



Original Research Paper

From Corporate ESG Investment to Regional Sustainable Development in China: A Cross-Level Review of Evidence, Mechanisms, and Boundary Conditions

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Abstract

Environmental, social, and governance (ESG) investment is increasingly expected to connect corporate strategy with the United Nations Sustainable Development Goals (SDGs). Yet the Chinese evidence remains dominated by firm-level financial outcomes and individual environmental indicators, leaving unclear whether corporate ESG activity accumulates into measurable regional progress. This article reviews and integrates research on Chinese listed firms to explain the cross-level pathway from corporate ESG investment to provincial environmental, social, and economic outcomes. Drawing on stakeholder theory and sustainable development theory, the review organizes prior work around three questions: what outcomes ESG can influence, through which mechanisms, and under what institutional conditions. The synthesis indicates that ESG is plausibly associated with lower emissions, green innovation, improved resource allocation, and more resilient growth, but the evidence for broader social welfare and regional equality is thinner. Green innovation is the most consistently supported transmission mechanism. State ownership can strengthen policy alignment and resource mobilization, while also increasing the risk of symbolic compliance. In heavy-polluting industries, technological lock-in and transition costs may weaken the conversion of ESG scores into material environmental outcomes. The review therefore proposes a cross-level framework centered on aggregate stakeholder externalities and hierarchical stakeholder salience. It concludes with a research agenda emphasizing multilevel panel designs, outcome-based ESG measurement, policy-shock identification, and explicit tests of spatial spillovers. This perspective helps distinguish substantive sustainability transformation from disclosure-led legitimacy and offers a closer conceptual match between corporate ESG assessment and regional SDG performance.

Keywords: *ESG investment; regional sustainable development; Chinese listed firms; green innovation; state ownership; cross-level analysis*

1. Introduction

Environmental, social, and governance investment has moved from a specialist investment screen to a central language of corporate sustainability. At the same time, the SDGs have established a multidimensional benchmark for judging whether economic activity improves environmental integrity, social inclusion, and durable prosperity. These developments appear complementary, but the empirical connection between them remains incomplete. ESG research typically asks whether a firm with a stronger score enjoys better valuation, financing conditions, innovation, or profitability. Goyal (2026) Sustainable-development research, by contrast, evaluates outcomes at national or regional scale. The result is a level-of-analysis gap: corporate action is measured at the firm level, while the public value that justifies ESG is expected to appear beyond the firm.

This gap is particularly important in China. Listed firms operate within a state-influenced market system in which regulatory direction, public ownership, capital-market incentives, and local implementation interact. Corporate sustainability is therefore neither wholly voluntary nor simply commanded. Stakeholder theory explains why firms respond to regulators, investors, employees, communities, and other claimants (Freeman, 1984), whereas sustainable development theory specifies the broader environmental, social, and economic ends against which those responses should be evaluated (WCED, 1987). Their combination permits a more demanding question: do corporate ESG investments produce material improvements in the regions where firms operate, or do they mainly generate disclosure, reputation, and legitimacy?

A cross-level review is needed for three reasons. First, ESG ratings can diverge from operational performance because agencies use different scopes, weights, and data, a problem described as aggregate

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Received: 25th May, 2026; Revised: 6th June, 2026; Accepted: 8th June, 2026; Available Online: 04rd August, 2026

(DOI): 10.70102/AEJ.2026.18.2s.123

confusion (Berg et al., 2022). Second, visible reporting can be decoupled from costly organizational change, particularly where legitimacy incentives are strong (Marquis & Qian, 2014). Third, sustainability effects may emerge only through aggregation, diffusion, and spillovers. A single firm's green patent or employment practice is unlikely to shift a provincial indicator, but a critical mass of aligned actions may affect technology trajectories, labor standards, pollution intensity, and industrial structure Abdullah et al. (2025).

This article synthesizes the literature around a question consistent with the underlying dissertation: how do ESG investments by Chinese listed firms influence regional sustainable development indicators, and through which mechanisms and boundary conditions does this influence operate? The contribution is conceptual rather than a new meta-analysis. K., V. (2026) It integrates fragmented environmental, social, economic, governance, and institutional findings into a cross-level transmission framework and identifies testable priorities for future research.

