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**Energy Transition Governance and Climate Constitutionalism: A Comparative Legal Analysis
of Germany and South Korea in Renewable Energy Regulation and Sustainable Industrial
Transformation**

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ABSTRACT

The global transition toward renewable energy has fundamentally transformed contemporary legal systems, regulatory governance structures, industrial policy frameworks, and climate accountability mechanisms. Energy transition governance increasingly functions not merely as environmental regulation but as a constitutional and developmental project involving institutional coordination, technological transformation, industrial restructuring, and socio-economic adaptation. This article examines how renewable energy governance shapes sustainable industrial transformation through a comparative legal analysis of Germany and South Korea. The study argues that effective energy transition governance depends on coherent integration among climate law, industrial policy, energy market regulation, technological innovation governance, and institutional accountability systems. Germany represents a decentralized and climate-constitutional governance model emphasizing environmental rights, energy democratization, and market-based renewable integration, whereas South Korea adopts a state-coordinated industrial transition model prioritizing technological modernization, strategic energy planning, and export-oriented green growth. Using comparative legal analysis, institutional governance theory, and regulatory process tracing, the article analyzes climate legislation, renewable energy frameworks, industrial transition policies, energy market

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reforms, carbon neutrality strategies, and administrative coordination systems across both jurisdictions. The findings indicate that governance effectiveness depends not solely on renewable energy expansion but on institutional interoperability, regulatory stability, industrial adaptation capacity, and public legitimacy. The article contributes to comparative legal scholarship by developing an integrated framework linking climate constitutionalism, industrial governance, energy regulation, and sustainable development. It further proposes theoretical propositions concerning adaptive climate governance, institutional coordination, and sustainable industrial resilience in contemporary energy transition law.

Keywords

energy transition law; climate governance; renewable energy regulation; comparative law; sustainable development; industrial transformation; Germany; South Korea; climate constitutionalism; green industrial policy

INTRODUCTION

The accelerating climate crisis has transformed energy governance into one of the most significant legal and institutional challenges of the twenty-first century. Governments worldwide increasingly confront the need to reconcile environmental sustainability, energy security, industrial competitiveness, and socio-economic stability within rapidly evolving global energy systems. According to the International Energy Agency (IEA, 2024), global renewable electricity generation is expected to surpass coal-fired power generation before 2026, while the renewable energy sector may account for over one-third of global electricity production by 2030. Simultaneously, the Intergovernmental Panel on Climate Change (IPCC, 2023) warns that failure to achieve rapid decarbonization could intensify economic instability, environmental degradation, and social inequality.

The global energy transition therefore involves far more than technological substitution. It represents a comprehensive restructuring of legal systems, industrial governance models, investment frameworks, administrative institutions, labor markets, and public accountability mechanisms. Climate governance increasingly intersects with industrial policy, competition regulation, constitutional rights, trade governance, technological innovation, and sustainable development planning. Consequently, energy transition law has emerged as a multidimensional governance field in which states seek to manage environmental risk while preserving economic resilience and institutional legitimacy.

This transformation reflects broader developments in climate constitutionalism and sustainable governance. Climate litigation, carbon neutrality legislation, renewable energy mandates, green industrial policies, and environmental rights frameworks increasingly constitutionalize climate governance within domestic and transnational legal systems (Peel & Osofsky, 2020). Simultaneously, governments are adopting green industrial strategies linking renewable energy expansion with industrial modernization, technological innovation, and economic competitiveness.

Within this context, Germany and South Korea represent two influential but institutionally distinct models of energy transition governance. Germany has developed one of the world's most advanced climate-constitutional frameworks through the Energiewende policy, Renewable Energy Sources Act (EEG), Climate Protection Act, and decentralized renewable energy governance systems. German energy governance emphasizes environmental sustainability, participatory governance, market-based renewable integration, and constitutional accountability. The Federal Constitutional Court's 2021 climate decision further strengthened climate governance by recognizing intergenerational obligations and constitutional climate responsibilities (Bundesverfassungsgericht, 2021).

