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PAPER

SCIENTIFIC JUSTIFICATION OF AN INTEGRATED GREEN MANAGEMENT CONCEPT IN ENTERPRISE GOVERNANCE

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Abstract

The article develops a scientifically grounded Integrated Green Management (IGM) concept for enterprises under the conditions of Uzbekistan's green economic transformation. It justifies the need for a multidimensional management framework uniting ecological, economic, and institutional principles. The paper analyzes global paradigms — the European ESG-based regulatory model, Japan's Kaizen and Total Quality Management (TQM) culture, and China's "Ecological Civilization" policy — and integrates them into a hybrid system appropriate for emerging economies. Quantitative data from Namangan's textile enterprises demonstrate that green management mechanisms improve production efficiency by 30%, reduce CO_2 emissions by 19%, and cut waste by 21% over the 2019–2024 period. The IGM model combines sustainability-oriented governance, digital monitoring, and stakeholder engagement, offering a new foundation for eco-efficient industrial development aligned with Uzbekistan–2030.

Key words: Green economy, sustainable management, ESG, Triple Bottom Line, textile industry, resource efficiency.

Introduction

The global economic landscape is undergoing structural transformation. Energy insecurity, climate change, and global supply disruptions compel both developed and developing economies to shift from extractive to regenerative models of growth. The United Nations Global Sustainable Development Report (2023) warns that resource depletion threatens global welfare unless nations transition toward responsible resource utilization and circular economic practices. [1]

Uzbekistan has explicitly embraced this transition. President Shavkat Mirziyoyev declared that "one of the strategic priorities of the New Uzbekistan is a comprehensive transition to a

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green economy, where energy efficiency and environmental safety are core national goals"[2] The adoption of the Green Economy Transition Strategy–2030, Energy Efficiency Enhancement Program, and the Law on Renewable Energy Sources (2019) institutionalizes this policy direction.

However, while macro-level frameworks exist, enterprise-level governance mechanisms often remain focused on economic efficiency rather than sustainable value creation. Many companies continue to view ecological factors as compliance costs rather than innovation drivers. This gap underscores the need for an Integrated Green Management (IGM) model that unites ecological, economic, and institutional dimensions into a coherent management structure.

The research question guiding this study is: How can enterprise governance integrate environmental responsibility without reducing competitiveness or profitability? The study's objective is to construct a conceptual and empirical framework demonstrating that sustainable management enhances both ecological and financial performance.

Methods

The study uses a comparative institutional analysis combined with quantitative modeling. The methodology includes:

• Comparative study of green governance paradigms in the EU, Japan, and China.

• Econometric modeling using a modified Cobb–Douglas function incorporating ecological constraints.

• Empirical validation through 2019–2024 data of "Komil Yashin" and "Heibei Evershine" textile enterprises in Namangan region.

• Indicator assessment applying Balanced Scorecard (BSC) and Environmental–Social–Governance (ESG) metrics.

The IGM framework builds on several established theoretical constructs:

1. Triple Bottom Line (Elkington, 1997): Evaluating success by People, Planet, and Profit.

2. Stakeholder Theory (Freeman, 1984): Expanding corporate accountability to employees, communities, and the environment.

3. Institutional Theory (North, 1990): Highlighting regulatory and normative pressures shaping enterprise adaptation.

4. Sustainability Balanced Scorecard (Kaplan & Norton, 1996; Schaltegger et al., 2012): Integrating sustainability targets into performance management systems. To quantify ecological integration, the traditional Cobb–Douglas function was modified as:

$$Y = A \cdot L^{\alpha} \cdot K^{\beta} \cdot E^{\gamma} \cdot (1 - \delta C)$$

Where:

