firms outperform the non-family firms in terms of sustainable innovation output; this could be more specifically verified by an analysis of environmental outputs.

Dangelico (2017) found that family ownership positively influences green product features, such as product differentiation, but does not affect the market performance of green products. When it comes to environmental innovation, family firms differ from non-family firms in three key areas: firm's motivations, most relevant pressures, and attitudes (Dangelico *et al.*, 2019). According to Veiga (2025), both firm-specific resources and market location factors serve as key drivers of environmental innovation in family businesses. The author reports that family firms that are larger in size, are technologically advanced, possess digital capabilities, and are located in well-developed regulatory environments are more likely to adopt sustainable practices and engage in green innovation. Moreover, it appears that competitors' influence outweigh government oversight as drivers of investment decisions in environmental innovation, as the probability of those decisions decreases if they could potentially damage family firms' reputation among peers in their industry of operation (Bendell, 2022).

*3.1.3 Government owners.* Research on state-affiliated organizations and state support in relation to environmental innovation generally focuses on evaluating government interventions, interference, and regulatory policies in relation to a particular industry or environmental innovation technology. Overall, this literature shows there is an intertwining of government roles (i.e., regulators, policy makers, monitors, and owners) when it comes to environmental innovation technologies and policies.

AlNuaimi and Khan (2019) investigated the relationships between the innovation capability of organizations and the implementation of green procurement in the public sector of the United Arab Emirates (UAE). They recommend that government officials and managers of state-owned enterprises must, in their design of green-procurement regulations and training programs, reexamine their own personal values and commitment to environmental causes. Lalor and Hickey (2014) also focused on policy makers and their knowledge and perception of environmental causes. The authors suggest that state-owned organizations could further enhance evidence-based policies on ecological issues by facilitating policies that better reflect the complexity of

environmental decision-making and a more decentralized and democratic approach to the generation of scientific knowledge.

Investigating the oil and gas industry in Russia, Thurner and Proskuryakova (2014) found that Chief Executive Officers (CEOs) are much better than government regulation at driving their companies' adoption of green innovation. The authors found that this industry's leading actors influence government regulation through their actions, which then promotes greener production by late followers. For industry leaders, green innovation originates either from international alliances or through in-house R&D investments. However, these conclusions must be interpreted with caution, as they risk oversimplifying a complex relationship whose outcomes cannot be generalized beyond the studied sample of the six most prominent companies in the Russian oil and gas sector between 2008 and 2010 (Thurner and Proskuryakova, 2014). The effectiveness of CEO-led initiatives versus government regulation depends on several context-specific factors, including product types, firm characteristics, industrial sectors, national jurisdictions, and temporal dynamics.

It is worth noting here that most of these papers focus on China. Furthermore, the Chinese government takes an active role in the economy, not only as a regulator but also as an economic agent via ownership, investments, and subsidies. Such studies generally claim that environmental benefits can be significantly improved through state investment in production and recycling efficiencies (Zhang *et al.*, 2020a). These research papers also prioritize the role of government interventions (Huang *et al.*, 2018; Lin and Luan, 2020), such as investment in energy-saving technology and government promotion of the production and use of alternative energy (Xu and Lin, 2016). Ji and Miao (2020) investigated the relationship between environmental CSR and collaborative innovation (measured by co-authored patents between organizations), and how this is mediated by direct and indirect government support in China. They found that indirect support amplifies the positive impact of environmental CSR on collaborative innovation. Indirect state support also reinforces the positive impact of corporate governance on collaborative innovation. Relatedly, research has also found that firms with political connections to the government promoted more green innovation (Huang *et al.*, 2021). This paradox, given how much is yet to be done in China in addressing the environmental challenges, requires further attention.

These findings align with the broader argument that research on green innovation and corporate governance must be contextualized within specific political and economic systems. There are variations, even between state-led economies, such as Russia and China. While China has heavily invested in a top-down approach,

mandating companies towards environmental innovation, in Russia, the government has been in favor of a bottom-up approach towards environmental innovation, letting companies decide what is right or wrong. Recognizing and integrating these contextual factors into research ensures more accurate analyses and the development of innovation strategies that are both effective and context-specific.

*3.1.4 Managers as owners.* Research on managers as owners has found that managerial ownership, in the absence of short-term compensation, fosters environmental innovation (Ortiz-de-Mandojana *et al.*, 2019), because share ownership forces managers' time horizons into alignment with the investment required for environmental technologies. Yue *et al.* (2025) report similar findings, even though salary also boosts environmental innovation but to a lesser extent than executive ownership. More research is warranted to test the boundary effect of managerial and employee equity-linked compensation, for instance in contexts where such compensation has been found to have conflicting effects on firm outcomes.

*3.1.5 Institutional investors.* Recent studies have highlighted the changing role of institutional investors on environmental innovation. For instance, in pollution-intensive sectors, institutional investors are associated with higher levels of environmental patents, boosting CSR information disclosure and facilitating monitoring activities of sustainable innovation (Xu *et al.*, 2023). García-Sánchez *et al.* (2020) considered the different categories of institutional investors according to their stock-holding orientation. They found that institutional investors positively influence eco-innovation, irrespective of whether their holding patterns are short-term or long-term oriented. This might be explained by the fact that institutional investors exert more pressure on firms to push for investments that will increase long-term firm value. It could also be expected that even short-term-oriented institutional investors nudge firms to invest in environmental innovation. This positive effect is accentuated by dispersed ownership. More broadly, institutional investors are more likely to target companies with superior corporate social performance (Wang and Chen, 2017). In the same vein, when the share of institutional ownership is small, organizations with weaker corporate governance structures produce fewer green patents relative to other types of innovations they generate (Amore and Bennedsen, 2016). However, a recent study demonstrates that environmental concerns continue to remain mostly localized, because only domestic institutional owners are committed to both environmental innovation and performance of multinationals, contrary to their foreign counterparts whose influence on environmental performance is significant only for firms with low international diversification levels (Ellimäki *et al.*, 2023).

Masini and Menichetti (2013) examined the non-financial determinants that influence the decision of institutional investors to invest in renewable energy. They found that the investors' understanding of the renewable energy plays a crucial role in investment decisions; in particular, the proven reliability of a technology is a prerequisite for investing in it. Another study examining the behavior of crowdfunding investors investing in European clean-tech projects showed that after considering country risk, the returns are not consistent with the risks associated with the technology used in the project, a finding that may generally hold with crowdfunded projects. Behavioral factors, such as bounded rationality and investor cultural aspects, can explain this risk misjudgment (Bento *et al.*, 2019).

Marti-Ballester (2019) examined the performance of global renewable energy funds by comparing risk-adjusted returns to the returns achieved by mutual funds and traditional energy funds. The author states that 37.04% of renewable energy funds perform well below the S&P Global 1200 benchmark; investors, therefore, apparently pay a premium to mutual funds that implement renewable energy standards.

We now review the studies in six thematic clusters as identified through VOS keyword co-occurrence analysis above (Figure 2 and Table 2), starting with the cluster of studies on *Environmental Policy* (cluster 6 in Figure 2 and Table 2, and also featuring in the top right part of our integrative framework in Figure 3.1).

### *3.2 Environmental policy*

The final cluster of studies is organized under the umbrella of environmental policy, and includes topics such as environmental dynamism, environmental policy, stakeholder engagement, and sustainable development.

