

The Impact of Environmental Legislation in Shaanxi Province on Corporate Ecological Investment Decisions: From the Perspective of Environmental Responsibility Governance

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Abstract: Shaanxi Province's environmental legislation imposes emission limits, technology access standards, and liability traceability rules, thereby exerting multi-dimensional effects on corporate ecological investment decisions. From the perspective of environmental responsibility governance, this study analyzes how legislative stringency guides the internal allocation of corporate resources, regulates managerial incentives, and interacts with investment thresholds. It further examines the intervention modes of the responsibility governance system on the sedimentation of ecological assets and the allocation of operational costs, the shaping effects of compliance pressure on the staged adoption of technologies, and the matching logic between responsibility tiers and investment cycles. Meanwhile, it explores the modifying role of legislative differentiation characteristics on the marginal returns of ecological investment, the positive correlation between the intensity of liability traceability mechanisms and corporate willingness to preserve ecological capital, and the disturbance and rebalancing mechanisms of legislative update frequency on the stability of investment decisions. The findings indicate that environmental legislation, by converting external costs into internal expected liabilities, refining liability attribution clauses, and introducing enforcement uncertainty, prompts corporations to restructure their ecological investment portfolios and develop adaptive rebalancing behaviors. This research provides an analytical framework for understanding how regional environmental legislation influences long-term corporate capital allocation through the chain of responsibility governance.

Keywords: Corporate Management; Shaanxi Province's Environmental Legislation; Ecological Investment Decisions; Environmental Responsibility Governance; Investment Thresholds

Introduction

Corporate ecological investment decisions are directly related to the improvement of regional environmental quality and the process of industrial green transformation; however, as an external institutional constraint, environmental legislation's pathways of influence and depth of impact have not yet been fully revealed. Existing literature predominantly focuses on the simple linear relationship between legislative stringency and corporate environmental expenditure, while neglecting the intrinsic moderating effects of structural factors within the responsibility governance system—such as liability attribution, traceability mechanisms, and update frequency—on investment behaviors. Focusing on the legislative practice in Shaanxi Province, it is necessary to adopt the perspective of environmental responsibility governance, because this perspective can transform the obligation clauses in legislative texts into observable decision-making constraints for enterprises, thereby explaining why, under the same regulatory framework, firms exhibit differentiated willingness to invest ecologically and divergent structural evolution paths. The significance of this study lies in the fact that, by analyzing the shaping mechanisms of three dimensions—legislative stringency, responsibility governance system, and legislative differentiation characteristics—on corporate resource allocation, technology adoption, and return expectations, it compensates for the insufficient attention paid in existing research to the transmission function of the responsibility chain, and provides a theoretical reference for enterprises to reasonably assess the investment risks and returns arising from regulatory changes.

1. Mechanisms of Association between Environmental Legislative Stringency and Corporate Willingness to Make Ecological Investments

1.1 The Guiding Role of Environmental Legislative Constraints on Corporate Internal Resource Allocation

The emission limits and technology access standards set forth in Shaanxi Province's environmental legislation directly alter the constraint conditions within corporate production functions. Confronted with these statutory requirements, enterprises are compelled to reassess the weighting of capital allocation among existing equipment upgrades, pollution control, and end-of-pipe treatment. From the perspective of responsibility governance, legislative provisions partially convert the external costs of environmental damage into expected liabilities recorded in corporate accounts, thereby prompting management to prioritize compliance-oriented ecological assets in the capital budgeting process. This guiding effect is not merely one-way coercion; rather, by influencing the marginal abatement cost curve, it redirects resources away from inefficient environmental inputs toward areas that carry clearly defined statutory return expectations.

