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CONCEPTUAL FRAMEWORK FOR HUMAN RESOURCE MANAGEMENT (HRM) AT ENERGY ENTERPRISES DURING GREEN TRANSFORMATION*

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Abstract. The green transformation of energy enterprises has become a critical component of global sustainability transitions, requiring organizations to adapt not only technologically but also strategically, institutionally, and socially. While existing research has extensively examined technological, economic, and regulatory aspects of energy transition, the role of human resource management (HRM) remains fragmented across multiple theoretical traditions. The aim of this article is to develop an integrated conceptual framework for HRM at energy enterprises during green transformation. The study employs a conceptual research design based on a systematic review and synthesis of scientific literature in the fields of institutional theory, socio-technical transition studies, strategic management, organizational capabilities, and Sustainable and Green Human Resource Management (HRM). The analysis demonstrates that green transformation should be understood as a multidimensional and context-dependent process shaped by the interaction of external sustainability-related pressures, organizational adaptation mechanisms, and workforce-related transformation processes. The findings suggest that HRM functions not merely as an administrative support activity but as a strategic organizational capability that enables workforce transformation, organizational learning, employee engagement, sustainability-oriented leadership, and the development of green competencies. Based on the cross-paradigm synthesis, an integrated conceptual framework is proposed that explains how external institutional and socio-technical drivers influence transformation outcomes through organizational mediators and HRM mechanisms. The framework provides a theoretical foundation for future empirical research and practical analysis of HRM contributions to sustainability-oriented transformation in the energy sector.

Keywords: human resource management (HRM); energy enterprises; green transformation; HRM contributions; conceptual framework

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1. Introduction

The transition toward sustainable and low-carbon development has become one of the most significant challenges facing contemporary economies. Within this process, the energy sector occupies a particularly important position due to its central role in economic systems, substantial contribution to greenhouse gas emissions, and strategic importance for economic and societal development (United Nations Development Programme, 2025; Strielkowski et al., 2024; Thomas et al., 2024). Consequently, energy enterprises are

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increasingly required to implement green transformation initiatives that encompass technological modernization, organizational adaptation, innovation, regulatory compliance, and social sustainability. Green transformation therefore extends beyond the adoption of renewable energy technologies and involves fundamental changes in organizational structures, managerial practices, workforce competencies, and corporate strategies (Geels, 2002; Schot & Geels, 2008; Liu & Song, 2023).

While existing research has extensively examined technological, economic, and policy aspects of energy transition (Geels et al., 2016; Plotkin et al., 2023; Zhou et al., 2025), considerably less attention has been devoted to the role of human resource management (HRM) in facilitating sustainability-oriented transformation. However, the successful implementation of green transformation depends not only on technological innovations and strategic decisions but also on employees' competencies, behaviours, engagement, and capacity to adapt to changing organizational requirements. As a result, HRM increasingly emerges as a strategic organizational capability that supports workforce transformation, organizational learning, innovation, and sustainability-oriented change (Ehnert, 2009; Jabbour & Santos, 2008; Yong et al., 2020).

The growing body of research on Sustainable Human Resource Management (Sustainable HRM) and Green Human Resource Management (Green HRM) demonstrates that HRM contributes to organizational sustainability through the development of green competencies, environmental commitment, employee engagement, environmental training, and sustainability-oriented leadership (Renwick et al., 2012; Jabbour, 2013; Dumont et al., 2017; Yong et al., 2020). Nevertheless, the existing literature remains fragmented across several theoretical traditions. Institutional theory explains how organizations respond to environmental and societal pressures (Selznick, 1957; Meyer & Rowan, 1977; DiMaggio & Powell, 1983; Scott, 2014), sustainability transition studies explain how socio-technical systems evolve toward sustainability (Geels, 2002; Schot & Geels, 2008; Geels et al., 2016), while strategic management and organizational capabilities theories explain how organizations adapt, innovate, and develop capabilities required for transformation (Barney, 1991; Teece et al., 1997; Eisenhardt & Martin, 2000). Although these perspectives address important aspects of transformation, they are rarely integrated into a unified framework capable of explaining the role of HRM within the broader process of green transformation at energy enterprises.