One strand of studies adopts a macro-level perspective with an emphasis on external governance mechanisms to examine how regulatory processes and industrial policies affect organizational engagement in eco-innovation and corporate environmental reporting (Ford *et al.*, 2014; Huang *et al.*, 2021). Thus, Lai and Sohail (2022) found that environmental law and environmental policy stringency have a positive effect on green innovation in both the short and long run. The key question is whether the legislation acts as a restraining force that compels firms to pursue eco-friendly manufacturing and sustainability goals (Jabeen and Bodolica, 2023), or whether companies are inclined to go beyond compliance levels by adopting green strategies to secure their differentiation and competitiveness. While top-down enforcement induces organizations to meet regulatory demands, recent studies have

showed that eco-innovations materialize when firms develop competencies that draw on voluntary self-regulation to meet environmentalists' claims and consumer pressure (Demirel and Kesidou, 2019).

The effect of regulatory pressure is ambiguous and is dependent on the time horizon of the regulation. For instance, *Peuckert*'s (2014) study supports the "induced innovation" hypothesis, indicating that stringent environmental regulations can stimulate innovation within firms. This innovation, in turn, can offset compliance costs and potentially lead to competitive advantages. The presence of robust environmental quality institutions correlates with more favorable perceptions of the *long-term* competitiveness impacts of environmental regulations. This implies that well-established institutions can facilitate the implementation of regulations in a manner that supports business competitiveness. The study also finds that flexible regulatory designs, which allow firms multiple pathways to achieve compliance, are positively associated with enhanced long-term competitiveness. This suggests that when companies have the freedom to choose how to meet environmental standards, they can innovate more effectively, leading to improved performance. Further, Kim (2013) analyzes the complex relationship between regulatory environments and corporate investment decisions in green technologies. The study highlights that deregulation—intended to foster competition—can also have unintended consequences by reducing incumbents' incentives to invest in green technologies. Specifically, Kim (2013) shows that in a deregulated environment, firms prioritize cost efficiency and short-term financial performance, often at the expense of renewable energy investments.

Incumbents' responses to deregulation also depend on internal firm resources that take previous resource configurations into account. Nielsen *et al.* (2016) studied end-user-led sustainable innovation and the implications for policy, especially in terms of designing policies that focus on fostering and inducing innovation processes. Independent sustainable end-user innovation remains ++challenged by the fact that projects are often financed by the personal income of the innovator, who will therefore view the process as a personal project. Policy tools for supporting independent sustainable environmental initiatives include diverse education initiatives (e.g., the introduction of organic farming methods into the learning curriculum at agricultural institutions in the UK and the spread, facilitated by working groups and courses, of solar collectors in Austria), supportive intermediaries (national organizations such as Communities and Climate Action, or international networks such as Ashoka), microloans and alternative finance (e.g., coordinated or bulk purchases, crowdfunding), and data

access and co-location. The need for more flexible funding to support sustainable end-user innovation has been acknowledged (Nielsen *et al.*, 2016). Policy makers could also encourage companies to make available sustainability-oriented toolboxes to help consumers innovate.

Lalor and Hickey (2014) found that governments could further strengthen a culture of policy-relevant research and evidence-based policy on environmental issues by promoting a more decentralized and democratic approach to policy and to the generation of scientific knowledge. They identified a clear link between a country's commitment to climate change expenditure (measured as amount per head of population) and that country's improved environmental innovation. Further, Crecente *et al.* (2021) assert that the European Union needs to establish a single voice on climate change among its members to encourage a new and different sustainable entrepreneurship.

### *3.3 Corporate governance, CSR, and corporate sustainability*

We now review the clusters of studies on corporate governance, CSR and corporate sustainability (cluster 4 and 5 in Figure 2 and Table 2, and also featuring in our integrative framework in Figure 3).

Studies in this cluster are focused on the intersection between corporate governance, CSR, and environmental innovation, and their effects on firm performance [1]. He *et al.* (2021) found that the academic expertise of senior management had a positive impact on environmental innovation. In addition, it was found that the technical background, international experience, and political ties of executives greatly enhance the positive impact of their academic experience on environmental innovation.

Integrating CSR standards into executive compensation leads to long-term direction, improved corporate value, improved social and ecological initiatives, and reduced emissions. And, most importantly, it leads to an increase in environmental innovation because executive compensation linked to CSR standards is likely to nudge managers towards the long-term focus that is essential to innovation (Flammer *et al.*, 2019). Conversely, companies are more likely to commit environmental fraud if senior management is substantially rewarded by the short-termist variable components that can induce riskier behavior (Li *et al.*, 2018).

Another literature strand is positioned at the level of corporate leadership to assess the impact of board and top management team (TMT) characteristics on firms'

eco-innovation. A bulk of the literature explores the relationship between board attributes (e.g., gender diversity, independence, specialization) and environmental innovation (de Abreu *et al.*, 2023; García-Sánchez *et al.*, 2021, 2023). It is argued that more diverse boards are more likely to be considerate of different stakeholders' demands and ensure that their voices are heard (Nadeem *et al.*, 2020). For instance, board gender diversity reduces the level of corporate carbon emissions, a relationship which is amplified by environmental innovation (Konadu *et al.*, 2022). In the context of Chinese manufacturing firms, a larger female representation on the board of directors plays a pivotal role in green product innovation (He and Jiang, 2019). Board members who evince stronger communal, social, and ethical values are more likely to engage in strategic processes aimed at enhancing green management practices and eco-innovation.

Amid the intensifying global challenges posed by climate change and the growing scrutiny of sustainability practices in modern corporations, scholarly interest in identifying optimal governance structures that promote environmental innovation remains strong and continues to expand. For instance, using a global sample of non-financial companies, Meqbel *et al.* (2025) recently find that the presence, size, and independence of CSR committee exert a significantly positive effect on environmental innovation. In the same vein, Ashraf *et al.* (2025) report that board gender diversity is positively associated with environmental innovation, while the CSR committee partially mediates this relationship in European non-financial firms. It is worth noting, however, that the causality between a given phenomenon (e.g., board of directors' membership structure), and environmental innovation warrants deeper investigation and a more fine-grained understanding. Indeed, the composition of the corporate board may be driven by other determinants, such as strategic business priorities, institutional norms, cultural patterns, and sectoral requirements, that necessitate a diverse board of directors' structural design, potentially fostering environmental sensitivities.

The environmentally-responsible leadership of the CEO and TMT, their personality characteristics such as hubris (Arena *et al.*, 2018), and the academic experience and political connections of senior management (He *et al.*, 2020) as well as their military background (Chen *et al.*, 2021), are also likely to induce pro-environmental behavior and superior green performance of the firm. For instance, CEO's tenure is one such strategic leadership feature that both mediates and moderates the relationship between environmental responsibility and innovation legitimacy of a publicly listed organization (Xu *et al.*, 2022).

There is a phalanx of other, more contextual, studies positioned at the intersection of strategic governance and eco-innovation or corporate environmentalism. Among the most explored contexts are organization types (publicly listed firms versus SMEs); developed economies versus emerging markets (most commonly China); industrial sectors, such as environmentally sensitive industries, agri-food businesses, and technology-based firms; and various ownership structures, such as state/government investors (Pan *et al.*, 2020), family-owned enterprises (Bammens and Hünermund, 2020), sole-proprietorship in start-ups, and (social) entrepreneurial ventures.

### *3.4 Strategy, capabilities, and resources*

Finally, we focus on the cluster of studies on strategy, capabilities and resources (clusters 1, 2, 3 and 5 in Figure 2 and Table 2, and also featuring in our integrative framework in Figure 3).

*3.4.1 Corporate sustainability.* The cluster of studies on corporate sustainability deals with a way of doing business that generates profit, while avoiding harm to people and the planet (Gabler *et al.*, 2017). Gabler *et al.* (2017) suggest that in order to pursue a corporate sustainability plan, the organization must:

- adopt a company-wide philosophy of environmental sustainability;
- develop a specific strategy that conforms to this philosophy; and
- operationalize, execute, and measure the performance of these strategies.