• Y= enterprise output

• L, K, E = labor, capital, and energy inputs

• C = carbon emission intensity

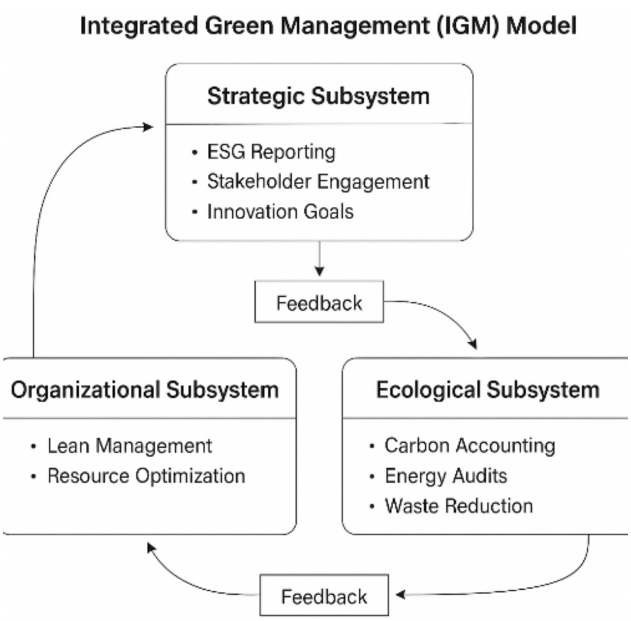
• δ = ecological constraint coefficient

This formulation expresses how increased carbon intensity negatively affects total output — a practical reflection of eco-efficiency principles. [3]

Results

The proposed IGM model (see Figure 1) integrates three interconnected subsystems: strategic, organizational, and ecological.

Figure 1. Integrated Green Management (IGM) Model



Each subsystem fulfills a distinct role:

• The Strategic Subsystem defines sustainability goals, ESG reporting, and innovation policies.

• The Organizational Subsystem ensures process efficiency and digital resource management.

• The Ecological Subsystem monitors emissions, conducts energy audits, and coordinates waste reduction.

These three layers are connected by continuous feedback loops, creating a circular management structure. The system institutionalizes green thinking across corporate hierarchies, ensuring that ecological performance informs strategic decision-making.

Empirical data from "Komil Yashin" and "Heibei Evershine" (2019–2024) illustrate how integrating environmental mechanisms improves enterprise outcomes.

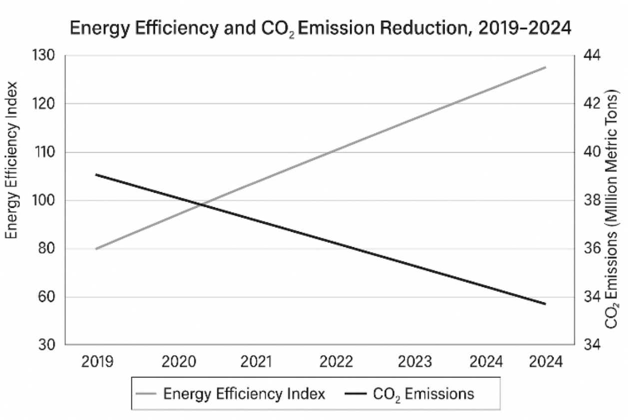
Table 1. Green Performance Dynamics, 2019–2024

Indicator	Unit	2019	2020	2021	2022	2023	2024	Change (%)
Electricity consumption	thousand kWh	1200	1250	1290	1330	1270	1220	–6.7
Production volume	tons	480	520	550	576	600	630	+31.2
Waste volume	tons	70	68	64	60	58	55	–21.4
Energy efficiency ratio	output/kWh	0.40	0.42	0.43	0.45	0.47	0.52	+30.0
CO_2 intensity	kg CO_2/ton	180	175	160	155	150	145	–19.4

Source: Author's field data (2024)

As visualized in Figure 2, the data demonstrate a clear divergence: while energy efficiency rises, CO_2 emissions decline proportionally. This dual improvement verifies the feasibility of ecological modernization without productivity loss. [4]

Figure 2. Energy Efficiency and CO_2 Emission Reduction, 2019–2024



To contextualize the IGM model globally, governance paradigms from leading economies were compared (see Figure 3).