This fragmentation creates a theoretical gap in understanding how external sustainability pressures, organizational adaptation mechanisms, and HRM practices interact during the green transformation of energy enterprises. Existing studies have predominantly examined these elements separately, resulting in limited theoretical understanding of the mechanisms through which HRM contributes to sustainability-oriented organizational transformation. Addressing this gap is important both for advancing academic knowledge and for supporting managers responsible for implementing workforce-related aspects of energy transition and sustainable development.

The aim of this article is to develop a conceptual framework for human resource management at energy enterprises during green transformation. Drawing upon institutional and socio-technical transition theory (Selznick, 1957; Scott, 2014; Geels, 2002, 2024), strategic management and organizational capabilities theory (Barney, 1991; Teece et al., 1997; Eisenhardt & Martin, 2000), and the Sustainable and Green HRM paradigm (Ehnert, 2009; Renwick et al., 2012; Yong et al., 2020), the article synthesizes existing theoretical perspectives into an integrated analytical model. The proposed framework conceptualizes HRM as a strategic organizational mechanism that mediates the relationship between external transformation drivers, organizational adaptation processes, and enterprise-level green transformation outcomes.

The article contributes to the literature in three ways. First, it systematizes the principal theoretical approaches relevant to HRM in the context of green transformation. Second, it develops an integrated conceptual framework that explains the relationships between institutional pressures, organizational adaptation mechanisms, HRM practices, and transformation outcomes. Third, it identifies the key dimensions through which the contribution of HRM to the green transformation of energy enterprises can be analysed in future empirical research and managerial practice.

2. Green transformation of energy enterprises: defining, structuring and contextualizing

The green transformation of energy enterprises represents a specific and particularly complex case of sustainability-oriented transformation due to the systemic role of the energy sector in economic development and its central contribution to global environmental challenges. Unlike many other industries, energy enterprises operate within highly capital-intensive, infrastructure-dependent, and strongly regulated systems, where technological change is closely intertwined with institutional frameworks, market structures, geopolitical dynamics, and long-term investment cycles (Strielkowski et al., 2024; Plotkin et al., 2023). At the same time, the energy sector remains the largest contributor to global greenhouse gas emissions and therefore occupies a central position in decarbonization strategies and sustainability transitions (United Nations Development Programme, 2025). Consequently, the transformation of energy enterprises extends beyond organizational change and constitutes an essential component of broader socio-technical, economic, and institutional transformation processes (Geels, 2002; Schot & Geels, 2008).

In contrast to less system-critical industries, changes occurring within energy enterprises generate cascading effects across value chains, markets, and societal systems. The transformation of the sector therefore requires coordinated changes in technologies, business models, regulatory frameworks, and organizational practices. Furthermore, energy enterprises face the challenge of balancing environmental sustainability objectives with energy security, affordability, and economic competitiveness (European Bank for Reconstruction and Development, n.d.; Vosylius et al., 2013; Thomas et al., 2024). These characteristics distinguish the energy sector from many other industries and necessitate a multidimensional analytical perspective capable of capturing the complexity of green transformation processes.

The scientific literature demonstrates that green transformation is a multidimensional, dynamic, and context-dependent phenomenon for which no universally accepted definition currently exists. Instead, scholars conceptualize it through different theoretical lenses emphasizing technological change, sustainability transitions, organizational adaptation, innovation, and institutional transformation. Amundsen and Hermansen (2021) describe green transformation as a boundary object characterized by interpretive flexibility, allowing different stakeholders to assign diverse meanings ranging from incremental environmental improvements to fundamental socio-economic restructuring. This perspective highlights the conceptual breadth of green transformation and its dependence on contextual conditions.

From a strategic perspective, green transformation can be understood as a process through which organizations seek to maintain long-term sustainability, resilience, and competitiveness under conditions of climate change, environmental regulation, and global uncertainty (Plotkin et al., 2023). Innovation-oriented approaches emphasize the integration of environmental objectives into corporate strategies, innovation systems, and operational models, where digital technologies, green innovation, and dynamic capabilities function as key transformation mechanisms (Liu & Song, 2023). Sustainability transition research further interprets green transformation as a structural shift from fossil-fuel-based socio-technical systems toward renewable, low-carbon, and resource-efficient configurations, involving changes in technologies, institutions, markets, and social practices (Geels, 2002, 2024; Thomas et al., 2024; Strielkowski et al., 2024).