Similarly, Kiesnere and Baumgartner (2019) state that companies must have top management support and an open organizational culture in relation to sustainable development in order to integrate sustainability at operational, strategic, and normative management levels.

Recent studies have focused on the effect of the United Nations' Sustainable Development Goals (SDGs) on corporate strategies. Van der Waal and Thijssens (2020) found that firm-wide participation in the SDGs is still limited and is primarily associated with other sustainability-related issues, East Asian country settings, firm size, or level of corporate sustainability. In addition, the lack of SDG disclosures implies that investors cannot properly rely on sustainability reports for their investment choices.

Various tools have been applied to allow companies to better plan and implement their sustainability efforts, such as life cycle assessment (Manda *et al.*, 2016).

However, this is an unexplored area in which the development of accounting tools has only just begun (Van der Waal and Thijssens, 2020).

*3.4.2 Business model innovation for sustainability.* These studies investigate sustainability through the lens of business model innovation. They primarily deal with environmental entrepreneurship or sustainable entrepreneurship, and how these entrepreneurs innovate towards sustainability through an entrepreneurial process that identifies, assesses, and exploits economic opportunities (Cohen and Winn, 2007; Schaltegger *et al.*, 2016b). While environmental entrepreneurship is concerned with the pursuit of economic and environmental objectives, sustainable entrepreneurship follows a 'triple bottom line' with the additional emphasis on social objectives (Terán-Yépez and Marín-Carrillo, 2020). Sustainable entrepreneurs – whose entrepreneurial actions are focused on the simultaneous pursuit of economic, environmental, and social goals (Carle and Rayna, 2025) – often start with small projects within a large organization or with a niche that serves as a learning environment. Business models refer to the organizational structure or the design of how organizations generate and capture value (Amit and Zott, 2001; Artamoshina *et al.*, 2025; Teece, 2010). Business model innovation focuses on the changes and innovation in business model elements (Chesbrough, 2010; Veksler *et al.*, 2024).

Business model innovation can be useful for understanding the structures, strategies, and practices that promote sustainable innovation (Massa and Tucci, 2013), as well as the tensions that arise in organizations as they strive to reconcile their economic objectives with those grounded in social and environmental concerns. Sustainable innovation may be incremental, such as launching new technologies and strengthening technological operations. Sustainable innovation may also be radical, whether this is in thinking, design, technologies, or the development of new business models. The business model for sustainability is defined as "supporting voluntary, or mainly voluntary, activities which solve or moderate social and/or environmental problems" (Schaltegger *et al.*, 2012). The central logic is that sustainable innovations are orthogonal to the predominant rationale of an existing business model; to further refine its sustainability output, the organization has to change its business model to such an extent that ecological and social objectives are embedded into the main business logic.

Earlier literature analyzed business models from a sustainability perspective by regarding the model as a tool for maintaining sustainable innovation; for instance, the analysis of sharing transport business models (Schaltegger *et al.*, 2016a). What distinguishes business models for sustainability from the traditional business models is

the extension of value generation towards social and ecological values, and of the business infrastructure towards sustainable supply chain management. This connects with the corporate governance literature that is grounded in stakeholder theory because a business model innovation for sustainability leads to new approaches for partnerships with stakeholders, and to new firm capabilities related to ecological, financial, and social objectives (Calabrese *et al.*, 2018a). This set of literature is rich with novel theoretical framing, offering frameworks to explicate organizational learning and adaptation, and applying theoretical constructs such as system dynamics or evolutionary economics to the interdependencies between firm business models and their external environments (Schaltegger *et al.*, 2016b).

To gain a better understanding of sustainable innovation by examining it through the perspective of business model innovation for sustainability, Stubbs (2019) studied a BCorp model. She found that while ownership and governance arrangements formally balance the economic and social imperatives, they may also be the firm's main source of difficulty due to a disparity and collision in values between individuals who care about social objectives and those who care about financial goals. The organization addresses these tensions through a number of mixed strategies that include appropriate hiring techniques, socialization practices, and external certification of impact. Peralta *et al.* (2019) studied factors influencing the use of sustainable innovation practices in entrepreneurial firms. They discovered that an array of factors (e.g., performance expectancy, effort expectancy, social pressure, facilitating conditions, hedonic motivation, routine, expenditures, pace, financing, security, and behavioral intention) are involved in creating sustainable business model innovation; these factors are based on cognitive models of technology acceptance and business practices (Baalbaki *et al.*, 2025). While effort expectancy and hedonic motivation scored particularly high, the factors were overall not significantly different from those seen in any other type of business model innovation.

Finally, a stream of literature has attempted to delineate sustainable business model archetypes. The aim of these archetypes is to develop a common language that can be used to accelerate the development of sustainable business models in research and practice. The archetypes center around material and energy efficiency, waste management, renewables and natural processes, functionality, stewardship, self-reliance, business re-purposing for the environment, and scale-up solutions (Bocken *et al.*, 2014).

*3.4.3 Sustainable innovation capabilities.* This category of studies focuses on sustainable innovation capabilities, such as corporate strategy, eco-design, and R&D

capabilities. It does so in different contexts, such as economic crisis, SMEs, and geographic distance. Companies lacking the capacity to comply with regulatory requirements are less likely to invest in green technology (Qi *et al.*, 2020).

A number of studies focus on the innovation capability of environmental technologies. Zhang and White (2016) studied entrepreneurs in China's private solar photovoltaic sector as they built organizational skills and established legitimacy with resource owners and the global market. The authors identified three strategies used by the entrepreneurs: leveraging existing sources of legitimacy, aligning actions with established institutional rules and norms, and establishing an institutional environment to change perceptions of legitimacy. Early entrants needed to build effective organizational skills and establish their legitimacy at home and abroad. Later entrants could take advantage of that legitimacy to easily and quickly access external resources and become more competitive (Zhang and White, 2016).

Sun *et al.* (2008), when measuring eco-innovation capacity, found that the ratio of invention patents was negligible and concentrated in the eastern provinces of China. Moreover, the percentage of ecological patents in relation to all patents has been declining in recent years, and the majority of environmental patents are held by individuals (Sun *et al.*, 2008). It is thus evident that environmental innovation (in terms of patent numbers) is not at the level it should be to address the challenges China faces with environmental damage. This finding is striking, particularly given the efforts by the Chinese government to increase environmental monitoring and its offers of subsidies to organizations investing in environmental innovation (Ren *et al.*, 2021).

The spill-over of environmental capabilities influences the decision-making process for a company's growth (Berchicci *et al.*, 2012). Specifically, the decision to acquire a manufacturing company is influenced by both the environmental capabilities of the acquiror and the environmental capabilities of the target company. Acquirors with good environmental capacity are significantly more likely to buy neighboring facilities with low environmental capacity, and vice versa.

Ghisetti *et al.* (2021) investigated whether green-type designs can help companies improve their ability to invent in the environmental space. Designing new products and production processes with environmental impact in mind (a technique called "eco-design") is the basis of a new policy discourse towards environmental sustainability and the circular economy. The study found that green design increased environmental inventions by top R&D investors, and that it did so at a higher rate than non-green design. R&D increases the impact of green design on green inventions only when a company's R&D costs exceed a certain level.

Berkowitz (2018) studied meta-organizations, that is, organizations with members that are themselves organizations. These meta-organizations play a crucial role in collective capacity building, particularly in the dissemination of socially responsible practices (Héloïse *et al.*, 2017). More specifically, Berkowitz (2018) was interested in the organizational capabilities needed by meta-organizations for sustainable innovation and participatory governance (defined as governance through meta-organizations). From the literature, the author identified six organizational skills for sustainable innovation (namely, accountability, reflexivity, resilience, responsiveness, inclusion, and anticipation), which were fostered by broadly defined participatory governance mechanisms.