In actual practice, enterprises typically compare the compliance contribution rates and capital occupation cycles of different environmental protection projects. The more specific the environmental legislation, the more inclined enterprises are to allocate a fixed proportion of their annual technical renovation budget to ecological investments that are directly linked to statutory standards. For example, concentration requirements for volatile organic compound emissions drive enterprises to increase inputs in filtration and recovery equipment, while concurrently reducing general maintenance expenditures. This resource reallocation process is accompanied by adjustments in internal decision-making authority, as finance and production departments form new negotiation mechanisms around the sharing of compliance costs, ultimately manifesting as a systematic increase in the share of ecological assets within the corporate fixed-asset structure^[1].

1.2 The Moderating Effect of Statutory Liability Attribution in Ecological Investment Decisions on Managerial Incentives

When environmental legislation explicitly defines the statutory liabilities of enterprises and their managers with respect to ecological damages, the risk-return calculus at the individual managerial level undergoes a significant shift. The statutory codification of liability attribution implies that, in the event of environmental noncompliance, the decision-makers involved face not merely firm-level fines but may also be subject to economic compensation claims or occupational restrictions at the personal level. Such an institutional arrangement weakens managers' incentives to delay ecological investment in exchange for short-term performance gains, because the potential liability costs arising from delay are likely to far exceed the current expenditures saved. From the perspective of responsibility governance, the completeness of the statutory liability chain determines the relative preference of management for ecological projects when approving capital expenditures.

In the specific context of the investment decision-making process, the degree of refinement of liability attribution clauses directly influences the setting of risk weights during the feasibility study stage. Management tends to require that ecological investment proposals include liability isolation designs—for example, by establishing special environmental protection fund pools or introducing third-party environmental liability determination mechanisms—so as to reduce the risk of personal decision-making exposure to uncertain regulatory interpretations. At the same time, statutory liability also prompts enterprises to adopt more conservative investment hurdle rates, that is, to require lower internal rate of return standards for ecological projects than for conventional expansion projects. This motivational adjustment does not stem from moral self-consciousness, but rather from rational anticipation of statutory consequences, thereby fostering a more stable pattern of ecological investment behavior at the organizational level.

1.3 The Linkage between Corporate Risk Perception and Investment Thresholds under Regulatory Enforcement Uncertainty

The fluctuating range between the textual provisions of Shaanxi Province's environmental legislation and their enforcement discretion significantly elevates corporate subjective uncertainty regarding the future distribution of compliance costs. Such uncertainty does not necessarily suppress ecological investment; rather, it affects firms' behavior in setting investment thresholds by altering their

Bayesian updating process concerning the probability of investment failure. When enterprises perceive regional differences or temporal volatility in regulatory enforcement, they tend to raise the minimum expected rate of return requirements for ecological investment projects, so as to compensate for potential additional compliance expenditures. From the perspective of responsibility governance, this risk premium adjustment is, in effect, an institutional response to the lack of legislative predictability^[2].

Enterprises typically adopt a two-stage approach to cope with enforcement uncertainty: first, they invest in small-scale, reversible adaptive environmental retrofits, and then, based on subsequent signals regarding regulatory enforcement, decide whether to expand investment scale. This strategy renders the relationship between threshold values and uncertainty nonlinear — within a moderate range of uncertainty, firms may actually increase expenditures on information gathering and pilot projects for ecological investment, so as to reduce decision-making blind spots. When uncertainty exceeds a certain threshold, however, enterprises will turn to fully postponing non-mandatory ecological projects. This linkage explains why, under the same legislative framework, different firms exhibit divergent investment tempos: the key lies in their respective subjective probability assignments regarding regulatory enforcement stability, which in turn produce differentiated magnitudes of adjustment in investment thresholds.