International organizations similarly conceptualize green transformation as a holistic process integrating decarbonization, technological modernization, institutional reform, economic restructuring, and social inclusion. Particular emphasis is placed on the principles of sustainable development and just transition, ensuring that the benefits and costs of transformation are distributed fairly among stakeholders (United Nations Development Programme, 2025; European Bank for Reconstruction and Development, n.d.).

Synthesizing these perspectives, the authors define the green transformation of energy enterprises as a multidimensional, systemic, and non-linear process of strategic, technological, organizational, and institutional change aimed at achieving low-carbon, resource-efficient, and sustainable development while simultaneously ensuring economic resilience, social responsibility, and long-term competitiveness.

The literature further suggests that green transformation should be understood as a multi-level and multidimensional process composed of several interrelated dimensions. At the technological level, transformation involves the deployment of renewable energy technologies, improvements in energy efficiency, infrastructure modernization, digitalization, and the adoption of advanced technological solutions, including artificial intelligence and energy storage systems (Strielkowski et al., 2024; United Nations Development Programme, 2025). At the economic and strategic level, transformation is reflected in the integration of sustainability into corporate strategy, the development of carbon-neutral business models, and alignment with ESG principles that increasingly influence investment decisions and organizational performance evaluation (Plotkin et al., 2023; European Bank for Reconstruction and Development, n.d.; Zhou et al., 2025).

The organizational and managerial dimension encompasses changes in organizational structures, managerial practices, leadership approaches, and corporate culture aimed at increasing adaptability, innovation, and sustainability orientation (Thomas et al., 2024). The innovation and capability dimension highlights the importance of dynamic capabilities, organizational learning, and innovation capacity in enabling enterprises to convert technological and digital advancements into sustainable competitive advantages (Liu & Song, 2023; Tvaronavičienė & Černevičiūtė, 2015; Zhou et al., 2025). At the institutional and regulatory level, transformation is shaped by environmental regulations, policy frameworks, financial incentives, and governance mechanisms that create enabling conditions for sustainable development and green investment (European Bank for Reconstruction and Development, n.d.; Plotkin et al., 2023). Finally, the social dimension incorporates workforce development, reskilling, employee participation, social inclusion, and just transition principles, emphasizing the human-centered nature of sustainability-oriented transformation (United Nations Development Programme, 2025). These dimensions are closely interconnected and operate simultaneously across macro, meso, and micro levels of analysis, forming a holistic structure of green transformation as a systemic and integrated process. The resulting conceptualization provides the foundation for identifying the specific role of human resource management within the green transformation of energy enterprises. The key dimensions of green transformation identified in the literature are summarized in Table 1.

Table 1. Structure of green transformation of energy enterprises across dimensions and levels

Dimensions of green transformation	Levels of green transformation		
	Macro level (policy and institutional environment)	Meso level (industry and market structures)	Micro level (enterprises)
Technological	National energy transition policies; support for renewable energy; large-scale infrastructure programs; national digitalization strategies (Strielkowski et al., 2024; United Nations Development Programme, 2025)	Industry-level diffusion of renewable technologies; development of smart grids; sectoral standards for energy efficiency; technological collaboration networks	Adoption of renewable energy technologies; implementation of energy-efficient processes; use of digital tools (AI, big data); modernization of internal infrastructure
Economic and strategic	National decarbonisation strategies; green growth policies; development of sustainable finance systems; ESG regulatory frameworks (Plotkin et al., 2023; European Bank for Reconstruction and Development, n.d.; Zhou et al., 2025)	Industry competition and market structures; sectoral investment flows; ESG-driven market expectations; value chain restructuring toward sustainability	Integration of sustainability into corporate strategy; development of carbon-neutral business models; ESG-oriented decision-making; green investment planning
Organizational and managerial	National governance models; institutional norms influencing corporate governance; cultural patterns of management and leadership (Thomas et al., 2024)	Industry-specific organizational practices; sectoral management standards; inter-organizational coordination and partnerships	Transformation of organizational structures; development of sustainability-oriented corporate culture; adaptive leadership; changes in decision-making processes
Innovation and capability	National innovation systems; R&D policies; support for green and digital innovation ecosystems (Liu and Song, 2023; Zhou et al., 2025)	Industry innovation networks; knowledge spillovers; collaboration between firms, universities, and research institutions	Development of dynamic capabilities (absorptive, adaptive, innovative); internal R&D; ability to integrate digital and green innovations into operations
Institutional and regulatory	Environmental regulations; climate policies; legal frameworks;	Industry regulation; sector-specific standards;	Compliance with regulations; implementation of internal