*3.4.4 Environmental innovation technologies.* This cluster of studies zooms into environmental innovation technologies that include cleaner production (e.g., adopting a systematically-organized approach to production activities such that they can exert positive effects on the environment), renewable energy, and electric vehicles. Bhupendra and Sangle (2016) showed that top management's vision for future technologies and their ability to manage risk were crucial to the implementation of a clean technology strategy (e.g., avoiding negative externalities to the environment). Bohnsack *et al.* (2014) identified four archetypes of business models related to electric vehicles, their value proposition, value network (e.g., how the vehicle is designed and manufactured), and revenues and cost structure. They found that as a result of path dependencies, incumbents are more constrained than entrepreneurial firms and find themselves forced to stick closely to the existing business models of conventional vehicles. Incumbents' complementary assets, such as established manufacturing facilities and a dealer network, allowed them to respond to external events, such as state-supported programs, more quickly than the start-ups could. The latter had to build complementarities by mixing products and services in novel ways to gain new buyers, and by partnering with other players in the automotive sector. Ortiz-de-Mandojana *et al.* (2019) explicitly link strategic governance dynamics to specific environmental technologies, and they find that CEO ownership had a positive impact on environmentally responsible technologies.

One important takeaway from the studies of environmental technologies is the notion of community ownership. A partly decentralized electricity supply has been made possible by the implementation of renewable energy technologies by cooperatives and individuals, in regions such as Continental Europe and the Global South. Research indicates that this community ownership has been successful in driving energy autonomy and the transition to renewable energy

(Kirchhoff *et al.*, 2016). However, community ownership of a microgrid, including service and maintenance, has shown mixed results, as the management of growth and the need for technical know-how often exceed the capabilities of village communities. Rural electrification is best facilitated by partners who are capable of explaining the options because off-grid communities are often unfamiliar with technology or its implications. To create a well-run microgrid, it is necessary to integrate community contributions like a legal framework, volunteered labor, and reliable financial contributions (Kirchhoff *et al.*, 2016).

### *3.5 Alternative taxonomies*

Alternative methods to bibliometric analysis for identifying research clusters include machine-learning approaches that classify topics based on probabilistic distributions rather than network-based relationships, allowing for a more nuanced understanding of thematic structures. In general, artificial intelligence (AI) tools contribute to a rise in reviews relying on AI and machine learning (Krlev *et al.*, 2025). Another approach is thematic taxonomies, which categorize research based on theories, methodologies, or geographic focus, offering an alternative to purely data-driven clustering (Snyder, 2019).

Here, we complemented bibliometric clustering with scholarly expertise in corporate governance, enabling us to refine categories of the integrative framework based on theoretical coherence and contextual relevance rather than purely algorithmic co-occurrence patterns. Thus, our review also resonates with an integrative review method, where literature is synthesized in a way that a new framework or perspective on the topic emerges (Elsbach and van Knippenberg, 2020).

Furthermore, our human-generated review of the literature holds the potential for enduring relevance in the age of generative AI for three main reasons (Block and Kuckertz, 2024). First, guided by intellectual curiosity and scholarly expertise, we problematize an issue that is located at the crossroads of two disciplines and is worthy of further exploration. Second, we deliberately engage in a process of ‘strategic inefficiency’ by refining our sample of included studies and subjecting them to context-dependent interpretation, thereby generating more nuanced conclusions (Block and Kuckertz, 2024). And third, we articulate a unique and creative understanding of the analyzed phenomenon by advancing an integrative framework of environmental innovation, driven by relevant corporate governance mechanisms.

# 4. Discussion and future directions for research

Given the growth of studies at the juncture of corporate governance and environmental innovation, studies of innovation can no longer ignore corporate governance effects, and corporate governance studies must incorporate aspects related to innovation. From our review, we propose how scholars can contribute to such research by focusing on corporate governance actors, outcomes from corporate governance identified in our integrative framework (Figure 3), theories, and research methods.

## *4.1 Future research at the strategic actor level*

We structure our future research suggestions according to the aspects of corporate governance that have been identified as the most influential for eco-innovation. At the same time, we suggest promising avenues for further inquiry into how environmental innovation is most likely to disrupt the existing models and systems of corporate governance.

*4.1.1 Owners.* From the reviewed literature, owners are by some distance the actors who primarily shape environmental innovation of organizations. Entrepreneurial firms are the most studied organizational form, and scholarly investigations on them is primarily focused on sustainable innovation. Corporate governance research could benefit from such findings by reconceptualizing value creation in organizations as geared towards social and ecological values. Research can also determine how this new purpose can lead to new organizational capabilities and partnerships with stakeholders. While research on environmental innovation and entrepreneurial firms focuses on firms and their business models, corporate

governance scholars can investigate the decision-making processes of owner-entrepreneurs; in particular, they might look at which corporate governance structures should be put in place to induce innovation in a sustainable way.

Another avenue for fruitful research relates to venture capital and other non-founding investors in sustainable startups, examining how active these owners are as opposed to the founders, who launch their entrepreneurial ventures to pursue sustainability-related opportunities (Hockerts and Wüstenhagen, 2010). Connected to ecopreneurship, there are concepts of social entrepreneurship and inclusive innovation that are based on similar foundations with a special emphasis on social value creation (Carle and Rayna, 2025). Corporate governance research could shed further explanatory light on the investing and financing strategies that would make social entrepreneurship more sustainable and attractive to potential investors.

Additionally, to ensure a more precise and focused analysis, future studies could differentiate between various types of activities to determine the scale of impact and required investment from capital providers. Despite being treated uniformly in the context of eco-entrepreneurship (Piwowar-Sulej *et al.*, 2021), businesses that solve environmental problems (such as innovation on carbon capture) could be distinguished from those that operate sustainably (e.g., by switching to solar panels). Scholars may inquire and conclude that different corporate governance devices are conducive to the generation of eco-innovations as opposed to the implementation of already existing green technologies aimed at securing sustainable business operations.

Another category of owners that would be of particular interest to corporate governance scholars when it comes to environmental innovation is the government. The effect of government ownership, influence, and support is complex due to conflicting agendas and multi-level agency. Future studies can elaborate on how government ownership affects managerial and employee perceptions of and commitments to environmental innovation. Other studies can continue to investigate how the level and intensity of government ownership and control may impact on eco-innovation; there is also a need to extend the context of such research from China to other milieus where government ownership is typically understudied.

One promising avenue for research is to focus on the sovereign wealth funds established by developed and mid-range economies, and how these might pursue an environmental investment strategy and influence the environmental innovation of their portfolio firms. Corporate governance scholars with a focus on climate finance could further investigate the differences in performance and returns between ordinary stocks

and/or funds and how they relate to environmental technologies (Bolton and Kacperczyk, 2021).

*4.1.2 Board of directors and managers*. First, more empirical studies are needed on specific board of directors' and TMT processes and practices that are focused on pursuing green agenda and advancing corporate environmentalism. Researchers are encouraged to go beyond surface-level attributes of boards and TMT (in terms of their structure and composition) for assessing whether and how deep-level dimensions that pertain to knowledge profiles and skillsets of directors and top managers relate to environmental sustainability and innovation. In a recent systematic literature review of 137 scholarly articles on knowledge heterogeneity in corporate boards, Selivanovskikh and Bodolica (2025) argue that directors' knowledge varies across educational, functional, occupational, and industrial dimensions, each contributing to the broader concept of board knowledge heterogeneity. Therefore, worthy of further exploration remains the question of how board and TMT diversity, in terms of political connections and network ties, cultural origin and international experience, functional and educational backgrounds, and industry-related expertise (Ponomareva *et al.*, 2022), is associated with and affects the environmental innovation and performance of organizations.