South Korea, by contrast, has pursued a state-coordinated green industrial transition model integrating renewable energy expansion, technological modernization, export competitiveness, and industrial innovation. Through the Korean Green New Deal, Carbon Neutrality Act, hydrogen economy initiatives, and strategic industrial policy frameworks, South Korea institutionalizes energy transition governance within broader economic modernization and industrial transformation strategies (Korean Government, 2023). This governance model emphasizes centralized coordination, technological development, and industrial competitiveness.

The comparative significance of these governance systems extends beyond domestic energy policy. Germany increasingly influences European climate governance and global renewable energy regulation through environmental leadership and climate diplomacy. South Korea similarly shapes regional energy governance and green industrial development through technological innovation, battery manufacturing, and hydrogen economy initiatives. Both systems therefore contribute to evolving global governance debates concerning climate transition, sustainable industrialization, and energy justice.

Academic scholarship on energy transition governance has expanded significantly in recent years. Scholars such as Sovacool (2021) emphasize that energy transitions involve political, institutional, and socio-economic transformations rather than purely technological change. Setzer and Higham (2022) analyze the growing role of climate litigation in strengthening governmental accountability and climate governance obligations. Meanwhile, Mehling (2020) argues that carbon neutrality commitments increasingly reshape domestic legal systems and international governance structures.

Other scholars focus on green industrial policy and sustainable development. Rodrik (2023) contends that climate transition requires active state coordination and industrial policy rather than reliance solely on market mechanisms. Similarly, Geels et al. (2021) emphasize the importance of socio-technical transition governance and institutional adaptation within low-carbon transformation processes.

However, existing scholarship remains limited in several important respects. First, many studies focus primarily on environmental policy or technological innovation without sufficiently analyzing legal governance structures and institutional implementation mechanisms. Second, comparative legal analyses often fail to integrate climate constitutionalism, industrial policy, and sustainable development within a coherent analytical framework. Third, limited scholarship systematically examines how institutional

coordination mediates the relationship between renewable energy law and industrial transformation outcomes. Fourth, existing literature inadequately explains how climate governance influences socio-economic resilience, public legitimacy, and sustainable industrial adaptation.

This article addresses these gaps by developing an integrated comparative legal governance framework linking climate law, renewable energy governance, industrial transformation, and sustainable development. The article argues that energy transition governance should be understood as a form of climate constitutionalism in which legal systems structure relationships among environmental sustainability, industrial modernization, technological innovation, and institutional accountability.

The novelty of this article lies in three principal contributions. First, it conceptualizes energy transition governance as an integrated legal and industrial governance project rather than solely environmental regulation. Second, it develops a comparative framework explaining how institutional coordination mechanisms shape renewable energy implementation and industrial transformation. Third, it demonstrates how climate governance systems influence socio-economic resilience, industrial competitiveness, and sustainable development trajectories.

The analytical framework proposed in this article conceptualizes causal relationships among climate constitutionalism, institutional coordination, renewable energy governance, industrial adaptation, and sustainable socio-economic resilience. Specifically, the study examines how legal governance structures shape institutional interoperability, which subsequently influences implementation effectiveness, industrial transition capacity, public legitimacy, and sustainability outcomes.

Accordingly, this article aims to analyze how renewable energy governance systems in Germany and South Korea shape institutional implementation, industrial transformation, and sustainable socio-economic development within contemporary climate transition governance.

METHODOLOGY

This study employs a comparative legal governance methodology integrating doctrinal legal analysis, comparative institutional analysis, climate governance evaluation, and regulatory process tracing to examine renewable energy governance systems in Germany and South Korea. The research design is grounded in climate constitutionalism theory, adaptive governance frameworks, and sustainable industrial transition analysis, enabling the study to investigate how legal norms interact with energy markets, industrial policies, administrative institutions, and sustainability objectives. Germany and South Korea were selected because they represent globally influential yet structurally distinct governance models. Germany institutionalizes a decentralized and climate-constitutional framework emphasizing participatory renewable governance, environmental accountability, and market-based energy transition, whereas South Korea adopts a centralized industrial transition model prioritizing strategic coordination, technological modernization, and export-oriented green growth. The comparative variables include renewable energy regulation, climate

legislation, industrial policy integration, carbon neutrality governance, administrative coordination, energy market reform, public accountability structures, and socio-economic adaptation mechanisms. The study analyzes constitutional provisions, climate statutes, renewable energy legislation, industrial policy frameworks, parliamentary documents, administrative reports, and judicial decisions, including Germany's Climate Protection Act, Renewable Energy Sources Act, South Korea's Carbon Neutrality Framework Act, Green New Deal policies, and energy transition governance reports.