2. Review Approach and Conceptual Scope

The review adopts a structured narrative approach. Its evidence base comprises the theoretical and empirical literature assembled in the dissertation, with priority given to peer-reviewed studies directly addressing ESG or corporate social responsibility in China, green innovation and emissions, ownership and regulation, and the relationship between sustainable finance and the SDGs. Foundational works are retained when they define the theoretical mechanisms required for synthesis. Eighteen sources are used in the final narrative and reference list. This bounded strategy maintains consistency with the dissertation while allowing the article to focus tightly on the corporate-to-regional transmission problem.

For analytical purposes, ESG investment refers to the organizational resources, capabilities, governance arrangements, and operating practices represented—imperfectly—by ESG performance or ratings. Regional sustainable development refers to measurable environmental, social, and economic conditions at the province level. The environmental domain includes emissions, carbon intensity, clean-energy use, and green productivity; the social domain includes employment quality, educational and gender inequality, community welfare, and social satisfaction; the economic domain includes sustainable growth, regional balance, high-quality development, and green total factor productivity. This distinction between corporate input or signal and regional outcome is essential: a rating is not itself sustainable development.

The synthesis is organized by outcomes, mediating processes, and boundary conditions. It treats green innovation as a principal mediator, ownership structure and pollution intensity as central moderators, and China's institutional structure as the context connecting them. Because methods and measures differ

substantially across studies, the review does not pool effect sizes. Instead, it evaluates the coherence of mechanisms and the degree to which existing designs support cross-level inference.

3. Theoretical Foundations for Cross-Level ESG Effects

Stakeholder theory provides the micro-foundation for ESG adoption. Firms invest in sustainability when influential stakeholders possess the power, legitimacy, or urgency to shape corporate priorities (Mitchell et al., 1997). In conventional accounts, managers balance claims among investors, employees, customers, regulators, and communities. In China, however, stakeholder salience is more hierarchical. The state is simultaneously regulator, policy architect, financier, and—through state-owned enterprises (SOEs)—owner. Corporate alignment with sustainability priorities can thus influence access to legitimacy, credit, procurement, and managerial evaluation. Yin and Zhang (2012) show that corporate responsibility in an emerging-market context is shaped by institutional dynamics, supporting an interpretation of ESG behavior as embedded rather than purely discretionary.

Sustainable development theory supplies the macro-normative criterion. The Brundtland formulation emphasizes present needs, future capacity, and intergenerational trade-offs (WCED, 1987). The SDGs extend this view by treating decarbonization, human capability, inclusion, infrastructure, and institutional quality as connected transformations rather than independent targets (Sachs et al., 2019). Accordingly, corporate ESG should be assessed not only by private returns but also by externalities and system-level change.

Combining these perspectives produces two useful concepts. Aggregate stakeholder externality describes the regional consequence that arises when ESG practices across many firms jointly affect people and ecosystems beyond direct contractual stakeholders. Dave (2025) Hierarchical stakeholder salience describes the unequal ordering of stakeholder influence in a state-led setting. Together they predict that ESG effects depend on both the density of corporate action within a region and the institutional channels through which national priorities are translated into firm behavior. They also explain why an identical ESG score may have different substantive meanings across ownership types, sectors, and provinces.

4. Environmental Pathways: From Disclosure to Material Outcomes

The environmental pillar offers the clearest potential bridge from firm conduct to regional outcomes. Corporate investment in cleaner equipment, energy efficiency, process redesign, waste control, and supply-chain standards can reduce direct emissions and generate spillovers through suppliers and competitors. Evidence from Chinese A-share companies associates stronger ESG performance with lower corporate carbon-emission intensity (Xie et al., 2024). Zhang and

Lai (2024) likewise report that ESG ratings can improve corporate environmental performance. These findings are compatible with a regional pathway: when listed firms constitute a meaningful share of provincial production, firm-level reductions may accumulate into lower sulfur dioxide emissions, carbon intensity, and energy demand.

Green innovation is the most plausible mediator. ESG pressure can redirect managerial attention and capital toward environmental patents, cleaner technologies, and resource-efficient processes. Zhang and Chen (2023) find that ESG scores improve green innovation among Chinese listed companies. This mechanism accords with the Porter hypothesis: well-designed environmental pressure can stimulate innovation that partly offsets compliance costs and improves competitiveness (Porter & van der Linde, 1995). Innovation can also diffuse across organizational boundaries through labor mobility, supplier upgrading, demonstration effects, and local knowledge networks, enabling a corporate input to affect regional green productivity.