Second, it appears that strategic leadership remains largely isolated in its efforts to pursue green objectives and higher levels of environmental performance. What are the processes that must be put in place so that board members and TMT representatives can join forces in the spirit of shared governance, and align their efforts in their endeavor to build more sustainable organizations? An exploration of the dynamics of interaction between members within and across the board and TMT may offer a more accurate understanding of the enabling and restraining forces that drive the articulation of corporate purpose around environmental innovation and sustainability objectives. Questions of whether and how the formation of intra-group faultlines affects board dynamics, patterns of communication, and discussions of environment-focused agenda are worthy of further examination. While research has shown that faultlines affect behavioral patterns at the individual, subgroup, and group levels and intensify conflict among group members, it remains unclear how the existence of conflicts in the boardroom relates to the pursuit of sustainability objectives. This is particularly the case given that the type of conflict at play may result in creative disagreement or destructive outcomes.

Third, recent literature demonstrates that different governance paths can be espoused to achieve equally high levels of environmental innovation, particularly

when the efforts of several strategic actors, such as directors, owners and CEOs, come into play to create suitable governance constellations. In this context, studies on the concept of equifinality (Spraggon and Bodolica, 2021) may prove valuable for organizational leaders seeking to identify and design alternative bundles of corporate governance mechanisms that are equally conducive to fostering environmental innovation within their corporations. Using a configurational analysis, Shui *et al.* (2022) demonstrate that even weak CEOs can enable environmental innovation activities when their corporations are designed to possess suitable ownership structures and board of directors' archetypes. Relatedly, Villalba-Ríos *et al.* (2023) explore combinations of board characteristics that lead to high environmental sustainability by using fuzzy-set qualitative comparative analysis method. Their research indicates that large boards with a high presence of women and a low presence of family members are associated with better environmental performance, emphasizing the importance of board composition as a driver of environmental outcomes.

Thus, what governance configurations are needed to encourage leaders in organizations to devote time and attention to issues of sustainability and environmental innovation? Studies that identify a comprehensive set of the boundary conditions under which an organization can achieve superior levels of environmental innovation are needed. Such conditions include but are not limited to moderators of the governance – eco-innovation relationship, such as level of firm profitability, more-or-less environmentally sensitive industries, ownership-related characteristics, and the specificities of national regulatory frameworks. What specific governance bundles will lead to the formulation and implementation of environmentally friendly strategies and a better consideration of stakeholders' interests?

Finally, being one of the most significant enabling and restraining forces, the regulatory landscape and the efficiency of enforcement measures within a given industrial sector or national jurisdiction should receive additional consideration. Recent research highlights how varying regulatory and cultural environments influence board and TMT decision-making, particularly in jurisdictions where enforcement mechanisms differ in stringency and consistency. For instance, Lu and Wang (2021) suggest that companies in countries with robust legal systems and effective enforcement mechanisms tend to exhibit less voluntary CSR disclosures, implying that external governance is functional and may partially serve as a substitute for internal governance. The study also finds that firms in countries with low power distance, individualism, femininity, high uncertainty avoidance, and long-term orientation perform better environmentally.

Relatedly, employing a large sample of publicly-listed Chinese firms, Yue *et al.* (2025) report that executive ownership significantly enhances environmental innovation, while minority shareholder protection moderates this relationship. However, the impact of these findings is very minimal in high-polluting industries. Therefore, the authors suggests that external regulatory frameworks are needed to boost the effectiveness of internal governance mechanisms, acting as complementing drivers of sustainability efforts in organizations that operate in high-polluting sectors where internal governance alone may not be sufficient.

Additionally, it is worth understanding how research on behavioral and decision-making patterns at the individual, group, and organizational levels can be consolidated and compared to each other when various actors across levels of analysis are subject to different sets of rules or regulatory constraints. Therefore, future studies could conduct cross-country comparisons to provide further insight into how governance constellations function differently under distinct regulatory regimes. For instance, researchers could examine whether organizations in highly regulated sectors (e.g., European energy companies under the EU Green Deal and cap-and-trade system) may exhibit different board-level engagement than companies in loosely regulated markets where environmental innovation and performance are largely discretionary.

Furthermore, the complexity of regulatory environments may also contribute to intra-board conflicts regarding environmental innovation objectives. The presence of conflicting regulatory expectations across jurisdictions may intensify disagreements on how environmental policies should be prioritized within strategic decision-making in corporate settings. Research that examines how regulatory heterogeneity influences governance structures, managerial decision-making processes, and boardroom dynamics in sustainability-oriented organizations would provide valuable insights into how leadership responds to regulatory constraints and opportunities.

### *4.2 Outcomes from corporate governance, CSR, and sustainability: strategy, capabilities, resources, and environmental innovation*

We believe research could more explicitly link corporate governance dynamics to specific environmental technologies, such as cleaner production, green technology, electric vehicles, or renewable energy. A promising avenue for future research is how community ownership of complex environmental technologies can spark environmental innovation (Kirchhoff *et al.*, 2016). Corporate governance can also boost sustainable innovation capabilities, and future studies can focus on how

corporate governance can contribute to innovation capabilities, such as eco-innovation capacity or eco-design. There is also need for more studies on the participatory governance of meta-organizations, which play a crucial role in collectively building capabilities and spreading environmental practices for sustainable innovation (Héloïse *et al.*, 2017).

A striking issue requiring closer examination is the frequent tendency within the reviewed literature to treat corporate sustainability, corporate responsibility, and related concepts as intrinsic values and ends in themselves. However, it remains unclear the extent to which these activities in corporations contribute to the greater purpose, such as solving grand challenges or avoiding harm to people and the planet. Therefore, we underscore the need for further empirical investigation into whether sustainability practices in today's organizations genuinely fulfil their stated objectives.

When it comes to the effect of corporate governance on environmental innovation, it is helpful if we restructure the outcomes into three levels of operationalization: macro-level (i.e., effect on institutions), meso-level (i.e., effect on firms) and micro-level (i.e., effect on individuals), as per our integrative framework (as illustrated in Figure 3). First, future research can focus on macro-level effects, such as spillovers of environmentally friendly practices and the dissemination of culture and norms that can occur when a focal firm adopts environmental innovation. Conversely, firm misbehavior in terms of environmental practices can have adverse effects on regulation; these vary from the need for increased monitoring to regulatory prevention. There is also market sanctioning of environmental failures and the premium demanded by investors for polluting stocks (Bolton and Kacperczyk, 2021). Finally, international corporate governance plays a role when environmental progress leads to the standardization of environmental practices across countries. Future research is warranted on these important issues.

Second, we identified meso-level outcomes, e.g., at the operational and organizational levels. At the operational level, future studies can focus on which corporate governance practices and processes lead to operational improvements that may encompass new product development, energy efficiency, fuel consumption minimization, and reductions in waste or carbon dioxide emissions. At the organizational level, scholars could further investigate how good governance standards lead to improvements in environmental performance, financial sustainability, the organizational attitude towards environmental practices (such as substantive commitment as opposed to impression management) or an increase in R&D investments, number of patents, and firm value.

Third, at the micro-level, we see a great potential for studies examining attitudinal or behavioral changes in individuals as a result of environmentally focused corporate governance that may contribute to the broader stream of research on behavioral governance (Bodolica and Spraggon, 2011). For instance, researchers could examine how managerial attitudes change as a result of an increased focus by corporate boards on environmental innovation. Other effects would include improvements in employees' skills relating to environmental sustainability and innovation, or changes in the levels of creativity and the length of the decision-making horizon (short- vs. long-termism). Finally, future studies could focus on how corporate governance targeted at environmental innovation impacts at the micro-level of individual behavior and cognition, such as risk-taking, ethics, perceptions, belief, or respect.