The analytical approach combines qualitative comparative interpretation with governance process tracing to identify causal institutional mechanisms linking legal frameworks with industrial transformation and sustainability outcomes. Legal interpretation is triangulated with renewable energy statistics, climate governance indicators, OECD policy reports, IEA energy datasets, World Bank development indicators, and institutional publications from the European Union, German Federal Ministry for Economic Affairs and Climate Action, and South Korean industrial and environmental authorities. Analytical reliability is strengthened through cross-case doctrinal comparison, institutional governance analysis, and policy implementation evaluation. Ethical considerations involve ensuring evidentiary consistency, avoiding unsupported institutional claims, and maintaining methodological coherence through reliance on verifiable legal and policy sources. Methodological limitations arise from evolving energy markets, fluctuating geopolitical conditions, and rapidly changing renewable technology sectors. Nevertheless, the comparative governance framework enables robust analysis concerning how legal systems operationalize energy transition governance within broader processes of climate adaptation, industrial restructuring, and sustainable development transformation.

Findings and Discussion

1. Climate Constitutionalism and Renewable Energy Governance

The comparative analysis demonstrates that Germany and South Korea institutionalize fundamentally different forms of climate constitutionalism and renewable energy governance. Germany's governance model is grounded in environmental constitutionalism, democratic participation, and decentralized renewable energy integration. The German Energiewende framework emphasizes long-term decarbonization, public participation, energy democratization, and legal accountability mechanisms. The Federal Constitutional Court's climate decision in 2021 significantly strengthened this framework by holding that insufficient climate measures may violate constitutional freedoms and intergenerational rights (Bundesverfassungsgericht, 2021).

This constitutional orientation shapes Germany's renewable energy governance architecture. The Renewable Energy Sources Act institutionalizes feed-in tariffs, renewable energy incentives, and decentralized market participation mechanisms. Renewable energy cooperatives, municipal energy initiatives, and local governance structures therefore play significant roles in implementation processes.

South Korea adopts a different governance paradigm emphasizing centralized strategic planning, industrial modernization, and technological competitiveness. The Korean Green New Deal and Carbon Neutrality Framework Act integrate climate governance within broader industrial transition strategies involving battery technologies, hydrogen infrastructure, renewable manufacturing, and export-oriented green industries.

The comparison reveals that Germany conceptualizes renewable energy governance primarily as environmental democratization and constitutional sustainability, whereas South Korea frames energy transition as industrial modernization and strategic economic transformation. This divergence reflects broader differences concerning governance legitimacy, administrative coordination, and state-market relations.

2. Institutional Coordination and Industrial Transition

The findings indicate that institutional coordination significantly influences the effectiveness of renewable energy governance and industrial adaptation. Germany operates through a decentralized governance structure involving federal authorities, regional governments, municipal institutions, energy cooperatives, market regulators, and environmental agencies. This structure enhances democratic legitimacy and public participation but occasionally creates implementation complexity and regulatory fragmentation.

Renewable energy expansion in Germany has encountered challenges involving grid infrastructure, permitting procedures, regional coordination, and industrial energy costs. OECD (2023) governance assessments indicate that decentralized implementation can slow infrastructure development despite strong legal commitments.

South Korea's governance model exhibits stronger centralization and industrial coordination. Climate governance, industrial strategy, technological innovation, and energy planning are integrated through coordinated governmental frameworks. The Korean state actively supports renewable manufacturing, battery production, hydrogen technologies, and green industrial investment through strategic planning and industrial incentives.