However, the pathway is not automatic. ESG measures often emphasize policies and disclosure rather than verified physical outcomes. Firms may improve reporting faster than they change production, particularly when external assurance is weak. The Chinese CSR literature has long questioned whether reporting represents symbol or substance (Marquis & Qian, 2014), and transparency can affect firm value without guaranteeing environmental additionality (Yu et al., 2018). Consequently, studies that use a composite ESG rating as both treatment and proof of sustainability risk circular inference. Stronger work should connect corporate ratings to independently measured emissions, energy mix, water use, and pollution data.

Sectoral conditions further complicate the relationship. Heavy-polluting industries face large fixed assets, long technology cycles, and dependence on established energy systems. Carbon lock-in can make incremental disclosure inexpensive while making deep transformation technically and financially difficult (Unruh, 2000). Disclosure policies may also impose valuation or compliance consequences on heavily polluting enterprises without producing proportional abatement (Liu et al., 2023). Pollution intensity should therefore not be assumed to strengthen ESG effects; it may weaken them when transition costs, stranded-asset risks, and limited technological alternatives dominate.

5. Social Pathways: The Underdeveloped Dimension

Compared with environmental performance, the social consequences of ESG are less consistently conceptualized and measured. Firm-level studies usually examine employee safety, training, diversity, customer relations, philanthropy, or employment. These outcomes matter, but regional sustainable development requires a wider lens encompassing

educational opportunity, gender equality, social mobility, health, trust, and life satisfaction. The analytical challenge is attribution: provincial social indicators reflect public services, demographic change, household institutions, and labor-market structure as well as corporate conduct.

A credible cross-level mechanism nevertheless exists. Responsible firms can raise employment stability, wages, safety, and training; purchase from local suppliers; improve access for disadvantaged groups; and support community infrastructure. If such practices diffuse across a regional labor market, they may narrow opportunity gaps and strengthen social satisfaction. Stakeholder theory predicts these benefits when employees and communities have sufficient salience, but hierarchical salience cautions that politically visible initiatives may receive greater attention than less observable distributional outcomes.

The current evidence base is therefore better described as promising than conclusive. Studies of Chinese SOEs show that corporate social responsibility practices can improve organizational performance (Zhu et al., 2016), yet firm performance is not equivalent to regional welfare. Similarly, evidence that ESG activities correlate with firm performance (Ruan & Liu, 2021) does not establish reduced inequality. Future studies should link geocoded corporate practices to household surveys and administrative indicators, distinguish job quantity from job quality, and test distributional effects across gender, education, urban-rural status, and income groups. Without such designs, the S pillar risks remaining a disclosure category rather than an empirically demonstrated contribution to inclusive development.

6. Economic Pathways: Beyond Financial Performance

The economic literature has largely evaluated whether ESG creates value for the firm. Evidence from Chinese power-generation companies suggests a relationship between ESG and corporate financial performance (Zhao et al., 2018), while broader research links ESG activity to performance through reputation, risk control, operational efficiency, and access to finance (Ruan & Liu, 2021). These private benefits can support sustainable growth by reducing downside risk and enabling long-horizon investment. Nevertheless, a region can host profitable ESG leaders while still experiencing inequality, low productivity, or an unbalanced industrial structure.

A regional perspective shifts attention from accounting returns to the quality and distribution of growth. Sustainable finance may help mobilize capital toward SDG-compatible projects, although its effectiveness depends on institutions and allocation mechanisms (Ziolo et al., 2021). Corporate ESG can contribute through green capital formation, innovation spillovers, supplier upgrading, more efficient resource use, and resilience to environmental or regulatory shocks. These channels may raise green total factor

productivity and high-quality economic development while reducing dependence on pollution-intensive expansion.

The central unresolved issue is additionality. Capital may flow to firms already likely to perform well, producing selection rather than transformation. Strong ESG firms may cluster in wealthier provinces with better governance, universities, finance, and infrastructure. Shen et al. (2023) emphasize both progress and continuing challenges in China's corporate sustainable development, implying that firm behavior cannot be separated from regional capability. Cross-level research must therefore address sorting, reverse causality, and common policy exposure through firm and time fixed effects, lagged models, matching, instrumental variables where credible, and policy-shock designs.

7. Governance Boundary Conditions

Ownership structure is a defining boundary condition. SOEs receive stronger policy signals, have closer access to state-controlled finance, and can mobilize resources for long-horizon projects. Their ESG investments may therefore translate more directly into regional outcomes. Research on Chinese national SOEs documents performance improvements associated with CSR practices (Zhu et al., 2016). Environmental regulation also shapes corporate ESG performance, showing that formal policy can alter firm behavior (Lu & Cheng, 2023). These patterns support a positive moderation hypothesis for state ownership.