### *4.3 Cross-fertilizing theories*

We now turn to ways of extending or cross-fertilizing theories in these interdisciplinary studies by showing how the main theories of corporate governance (by the number of occurrences in reviewed papers) could contribute to studies of green innovation. Thus, we review institutional theory (Berrone *et al.*, 2013), stakeholder theory (Boiral and Heras-Saizarbitoria, 2017), resource-based view (Paladino, 2008), agency theory (Zheng and Kouwenberg, 2019), and innovation theories (Romijn and Caniëls, 2011) [2]. We propose how the theories of environmental innovation could contribute to the field of corporate governance, a specific analysis that stems from the review of the papers that use innovation theories (e.g., diffusion of innovation and open innovation) that have not been extensively used in relation to governance.

*4.3.1 Institutional theory.* Institutional theory constitutes one of the most prominent theoretical perspectives in the literature in that it crosses the corporate governance and environmental innovation domains. Studies that draw on this theory tend to consider various strategies that companies involved in green innovation use to adjust to regulatory pressures, respond to institutional demands, and operate under a given set of societal norms and expectations to achieve and maintain legitimacy in the market (Berrone *et al.*, 2013). Legitimacy-seeking actors not only leverage their legitimacy capital and align themselves with extant institutional conventions, but they also attempt to influence the institutional context to modify public perceptions of legitimate actions (Zhang and White, 2016). The role of the state and institutions has been explored in the sustainable development of a city (Weisenfeld and Hauerwaas, 2018) and in driving

technological innovations in industries of strategic importance to a nation (Genin *et al.*, 2021).

Institutional theory-based research would benefit from focusing on the examination of multiple governance considerations to identify corporate governance practices that could be institutionalized, thanks to their ability to boost environmental innovation and generate substantial improvements in sustainability outcomes. To advance these considerations and explore their potential for institutionalization within specific empirical settings, researchers could draw on a broad array of corporate governance devices, while also assessing their complementarity or substitution effects. Spraggon and Bodolica (2015) position the universe of governance attributes at the societal (macro), group (meso) and individual (micro) levels, with each of them focusing on different objectives, such as institutional compliance, relationship with others, and one's own self. The authors identify three groups of governance devices, namely formal (e.g., laws, regulations), social (e.g., relational trust, social sanctions), and emotional (e.g., authentic pride, self-regulation) mechanisms of control. Worth noting is that the type and efficacy of governance attributes in achieving sustainable eco-innovation objectives varies across types of ownership and industrial sectors. For instance, for the specific case of family firms, researchers differentiate between contractual (e.g., advisory board, formal contracts, outside directors, non-family managers, performance incentives) and relational (e.g., loyalty, mutual trust, tempered altruism, shared commitment, social capital) governance mechanisms (Bodolica and Spraggon, 2010).

We maintain that formal governance mechanisms, such as regulatory frameworks and legal mandates, interact with informal governance mechanisms, such as industry norms and voluntary sustainability initiatives, to drive the diffusion of environmental innovation. Scholars have found that specific governance characteristics, such as board interlocks through network ties, are fundamental to the institutional isomorphism that explains the spread of innovative practices in the business environment (Brown, 2011). Governmental inspection of corporate investments in green innovation may be particularly salient under a specific set of contingency factors, such as an underdeveloped market-based institutional context and a stronger environmental management capability of organizations (Qi *et al.*, 2020). Moreover, green technology innovation may result in superior environmental performance, increasing recycling behaviors and reducing waste production, particularly in jurisdictions with strong institutional settings and effective national governance systems (Orazalin *et al.*, 2025).

Another important governance consideration is the role of internal governance mechanisms, including board committees on sustainability, executive compensation linked to environmental performance, and ESG reporting. In a qualitative study of board of directors in UAE organizations, Alawadi *et al.* (2024) concluded that the institutional context – particularly national culture and regulatory characteristics – affect board diversity and ESG outcomes. These governance practices can help integrate environmental innovation into corporate strategies and embed sustainability into decision-making processes, making green innovation an institutionalized norm rather than an ad-hoc initiative (Kurzhals *et al.*, 2020).

*4.3.2 Stakeholder theory.* Stakeholder theory is concerned with the analysis of the interests of various stakeholder groups with a view to ensuring that the negative effects of a specific corporate activity on such stakeholders is alleviated (Boiral and Heras-Saizarbitoria, 2017). In extant studies, stakeholder theory has been used to assess how environmentally-concerned companies handle conflicting priorities and adjust to different stakeholders' pressures and demands (Liao and Zhang, 2020). Moreover, the critical role played by good governance practices in the fulfillment of corporate responsibility towards stakeholders and in shared value creation has been demonstrated in various settings, including SMEs (Rubio-Andrés *et al.*, 2020).

Since the reviewed literature reveals that little has been done thus far on the governance role of strategic leadership, future studies could draw on the stakeholder theory to examine how boards of directors and TMTs in companies that have begun to invest in green innovation manage the expectations of various internal and external audiences. Further research could be conducted to ascertain effective strategies that could be deployed to obtain support and boost the engagement of profit-seeking stakeholders in the environmental innovation activities of corporations. A promising avenue of inquiry lies in the identification of viable governance processes for the mobilization of interests among stakeholders for the sustainable transformation of industrial sectors (e.g., housing) that are lagging behind with regard to energy efficiency and other environmental sustainability issues (Lazoroska and Palm, 2019). The effectiveness of formal and informal practices of engagement (e.g., personalized meetings, advisory bodies, public forums) for different environmental stakeholder groups should be examined with the aim of preserving a trustworthy long-term relationship (Aguilera *et al.*, 2021).

*4.3.3 Resource-based view.* The resource-based view suggests that organizations, which possess resources and capabilities that are unique, rare, and difficult to imitate, achieve sustainable competitive advantages that allow them to outperform their rivals

(Paladino, 2008). Studies that draw on this view demonstrate that knowledge-based resources, such as absorptive capacity and sustainable capabilities (i.e., orientation, human capital, collaboration) are the most critical determinants of firms' adoption of green innovation (Aboelmaged and Hashem, 2019). Arguably, slack resources are also significant predictors of environmental product and process innovation (Liao and Long, 2018), while financial resources do not affect the environmental performance of organizations (Memon *et al.*, 2020).

In studying the corporate governance of environmental innovation through the resource-based lens, scholars could determine the specific types of resources, e.g., financial, reputational, organizational, relational, social, that are most critical to the eco-innovative success of various forms of entities by reference to their (dominant) ownership type. For instance, state ownership could provide better access to external resources in the form of funding and support from government officials, but this may not be accessible to the smaller eco-innovative firms that may need to rely more heavily on internal resources to achieve their environmental targets. Extant research has not given sufficient attention to the characteristics of strategic leaders and the specific resources that board members bring to the organization in terms of social capital, knowledge, and capabilities when it comes to securing a competitive advantage over other entities that do not pursue a green innovation agenda.

*4.3.4 Agency theory.* Agency theory recognizes the existence of conflicting goals among powerful corporate actors and focuses on the alignment of principal-agent interests through the adoption of relevant governance mechanisms to alleviate agency costs and improve the strained owner-manager relationship (Zheng and Kouwenberg, 2019). Although agency theory is the main theoretical lens in the corporate governance literature, scholars have not specifically drawn on the agency theory when examining linkages between governance and environmental innovation. Most agency-inspired studies in the field conduct their analysis of environmentally-responsible innovations and technologies through the prism of ownership concentration (Javeed *et al.*, 2021) and managerial shareholdings in the corporation (Ortiz-de-Mandojana *et al.*, 2019).