Table 1. Analytical Matrix of Comparative Legal and Governance Development

Variable	Germany	South Korea	Empirical Evidence	Analytical Interpretation
Governance Orientation	Climate constitutionalism and decentralized participation	State-coordinated industrial transition	Energiewende vs Korean Green New Deal	Governance legitimacy shapes implementation models
Renewable Energy Regulation	Market-based renewable integration	Strategic industrial renewable expansion	EEG vs industrial energy planning	Regulatory structures influence industrial adaptation

Institutional Coordination	Multi-level federal governance	Centralized administrative coordination	Federal-regional cooperation vs national strategic planning	Coordination mechanisms shape implementation efficiency
Climate Accountability	Constitutional judicial oversight	Administrative performance governance	Constitutional Court climate ruling vs executive coordination	Accountability models differ structurally
Industrial Policy Integration	Green industrial modernization with market coordination	Export-oriented green industrial strategy	EU green transition alignment vs industrial innovation planning	Industrial transition linked to governance structures
Public Participation	Strong civic and local participation	Technocratic policy coordination	Energy cooperatives vs centralized planning	Participation affects legitimacy and adaptation
Sustainability Outcomes	Democratic sustainability resilience	Rapid industrial transformation capacity	OECD and IEA indicators	Governance models shape resilience pathways

The table demonstrates that renewable energy governance effectiveness depends not solely on environmental targets but on institutional interoperability and industrial coordination capacity. This finding contributes to comparative governance theory by emphasizing that climate governance operates through integrated legal, economic, and industrial systems.

3. Energy Markets, Industrial Competitiveness, and Socio-Economic Adaptation

The comparison further reveals that renewable energy governance increasingly intersects with industrial competitiveness, labor transition, and socio-economic adaptation. Germany integrates climate governance within broader European sustainability objectives emphasizing green industrial modernization, labor transition support, and environmental accountability. However, rising industrial energy costs and geopolitical energy disruptions have intensified debates concerning competitiveness and energy security.

The evidence indicates that Germany's governance model prioritizes long-term sustainability legitimacy even when short-term economic pressures emerge. This reflects the constitutionalization of climate governance and strong public support for renewable transition objectives.

South Korea links renewable energy governance more directly to industrial competitiveness and technological innovation. Green industrial policy supports electric vehicle manufacturing, battery technology

development, hydrogen infrastructure, and renewable export industries. This governance model seeks to transform climate transition into a strategic economic opportunity.

However, centralized industrial governance also creates risks concerning policy concentration, corporate dependency, and uneven labor adaptation. Sustainable industrial transition therefore requires balancing economic competitiveness with social inclusion, labor protection, and regional adaptation.

The findings support Rodrik's (2023) argument that climate transition increasingly requires active industrial governance rather than purely market-based environmental regulation. Nevertheless, this study further demonstrates that governance legitimacy and institutional coordination remain essential for long-term sustainability resilience.

4. Public Legitimacy, Climate Litigation, and Sustainable Governance

A significant finding concerns the relationship between climate governance and institutional legitimacy. Germany's climate governance framework increasingly relies on judicial accountability, participatory governance, and constitutional review. Climate litigation strengthens governmental accountability while reinforcing public legitimacy concerning long-term sustainability objectives.

South Korea relies more heavily on administrative coordination, policy performance, and industrial modernization legitimacy. Governance effectiveness is measured primarily through implementation capacity, technological innovation, and economic adaptation outcomes rather than constitutional adjudication.

Despite these differences, both systems increasingly institutionalize climate transition as a central state responsibility requiring integrated governance mechanisms and long-term strategic planning. The comparison therefore reveals convergence concerning the importance of institutional coordination, industrial adaptation, and sustainability governance.

This study contributes to comparative legal scholarship by demonstrating that renewable energy governance should be understood as a multidimensional governance system involving constitutional accountability, industrial policy, technological innovation, and socio-economic transformation.

Theoretical Propositions

Proposition 1: Climate constitutionalism strengthens long-term sustainability governance legitimacy.

The findings indicate that constitutional integration of climate obligations enhances policy continuity, institutional accountability, and public trust in energy transition governance.

Proposition 2: Institutional interoperability mediates the relationship between renewable energy regulation and industrial resilience.

Effective energy transition governance depends on coordination among environmental agencies, industrial ministries, energy regulators, and local governance institutions.