2. Evolutionary Pathways of Ecological Investment Structure from the Perspective of Environmental Responsibility Governance

2.1 Intervention Modes of the Responsibility Governance System in the Sedimentation of Environmental Assets and the Allocation of Operational Costs

The environmental responsibility governance system, by defining the obligations that enterprises must assume—including environmental restoration, damage compensation, and compliance monitoring—directly alters the rules for the initial recognition and subsequent measurement of environmental assets. Under this institutional framework, assets such as pollution treatment equipment and ecological monitoring stations are no longer merely regarded as production cost centers; rather, they are redefined as material carriers for fulfilling statutory responsibilities. The finer the granularity of responsibility governance, the more enterprises tend to lock a fixed proportion of their operating cash flows into designated environmental protection expenditures, instead of incorporating them into the flexible pool of routine expenses. This intervention manifests as a positive correlation between the rate of asset sedimentation and the frequency of amendments to responsibility clauses—that is, whenever the scope of responsibility is refined, enterprises accelerate the recognition of corresponding investment in such assets.

At the level of operational cost allocation, the responsibility governance system introduces an itemized liability attribution mechanism, which prevents environmental expenditures arising from different production processes from being offset against one another. Enterprises must, in accordance with the liability chain specified by regulations, record end-of-pipe treatment costs, process control costs, and ecological remediation costs separately into the income statements of each business unit. This allocation method suppresses the traditional practice of lumping environmental protection expenditures into a single package, and instead requires the financial system to establish cost codes that correspond one-to-one with the tiers of responsibility. In actual practice, enterprises adjust their internal transfer pricing rules so that production lines generating higher environmental liabilities bear higher depreciation expenses for ecological assets, thereby forming a cost-pressure transmission pathway within the organization and channeling resources toward processes with lower liability burdens. Furthermore, the itemized liability attribution mechanism prompts enterprises to separately list the environmental expenditure caps for each responsibility center when preparing annual budgets, with any excess amount to be borne by the center itself, thus reinforcing the rigid constraint of cost allocation^[3].

2.2 The Shaping Effect of Environmental Compliance Pressure on the Staged Adoption of Ecological Technologies by Enterprises

The compliance deadlines and emission reduction gradients set forth in Shaanxi Province's environmental legislation force enterprises to face staged decision-making regarding technology options. Compliance pressure does not act uniformly on all ecological technologies; rather, in accordance with the urgency of regulatory requirements, it drives firms to sequentially adopt low-cost operational optimization technologies, medium-investment end-of-pipe control technologies, and

high-capital-intensity source-substitution technologies. This staged characteristic arises from the matching relationship between the payback periods of different technologies and the deadlines for compliance. In the first stage, enterprises typically opt for managerial measures that do not involve major equipment changes; only as the remaining compliance time shortens do they proceed to the technology upgrading stage that requires fixed-asset investment.

From the perspective of the specific rhythm of technology adoption, compliance pressure also influences enterprises' preferences between mature technologies and emerging ones. When statutory compliance deadlines are relatively lenient, firms are willing to adopt small-scale pilot approaches to test the applicability of novel ecological technologies, thereby accumulating operational data for subsequent full-scale deployment. Once compliance pressure approaches a critical threshold, however, enterprises shift toward mature technological solutions that have already been validated by peers in the industry, so as to avoid the risk of compliance default resulting from technological failure. This shaping effect leads to a convergence trend in the technological pathways of different firms within the same industry, particularly in regions where regulatory enforcement consistency is high; the staged division of ecological technology adoption gradually converges, forming an observable temporal pattern of technology diffusion. It is worth noting that if the gradient design of compliance pressure reserves a sufficient buffer period for technological adaptation, firms are actually more willing to introduce more forward-looking technological solutions at an early stage, thereby breaking the original passive adoption rhythm^[4].

2.3 The Matching Logic between Differences in Responsibility Governance Tiers and Investment Cycle Durations

The environmental responsibility governance system typically encompasses multiple tiers, such as on-site operational responsibility, workshop management responsibility, and corporate legal liability; different tiers of liability attribution correspond to differentiated investment decision-making cycles. Responsibilities at the operational level are often associated with routine maintenance investments, which have short decision-making cycles and are usually completed within quarterly or annual budgets. In contrast, responsibilities at the corporate level pertain to the overall environmental compliance system architecture of the entire enterprise; the corresponding investment projects—such as plant-wide environmental retrofits or multi-year ecological restoration projects—often span three to five fiscal years. This matching logic indicates that the higher the responsibility tier, the longer the lower bound of the investment cycle, making it difficult for enterprises to circumvent the capital expenditure demands arising from higher-tier responsibilities through short-term fund allocation.