	international agreements; financial incentives for green investments (European Bank for Reconstruction and Development, n.d.; Plotkin et al., 2023)	compliance mechanisms; role of industry associations and regulatory bodies	sustainability policies; alignment with ESG standards; reporting and accountability practices
Social	National social policies; just transition frameworks; education and training systems; societal attitudes toward sustainability (United Nations Development Programme, 2025)	Labor market dynamics in the energy sector; sectoral workforce transitions; social dialogue between stakeholders; professional networks	Workforce reskilling and upskilling; employee engagement in sustainability initiatives; organizational social responsibility practices; support for inclusive transition

Source: compiled by the authors based on the scientific literature

The multidimensional structure presented in Table 1 demonstrates that the green transformation of energy enterprises is a systemic process in which technological, economic, organizational, institutional, and social dimensions are closely interconnected. Although these dimensions can be analytically distinguished, they remain mutually dependent and evolve through continuous interactions across macro, meso, and micro levels of analysis. Consequently, understanding the mechanisms of green transformation requires moving beyond purely technological explanations and examining the organizational processes through which sustainability objectives are translated into concrete managerial practices and organizational outcomes.

Among the identified dimensions, particular importance can be attributed to the organizational and managerial dimension, which serves as a critical link between external transformation pressures and enterprise-level responses. Existing research suggests that organizational adaptation is shaped not only by technological change and regulatory requirements but also by internal factors such as governance structures, organizational culture, leadership practices, and decision-making processes (DiMaggio & Powell, 1983; Scott, 2014; Greenwood et al., 2017). These factors influence how organizations interpret sustainability-related challenges and how effectively they respond to changing environmental, regulatory, and market conditions.

Furthermore, organizational transformation depends on the development of adaptive capabilities, innovation-oriented cultures, and sustainability-oriented leadership capable of supporting long-term change (Eisenhardt & Martin, 2000; Teece, 2007; Walker et al., 2010; Boons & Lüdeke-Freund, 2013). From a process perspective, organizational change should be viewed as an evolving phenomenon that unfolds over time through interactions among technological, institutional, and managerial transformations (Van de Ven & Poole, 1995; Pettigrew, 1997; Geels, 2002, 2024; Schot & Geels, 2008). Consequently, analysing green transformation at the organizational level enables a deeper understanding of the managerial actions, organizational routines, and behavioural mechanisms through which sustainability objectives are implemented in practice (Whittington, 2006; Delmas & Toffel, 2008; Schaltegger & Wagner, 2011).

This organizational perspective is particularly relevant for the study of HRM. As enterprises adopt new technologies, business models, and sustainability strategies, workforce-related factors become increasingly important for successful transformation. Employees must acquire new competencies, adapt to changing work processes, participate in sustainability initiatives, and support organizational learning and innovation. Therefore, HRM represents a key organizational mechanism through which sustainability objectives are translated into employee capabilities, organizational culture, and transformation outcomes.

At the same time, the literature demonstrates that green transformation is highly context-dependent and unfolds unevenly across countries and regions. Differences in institutional quality, economic development, technological capabilities, regulatory frameworks, and cultural values shape the trajectories and outcomes of sustainability transitions (Strielkowski et al., 2024; Thomas et al., 2024; Geels, 2024). Consequently, energy enterprises operate within distinct national environments that influence their opportunities and constraints for implementing green transformation initiatives.

To illustrate this contextual diversity, it is useful to complement the conceptual discussion with comparative empirical evidence. Cross-country indicators provide an important analytical tool for examining differences in energy transition performance and transformation readiness across national contexts. One of the most widely

used instruments for this purpose is the Energy Transition Index (ETI), developed by the World Economic Forum, which evaluates both the current performance of national energy systems and their readiness for future transformation. By integrating environmental, economic, and institutional dimensions into a unified assessment framework, the ETI provides valuable insights into the uneven geography of global energy transitions. Table 2 therefore presents the latest ETI rankings and scores, illustrating the substantial cross-country variation in green transformation processes and reinforcing the argument that sustainability transitions are shaped by specific national and institutional contexts.