Yet SOE status has an ambiguous theoretical effect. Political visibility can encourage substantive investment, but it can also reward ceremonial compliance. Where targets emphasize report production, ratings, or easily observed projects, SOEs may respond with high-quality disclosure while underlying operations change slowly. Private firms may face fewer political resources but stronger competitive discipline and innovation incentives (Al Musheifri et al., 2026). Ownership should thus be treated as a configuration of authority, resources, and accountability rather than a binary label with a universally positive coefficient.

Industry pollution intensity is similarly conditional. High-impact sectors offer greater abatement potential, which could magnify returns to ESG. Conversely, lock-in, capital intensity, and transition costs can suppress responsiveness. The relevant moderator may be the interaction between pollution intensity and technological capability, financing access, regulatory enforcement, and local industrial dependence. A null average moderation effect would therefore be theoretically informative: it may conceal strong effects among technological leaders and weak or negative effects among laggards.

Finally, regional institutions determine whether firm actions aggregate. Provincial enforcement, market development, fiscal capacity, energy structure, and innovation ecosystems influence both ESG adoption

and the conversion of investment into outcomes. Hierarchical stakeholder salience predicts stronger alignment where implementation channels are coherent, but also potential regional divergence where local growth incentives conflict with national sustainability goals.

8. An Integrated Research Agenda

The literature supports a cross-level framework in which firm ESG affects regional environmental, social, and economic outcomes through accumulation, innovation, and spillovers. Green innovation is a core mediator; ownership, pollution intensity, regional institutions, and technological capability are boundary conditions. Four priorities can make this framework empirically credible.

First, measurement should separate ESG signals from sustainability outcomes. Researchers should retain ratings as indicators of corporate commitment or stakeholder recognition, but validate them against physical emissions, clean-energy shares, workplace outcomes, household welfare, regional inequality, and green productivity. Multiple rating providers and pillar-specific measures can reveal whether results survive aggregate confusion (Berg et al., 2022).

Second, designs must respect levels of analysis. Firm-year ESG should be aggregated using theoretically justified weights, such as operating scale, employment, emissions exposure, or local asset presence. Province-year outcomes should be modeled with multilevel or two-way fixed-effects approaches, and standard errors should reflect clustering. Spatial models are needed where pollution, technology, labor, or supply-chain effects cross provincial borders.

Third, causal identification should exploit institutional change. Mandatory disclosure reforms, green-finance pilots, environmental inspections, carbon-market expansion, and ownership reforms can provide difference-in-differences or event-study settings. Parallel-trend diagnostics, staggered-treatment estimators, placebo tests, and sensitivity analysis are necessary. Mediation analysis should establish temporal ordering: ESG change should precede innovation, which should precede outcome change.

Fourth, future studies should examine trade-offs. A project that lowers emissions may reduce employment in a carbon-dependent locality; an SOE-led transition may accelerate investment while crowding out smaller firms; green growth may improve averages without narrowing inequality. Sustainable-development claims require simultaneous examination of environmental, social, and economic dimensions rather than isolated positive coefficients. The most useful dependent variable is therefore not a single composite index alone, but a transparent dashboard that preserves distributional and biophysical meaning.

9. Conclusion

The literature increasingly supports the proposition that ESG investment by Chinese listed firms can contribute to sustainable development, especially through environmental improvement, green innovation, risk reduction, and higher-quality growth. However, existing evidence remains concentrated at the firm level and does not yet fully demonstrate how these gains accumulate into provincial environmental, social, and economic progress. The social dimension is particularly underdeveloped, and rating-based studies remain vulnerable to disclosure-performance decoupling.

A cross-level perspective resolves this mismatch by treating corporate ESG as an input and regional sustainability as an outcome. Aggregate stakeholder externalities explain how repeated firm practices can generate system effects, while hierarchical stakeholder salience explains why state ownership and policy alignment matter in China. These mechanisms also clarify why high-polluting industries may not respond more strongly: technological lock-in and transition costs can interrupt the pathway from ESG commitment to material change.

For scholarship, the implication is clear: ESG should be judged against independently measured SDG-related outcomes using multilevel, longitudinal, and causally credible designs. For policy and management, disclosure standards should become more outcome-oriented, green innovation should be supported as a transmission mechanism, and transition strategies should reflect ownership and sectoral constraints. Such an approach moves the debate beyond whether ESG is beneficial to the firm toward the more consequential question of when corporate sustainability investment becomes regional sustainable development.

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