Further observation reveals that the clarity of responsibility governance tiers determines whether enterprises can effectively manage the portfolio of investment projects with different cycles. When the boundaries at each responsibility level are clearly defined, enterprises can simultaneously operate multiple ecological investment projects of varying durations, using the cash flow recovered from short-term projects to support the capital occupation of long-term projects. Conversely, if there are overlaps or ambiguities among responsibility tiers, enterprises tend to uniformly lengthen their investment cycles in order to enhance their buffering capacity against uncertain liability traceability. This matching logic explains why, under the same legislative environment, enterprises that have established clear responsibility tier divisions exhibit a significantly higher proportion of short-cycle projects in their ecological investment portfolios than those with ambiguous responsibility governance structures. Clear division of responsibility tiers also facilitates enterprises' ability to break down long-term investments into several short-term, verifiable sub-stages, thereby reducing the risk of the entire investment chain being obstructed due to unclear liability attribution at a single link.

3. The Shaping of Corporate Expectations for Ecological Investment Returns by the Differentiated Characteristics of Environmental Legislation

3.1 The Modifying Effect of Fine-Grained Changes in Regulatory Provisions on the Marginal Returns of Ecological Investment

The fine-grained adjustments in provisions concerning emission concentrations, total volume control, and monitoring frequency within Shaanxi Province's environmental legislation directly alter the marginal abatement benefit curve corresponding to corporate ecological investment. When regulations compress the limit value of a given pollutant from a lenient range to a stringent one, the

existing end-of-pipe treatment equipment exhibits a diminishing marginal return characteristic in the process of meeting the new standards—that is, the incremental compliance benefit brought by each additional unit of investment gradually narrows. This modifying effect prompts enterprises to recalculate the break-even point of ecological investment: in the early stage of limit tightening, firms tend to increase investment to achieve rapid compliance; however, once the technological feasibility boundary is approached and marginal returns approach zero, the economic rationality of continued additional investment becomes questionable^[5].

Fine-grained changes are also manifested in the combination effects among different regulatory provisions. For instance, simultaneously adjusting the standards for water pollutant discharge and the frequency of soil monitoring creates cost linkages between two types of ecological investment projects that were originally independent. When evaluating the marginal returns of a particular type of investment, enterprises must incorporate the potential compliance costs arising from the requirements of other regulations into their considerations. This interactive modification among provisions leads to the outcome that the marginal returns of ecological investment are no longer determined by a single regulation, but are instead dominated by the minimum constraint condition of the entire regulatory system. In actual decision-making, enterprises will prioritize technological solutions that can simultaneously respond to multiple fine-grained provisions; even though such solutions entail higher initial investments, their comprehensive marginal returns often outperform those of decentralized investment strategies.

3.2 The Positive Correlation between the Intensity of the Liability Traceability Mechanism and Corporate Willingness to Preserve Ecological Capital

The intensity of the liability traceability mechanism is reflected in aspects such as the retroactive recognition period for historical environmental damages, the allocation of the burden of proof, and the scope of joint and several liability. When the traceability mechanism is of high intensity, enterprises, even after having fulfilled current compliance requirements, still face the risk that past production behaviors may be reincorporated into liability determinations. Such an institutional arrangement significantly heightens corporate attention to the expected service life of already-invested ecological assets, because once it is confirmed through traceability that certain equipment or processes fail to cover the historical emission gaps, the relevant assets may face premature decommissioning or pressure for additional retrofitting. Enterprises consequently develop a stronger willingness to preserve ecological capital, that is, they tend to prefer technological solutions that offer longer retroactive compatibility periods with compliance requirements in their investment decisions.