Proposition 3: Green industrial policy transforms climate governance into economic governance.

Renewable energy regulation increasingly functions as industrial transformation policy shaping technological innovation, labor adaptation, and export competitiveness.

Proposition 4: Sustainable energy transition requires balancing environmental legitimacy with industrial adaptation capacity.

Governance systems that prioritize either environmental ambition without industrial adaptation or industrial competitiveness without accountability risk weakening long-term sustainability resilience.

CONCLUSION

This article examined how renewable energy governance systems in Germany and South Korea shape institutional implementation, industrial transformation, and sustainable socio-economic development. The study argued that contemporary energy transition governance constitutes a form of climate constitutionalism integrating environmental law, industrial policy, technological innovation, and institutional accountability.

The findings demonstrate that Germany adopts a decentralized and climate-constitutional governance framework emphasizing environmental accountability, democratic participation, and market-based renewable integration. South Korea, by contrast, implements a centralized industrial transition model prioritizing strategic coordination, technological modernization, and export-oriented green growth.

Theoretically, the article contributes to comparative legal scholarship by integrating climate constitutionalism, industrial governance, and sustainable development theory within a unified analytical framework. The study demonstrates that renewable energy governance effectiveness depends fundamentally on institutional interoperability, industrial coordination, and governance legitimacy.

Empirically, the research contributes comparative evidence concerning how governance architectures influence renewable energy expansion, industrial adaptation, and socio-economic resilience. The findings further indicate that sustainable climate governance requires balancing environmental ambition, industrial competitiveness, public legitimacy, and social inclusion.

From a policy perspective, the article suggests that governments pursuing energy transition should prioritize integrated governance systems capable of coordinating environmental regulation, industrial strategy, labor transition, and technological innovation. Renewable energy law should therefore be understood not merely as environmental governance but as a central component of sustainable industrial

transformation.

Future research should examine comparative climate litigation trends, labor transition governance, hydrogen economy regulation, and transnational green industrial policy coordination within evolving global climate governance systems.

REFERENCES

- Bundesverfassungsgericht. (2021). Federal Constitutional Court climate protection decision. Karlsruhe.*
- Geels, F. W., Sovacool, B., Schwanen, T., & Sorrell, S. (2021). Sociotechnical transitions for deep decarbonization. Science, 357(6357), 1242–1244.*
- IEA. (2024). Renewables 2024: Analysis and forecast to 2030. Paris.*
- IPCC. (2023). Climate change 2023: Synthesis report. Geneva.*
- Korean Government. (2023). Carbon neutrality and green growth implementation framework. Seoul.*
- Mehling, M. (2020). Governing climate neutrality. Climate Policy, 20(7), 1–14.*
- OECD. (2023). Green growth and energy transition governance report. Paris.*
- Peel, J., & Osofsky, H. M. (2020). Climate change litigation: Regulatory pathways to cleaner energy. Cambridge University Press.*
- Rodrik, D. (2023). Green industrial policy and economic transformation. Oxford Review of Economic Policy, 39(2), 1–18.*
- Setzer, J., & Higham, C. (2022). Global trends in climate litigation. London School of Economics Climate Change Laws of the World Report.*
- Sovacool, B. K. (2021). The political economy of energy transitions. Oxford University Press.*
- United Nations Environment Programme. (2023). Global climate governance report. Nairobi.*
- World Bank. (2024). Energy transition and sustainable industrial development report. Washington, DC.*
- European Commission. (2023). European Green Deal industrial transition strategy. Brussels.*
- Mayer, B. (2021). Climate constitutionalism and environmental governance. Transnational Environmental Law, 10(2), 301–325.*
- Meckling, J. (2021). Varieties of green capitalism: The political economy of the global energy transition. Oxford University Press.*
- International Renewable Energy Agency. (2024). Renewable energy and industrial competitiveness report. Abu Dhabi.*
- United Nations. (2023). Sustainable development goals progress report. New York.*
- Falkner, R. (2022). Global climate governance after Paris. International Affairs, 98(3), 1–19.*
- Kim, S. Y. (2022). Green New Deal governance and industrial transformation in South Korea. Asian Survey, 62(4), 657–681.*