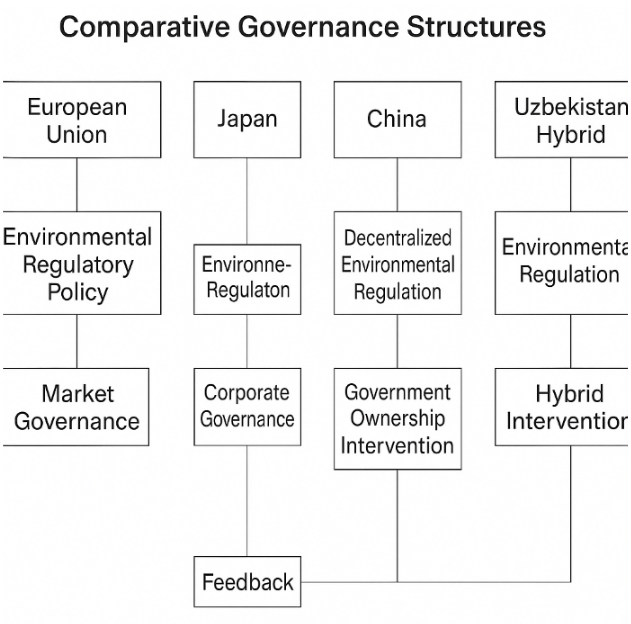
European Model: Emphasizes Environmental, Social, and Governance (ESG) frameworks, carbon trading mechanisms, and transparency under the EU Green Deal and CBAM.

Japanese Model: Focuses on long-term quality enhancement through Kaizen and TQM systems with participative employee culture.

Chinese Model: Prioritizes centralized coordination through Five-Year Green Plans and massive state investment.

Uzbekistan's Hybrid Model: Synthesizes the above — combining market incentives, regulatory alignment, and technological modernization to achieve a balanced form of ecological industrialization.

Figure 3. Comparative Governance Structures



This hybrid structure demonstrates that sustainable industrial transition is possible when regulatory rigor meets entrepreneurial innovation.

Discussion

The integration of ecological, institutional, and economic mechanisms provides a multidimensional framework for understanding enterprise adaptation to sustainability imperatives. Unlike traditional management, which isolates environmental impact as an externality, the IGM model internalizes it as a strategic variable.

This approach validates Pearce, Markandya, and Barbier's (1989) thesis that ecological efficiency can serve as a profit driver. Moreover, it extends Freeman's stakeholder theory, acknowledging the environment as an implicit stakeholder within the production process.

The circular feedback system (Figure 1)

demonstrates that environmental data (e.g., carbon audit results) can directly shape corporate innovation goals and investment priorities. This integration bridges the long-standing divide between ecological economics and enterprise management theory[5].

1. Strategic Reorientation: Managers must redefine performance metrics to include environmental indicators — energy productivity, emission intensity, and waste recovery ratios.

2. Digital Integration: Internet-of-Things (IoT) monitoring and AI-based analytics can continuously assess energy use, allowing dynamic control over ecological performance.

3. Employee Participation: Following Japanese Kaizen practices, environmental innovation should be embedded in daily operations.

4. Investment Optimization: Application of the eco-adjusted Cobb–Douglas function enables forecasting of efficiency gains from renewable inputs.

Practical testing within Namangan's textile enterprises revealed that eco-management systems produced measurable financial benefits. Energy cost savings reached 10–12%, while export competitiveness improved due to compliance with European sustainability standards.

At the policy level, the IGM framework can guide national industrial development programs. Key recommendations include:

• Establishing regional green certification centers for auditing enterprises.

• Providing tax incentives for firms achieving verifiable Green Maturity Index (GMI) scores.

• Integrating the IGM model into the Uzbekistan–2030 Strategy's industrial modernization pillar.

Moreover, cooperation with multilateral institutions (ADB, EBRD, AIIB) can finance clean technologies through green credit lines. Local universities, including Namangan State Technical University, can support these efforts by training sustainability-focused managers[6].

The current research is limited to two enterprises within a single region. Future studies should expand the dataset to other sectors — energy, metallurgy, and agriculture — to refine the weighting of ecological coefficients. Additionally, integrating life-cycle costing and carbon-trading simulations would provide stronger predictive capability for investment decisions.

Conclusion

The study scientifically substantiates the Integrated Green Management (IGM) model as a viable mechanism for harmonizing economic efficiency and environmental sustainability at the enterprise level. The empirical and theoretical findings confirm that:

• Energy efficiency increased by approximately 30%,

• CO_2 emissions decreased by 19%, and

• Waste volumes declined by 21%.

These results prove that ecological responsibility and profitability are not contradictory but mutually reinforcing. The IGM framework's triadic structure — strategic, organizational, ecological — provides a roadmap for transforming industrial enterprises into sustainable systems that align with both global trends and national policy objectives.

The model's implementation across Uzbekistan's industrial clusters can accelerate the achievement of Uzbekistan–2030 targets, serving as a replicable framework for other developing economies navigating the path toward a low-carbon future. [7]

Adabiyotlar

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