There are many opportunities for extending agency theory assumptions to the reviewed literature by focusing on the identification of optimal governance devices that may shape green innovation outcomes in today's corporations. On the one hand, a line of inquiry could consider the effect of external governance mechanisms, such as environmental laws and regulations, stakeholders' activism, and markets for corporate control, on the pursuit of environmentally sustainable practices and the innovative

success of organizations. A differential and comparative analysis of this effect could be made for various types of firms according to their ownership structure, such as family firms which are known for their principal-principal agency problems (Bodolica *et al.*, 2020) and mixed-shareholding entities where multi-principal conflicts may proliferate. On the other hand, there is vast potential for assessing the impact of internal governance devices on eco-innovation activities and outcomes. Such devices for reducing managerial opportunism include board-level characteristics, including board composition and compensation, individual and group-level CEO/TMT features, such as the incentive design of executive compensation packages (Bodolica and Spraggon, 2009b), and the interactive effect of the board and managerial characteristics (Bodolica and Spraggon, 2015).

*4.3.5 Innovation theories.* The reviewed literature draws on a wealth of innovation theories and models, of which the most salient are open innovation (Khurana *et al.*, 2021), innovation diffusion theory (Brown, 2011), Witte's Promoter Model (Kiesnere and Baumgartner, 2019), social or inclusive innovation (Sonne, 2012), disruptive innovation (Kuckertz *et al.*, 2020), evolutionary innovation theory (Romijn and Caniëls, 2011), innovation system model (Parayil, 2003), innovation intermediation and sustainability transitions (Kivimaa, 2014), process and product innovation (Nadeem *et al.*, 2020), and sustainability-oriented service innovation (Calabrese *et al.*, 2018b). Nevertheless, the explored linkages between various innovation models and corporate governance mechanisms in environmentally conscious companies remain very superficial, offering a wide array of opportunities for future research.

It is worth extending the analysis of previously examined questions to the low-tech industries that are considered to be laggards in terms of green innovation, such as the food sector (González-Moreno *et al.*, 2019). Future studies can focus on exploring other open eco-innovation sources, such as crowd contests, crowd collaborative communities, and crowd labor markets, with a view to identifying the optimal mechanisms for governing them. Comparative studies of eco-innovation strategies in public, private, and state-owned companies are needed to understand whether the innovation outcomes are due to the diverging corporate governance configurations of these entities. Also, there is a substantial reason to believe that theoretical cross-fertilization will advance current knowledge in the field. The innovation diffusion theory could be complemented with institutional theory insights to examine how the prevailing practices and processes that govern environmental innovation are diffused among industry players through mimicry and adaptation. Since open innovation induces firms to open themselves up to the outside world and seek innovations from

various sources, it can be combined with stakeholder theory insights to delimit the governance interventions that are most suitable for different stakeholders and the ensuing types of innovation.

### *4.4 Methodological recommendations*

There is a lack of consistency in the operationalization of environmental innovation; future research could aim at finding consistent measures to ensure comparability of data, perhaps via meta-analytical reviews. Since our scoping review and bibliometric analysis show that there is a decoupling between scholarly communities (business and governance scholars, on the one side, and sustainability and environmentalist scholars, on the other), a future research direction would be to propose a closer collaboration and integration among these communities to induce cross-fertilization of knowledge and create a truly interdisciplinary field of research. Research teams that draw on the expertise of specialists from diverse domains are more likely to develop deeper insights into the phenomena under investigation and to generate valuable contributions to the advancement of this field, along with actionable recommendations for practitioners seeking to enhance their environmental innovation investments and activities.

Next, corporate governance variables tend to be considered control variables in firm-level quantitative studies examining the causality between a given phenomenon and environmental innovation. Therefore, researchers understand that corporate governance can influence firms' environmental innovation or performance, although there is a lack of solid research in this field. More studies are needed where corporate governance features more prominently both theoretically and empirically in the research design.

Finally, the relationship between corporate governance and environmental innovation is highly endogenous, which makes the intersection of the two domains most interesting to study. Corporate governance does exert influence on innovation outcomes, and reciprocally, internal and external elements in the innovation domain disrupt the traditional corporate governance models, leading to innovation in corporate governance. We highlight this in our framework through feedback loops (Figure 3).

# 5. Conclusion

The contributions of our review of the literature on corporate governance and environmental innovation are three-fold. First, our review contributes to the emerging debate about the purpose-driven organization (Hart and Zingales, 2017; Henderson, 2020; Mayer, 2021), which is framed as "a concrete goal that reaches beyond profit maximization" (Henderson and Van den Steen, 2015). Throughout the last few years, there have been opportunities for governments to entice companies to comply with the Paris Agreement on climate change. This top-down approach has had limited success to date, primarily due to the unenthusiastic response from the organizations themselves (Bowsher *et al.*, 2020; Caldecott, 2020). The studies on better, purpose-driven firms call for the impact of corporate purpose to be disentangled from other core organizational aspects, such as leadership and corporate governance structures. We contribute to this call by theorizing from our review about which elements of CSR and sustainability practices are moderating the effect of corporate governance on environmental innovation. Further, we uncover which corporate governance mechanisms, especially at ownership and board levels, are more likely to be conduits for environmental innovation. This is particularly relevant since many foundations of corporate governance have been built with the sole purpose of profit maximization; critics therefore question whether owners, boards, or organizational leaders have the right tools in place to pursue a purpose-driven agenda.

Second, our survey of the literature suggests how to conduct interdisciplinary research on the topic. The sustainability field is broad and pluralistic, and our study goes beyond the management literature by integrating multidisciplinary journals

focused on environment, energy and ecology into the scope of review. The integration of different fields provides researchers with an opportunity to cross-fertilize theories, and to bring a conceptual perspective into sustainability studies which would not have otherwise done so.

Third, methodologically, we show how to create bridges between seemingly distinct fields of research, that is corporate governance on the one hand, and environmental innovation on the other hand. Our review provides a methodological illustration of how cluster analysis using bibliometric software allows for separating a body of literature into topical sub-fields, rather than disciplinary silos. We hope that the ideas contained in the review open new avenues of research on this important phenomenon, a better understanding of how strategic actors address environmental innovation, and how to design corporate governance policies in a purpose-driven firm.

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# Notes

[1.] For recent reviews on CSR, refer to Jain and Jamali (2016) and Zaman *et al.* (2022).

[2.] We do not extend our discussion to the upper echelons theory because it was recently reviewed by Kurzhals *et al.* (2020).

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## Appendix 1. An extant systematic review

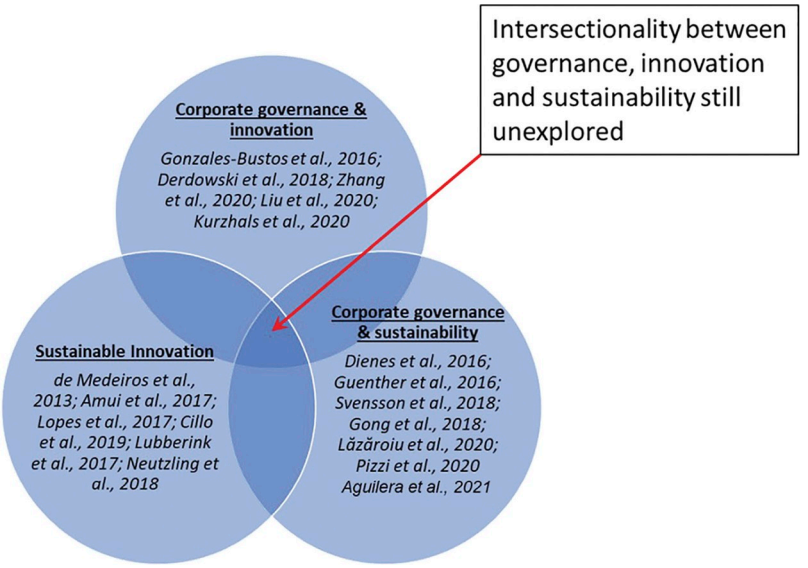


**Figure A1.** Unexplored intersection between the three domains

**Table A1.** Existing systematic reviews within the broad knowledge domains of governance, sustainability, and innovation