The specific manifestations of this preservation willingness include: enterprises prefer modularly designed environmental protection equipment, so that when the scope of regulatory traceability expands, they can maintain asset functionality through partial replacement rather than full replacement; at the same time, they tend to shorten the accounting life of ecological assets in depreciation policies, so as to accelerate capital recovery to hedge against traceability risks. This positive correlation is particularly evident when the liability traceability mechanism includes joint and several liability clauses, because joint and several liability means that environmental violations by upstream or downstream enterprises may also affect the firm itself. Enterprises will extend ecological capital preservation behaviors to the domain of supply chain management; by investing in more traceable environmental monitoring systems, they ensure that the ecological assets they hold possess a clear chain of compliance evidence within the liability traceability chain, thereby reducing the likelihood of asset value being reassessed.

3.3 The Disturbance and Rebalancing of Investment Decision Stability Caused by the Update Frequency of Legislative Content

The revision cycle and update frequency of Shaanxi Province's environmental legislation convey signals to enterprises regarding the magnitude of future regulatory changes. When the update frequency is high, enterprises find it difficult to determine the full-life-cycle return expectations of ecological investment projects based on current regulatory content, because before the investment is fully recovered, the regulations may have already undergone new adjustments. This disturbance effect manifests as a decline in corporate willingness to initiate long-term ecological investment projects—such as site soil remediation or multi-year wastewater treatment system construction—while increasing the proportion of expenditure allocated to short-term, flexibly adjustable leased environmental protection equipment or outsourced treatment services. The time horizon for investment

decision-making is consequently compressed, and enterprises tend to adopt real option pricing methods to value ecological projects, so as to retain the flexibility to exit at any time.

In the face of the disturbance induced by frequent updates, enterprises develop rebalancing mechanisms to restore the stability of investment decisions. One common rebalancing approach is to establish an internal early-warning and investment decision linkage model, which incorporates possible future directions of legislative changes as scenario analysis variables into the project evaluation process. Based on the historical frequency and topical distribution of regulatory updates, firms infer the medium-term risk exposure in specific ecological technology areas, and accordingly allocate both low-risk basic compliance assets and high-risk high-efficiency emission-reduction assets within their investment portfolios, thereby forming a risk hedge. Another rebalancing approach is to proactively shorten the information collection cycle for investment decisions, adjusting the originally annual environmental compliance reviews to quarterly rolling assessments, so as to capture regulatory change signals in a timely manner and adjust the investment rhythm accordingly. These rebalancing behaviors enable enterprises to maintain the overall scale of ecological investment even under frequent updates to legislative content, while merely subjecting the investment structure and temporal distribution to adaptive reorganization.

Conclusion

Shaanxi Province's environmental legislation, through the setting of constraint conditions, the statutory codification of liability attribution, and the transmission of enforcement uncertainty, directly affects the willingness level and threshold values of corporate ecological investment. The responsibility governance system, by intervening in asset sedimentation modes, operational cost allocation, the rhythm of technology adoption, and investment cycle matching, shapes the staged evolutionary pathway of ecological investment structures. Among the differentiated characteristics of legislation, the fine granularity of provisions, the intensity of traceability mechanisms, and the update frequency further modify expectations of marginal returns on ecological investment, reinforce corporate behaviors of ecological capital preservation, and give rise to rebalancing mechanisms in investment decisions amid disturbances. Future research may be extended along the following directions: First, to explore the divergences in ecological investment strategies and their underlying driving factors among enterprises with different industrial attributes (e.g., resource-intensive versus technology-intensive) under the same legislative environment. Second, to construct dynamic models that simulate the nonlinear response relationships between the magnitude of adjustments in legislative provisions and the restructuring of corporate investment portfolios. Third, to incorporate the transmission of supply-chain environmental responsibility into the analytical framework, and to examine the synergistic or substitution effects of ecological investment behaviors among upstream and downstream enterprises.

Fund Projects

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