| Authors | Title | Journal |
|---|---|---|
| Aguinis and Glavas (2012) | A review of corporate social responsibility | *Journal of Management* |
| De Medeiros *et al.* (2014) | Success factors for environmentally sustainable product innovation: A systematic literature review | *Journal of Cleaner Production* |
| Adams *et al.* (2016) | A systematic review of sustainability-oriented innovation | *International Journal of Management Reviews* |
| Dienes *et al.* (2016) | What are the drivers of sustainability reporting? A systematic review | *Sustainability Accounting, Management and Policy Journal* |
| Gonzales-Bustos and Hernández-Lara (2016) | Corporate governance and innovation: A systematic literature review | *Corporate Ownership and Control* |
| Guenther *et al.* (2016) | Environmental management control systems: a conceptualization and a review of the empirical evidence | *Journal of Cleaner Production* |
| Jain and Jamali (2016) | A review on corporate governance and corporate social responsibility | *Corporate Governance: An International Review* |
| Svensson *et al.* (2016) | A Triple Bottom Line Dominant Logic for Business Sustainability: Framework and Empirical Findings | *Journal of Business-to-Business Marketing* |

(*continued*)

**Table A1.** Continued

| Authors | Title | Journal |
|---|---|---|
| Amui *et al.* (2017) | Sustainability as a dynamic organizational capability: a systematic review and a future agenda toward a sustainable transition | *Journal of Cleaner Production* |
| Bansal and Song (2017) | A review on corporate sustainability | *Academy of Management Annals* |
| Lopes *et al.* (2017) | An analysis of the interplay between organizational sustainability, knowledge management, and open innovation | *Journal of Cleaner Production* |
| Lubberink *et al.* (2017) | Lessons for responsible innovation in the business context: A systematic literature review of responsible, social and sustainable innovation practices | *Sustainability (Switzerland)* |
| Derdowski *et al.* (2018) | Creative and innovative behaviors of corporate directors: an elusive role of task-related conflicts | *Journal of Management and Governance* |
| Gong *et al.* (2018) | Inside out: The interrelationships of sustainable performance metrics and its effect on business decision making: Theory and practice | *Resources, Conservation and Recycling* |
| Mura *et al.* (2018) | A review on sustainability measurement research | *International Journal of Management Reviews* |

(*continued*)

**Table A1.** Continued

| Authors | Title | Journal |
|---|---|---|
| Neutzling *et al.* (2018) | Linking sustainability-oriented innovation to supply chain relationship integration | *Journal of Cleaner Production* |
| Cillo *et al.* (2019) | Understanding sustainable innovation: A systematic literature review | *Corporate Responsibility and Environmental Management* |
| Kurzhals *et al.* (2020) | Strategic leadership and technological innovation: A comprehensive review and research agenda | *Corporate Governance: An International Review* |
| Lazaroiu *et al.* (2020) | Sustainability management and performance in the urban corporate economy: A systematic literature review | *Sustainability (Switzerland)* |
| Liu *et al.* (2020) | Corporate executives with financial backgrounds: The crowding-out effect on innovation investment and outcomes | *Journal of Business Research* |
| Zhang *et al.* (2020b) | How do environmental, social and governance initiatives affect innovative performance for corporate sustainability? | *Sustainability (Switzerland)* |
| Zaman *et al.* (2022) | Corporate governance meets corporate social responsibility: Mapping the interface | *Business & Society* |
| Aguilera *et al.* (2021) | A review on corporate governance (focusing on corporate governance actors) and sustainability | *Journal of Management* |

## Appendix 2. Methodology

**Table A2.** Search strategy

| Search strings | Articles and Reviews in English | Business, Management and Accounting |
|---|---|---|
| *Level 1 – keywords*: "corporate governance" OR "strategic leader*" OR "upper echelon*" OR "Board of director*" OR director* OR officer* OR "top management" OR "TMT*" OR executive* OR "top manager*" OR "business unit head*" OR "business unit leader*" OR "vice president" OR "CEO" OR "CFO" OR "CMO" OR "CTO" OR "COO" OR "CSO" OR "CIO" OR "CDO" OR "shareholder*" OR "owner*" OR investor* OR founder* OR entrepreneur OR entrepreneurs *Level 2 – keywords*: innovat* OR invent* OR ambidex* OR "technological change" OR "exploration" OR "exploitation" OR "new process" OR "new product" OR "new service" OR "discontinuous technology" OR "disruptive technology" OR "technology" *Level 3 – keywords*: environment* OR sustainab* OR green OR ethic* OR "eco" *Level 4 – Journals*: "journal of cleaner production" OR "sustainability: Switzerland" OR "business strategy and the environment" OR "organization and environment" OR "environment and planning" | 739 | 263 |
| *Levels 1, 2,3 – Keywords… Level 4 – Journals*: "Journal of management" OR "Journal of management studies" OR "Journal of organizational behavior" OR "journal of political economy" OR | 132 | 132 |

(*continued*)

**Table A2.** Continued

| Search strings | Articles and Reviews in English | Business, Management and Accounting |
|---|---|---|
| "Journal of product innovation management" OR "Leadership quarterly" OR "management science" OR "organization science" OR "personnel psychology" OR "quarterly journal of economics" OR "research policy" OR "review of economic studies" OR "strategic organization" OR "journal of consumer research" | | |
| *Levels 1, 2, 3 – Keywords… Level 4 – Journals:* "strategic management journal" OR "academy of management" OR "accounting review" OR "administrative science quarterly" OR "American economic review" OR "contemporary accounting research" OR "corporate governance: an international review" OR "Entrepreneurship Theory and Practice" | 82 | 82 |
| *Levels 1, 2, 3 – Keywords… Level 4 – Journals:* "Technological Forecasting and Social Change" OR "Family business review" OR "Human resource management" OR "Journal of accounting and economics" OR "journal of accounting research" OR "journal of applied psychology" OR "Journal of business venturing" OR "Journal of family business strategy" OR "Journal of finance" OR "journal of financial economics" OR "Journal of financial and quantitative" OR "Journal of international business studies" OR "Journal of sustainable tourism" | 190 | 185 |
| *Levels 1, 2, 3 – Keywords… Level 4 – Journals:* "Ecological Economics" OR "Environmental Management" OR "Environmental Modelling and Assessment" OR "Environmental Quality | 265 | 34 |

(*continued*)

**Table A2.** Continued

| Search strings | Articles and Reviews in English | Business, Management and Accounting |
|---|---|---|
| Management" OR "Environmental Research" OR "Environmental Science and Technology" OR "Environmental Science and Policy" OR "Environmental Policy and Governance" OR "Environmental Innovation and Societal Transitions" OR "Review of Environmental Economics and Policy" OR "Journal of the Association of Environmental and Resource Economists" | | |
| *Levels 1, 2, 3 – Keywords… Level 4 – Journals*: "Energy Research and Social Science" OR "Ecological Economics" OR "Environmental Politics" OR "Sustainable Development" OR "Ecology and Society" OR "Global Environmental Politics" OR "Environmental Values" OR "Sustainable Cities and Society" OR "International Journal of Sustainable Development and World Ecology" OR "Clean Technologies and Environmental Policy" OR "Energy Sustainability and Society" | 264 | 25 |
| *Total* | *1672* | *721* |