Table 2. Energy Transition Index (ETI), n = 118 countries, 2025

Rank	Country	ETI Score
TOP 20		
1	Sweden	77.5
2	Finland	71.8
3	Denmark	71.6
4	Norway	71.5
5	Switzerland	71.0
6	Austria	70.6
7	Latvia	69.4
8	Netherlands	69.2
9	Germany	68.8
10	Portugal	68.6
11	Estonia	68.0
12	China	67.5
13	Iceland	67.3
14	France	67.1
15	Brazil	67.0
16	UK	66.8
17	US	66.8
18	Spain	66.6
19	Lithuania	66.6
20	Israel	66.1
BOTTOM 20		
99	Guatemala	48.7
100	Kuwait	48.6
101	Pakistan	48.5
102	Iran (Islamic Rep.)	47.6
103	Brunei Darussalam	47.6
104	Nepal	47.5
105	Bahrain	47.2
106	Mozambique	47.1
107	Nicaragua	46.8
108	Honduras	46.5
109	Zambia	46.3
110	Senegal	46.1
111	Tanzania	46.0
112	Ethiopia	45.9
113	Zimbabwe	44.8
114	Jamaica	44.5
115	Mongolia	44.2
116	Trinidad and Tobago	44.0
117	Botswana	42.8
118	Democratic Republic of Congo	42.4

Source: World Economic Forum, 2025.

The data presented in Table 2 demonstrate substantial differences in the level of energy transition across countries, confirming that the green transformation of energy enterprises unfolds unevenly in the global context. The highest ETI scores are concentrated in Northern and Western European countries, such as Sweden, Finland, Denmark, and Norway, whose strong performance is supported by advanced institutional frameworks, high shares of renewable energy, developed infrastructure, and long-term policy commitments to sustainability. In contrast, many developing and resource-dependent economies occupy lower positions, reflecting structural constraints related to fossil-fuel dependence, limited financial resources, and less developed regulatory environments.

These differences suggest that energy enterprises operate within highly heterogeneous external environments that shape both the opportunities and constraints of green transformation. The positions of Latvia and China provide illustrative examples of different transformation pathways. Latvia ranks among the global leaders in energy transition performance, benefiting from a relatively clean energy mix, substantial integration of renewable energy sources, and close alignment with European Union climate and energy policies. Consequently, Latvian energy enterprises operate in an environment where sustainability objectives are increasingly institutionalized through regulations, market expectations, and stakeholder demands, shifting the focus from fundamental structural transformation toward optimization, innovation, and continuous sustainability improvement (Lebedeva et al., 2021; Blumberga et al., 2014, 2024; Lagzdīņa et al., 2024). This sustainability-oriented context is further supported by recent studies of Latvia's climate-neutral energy pathway and energy-sector transformation (Kudrenickis et al., 2024; Allena-Ozoliņa, 2025).

China represents a different transformation context. Despite the continued importance of fossil fuels within its energy system, the country has achieved substantial progress through large-scale investments in renewable energy technologies, rapid infrastructure development, and strong state support for sustainability initiatives. As a result, Chinese energy enterprises operate within a dynamic environment characterized by simultaneous modernization of existing energy systems and deployment of new low-carbon technologies (Sun et al., 2016; Guan et al., 2018; Liu & Song, 2023; Zhou et al., 2022). These examples illustrate that similar sustainability objectives may be pursued through different institutional arrangements, technological pathways, and organizational strategies.

More broadly, the ETI can be interpreted as an aggregated indicator of the external environment in which energy enterprises conduct their transformation activities. Higher ETI scores generally reflect stronger institutional support, more advanced technological infrastructure, and market conditions that facilitate sustainability-oriented change. Conversely, lower scores often indicate structural and institutional barriers that require enterprises to rely more heavily on internal capabilities, innovation, and adaptive strategies. Therefore, national energy transition performance not only reflects country-level progress but also signals the opportunities and constraints faced by individual enterprises operating within different contexts (World Economic Forum, 2025).

At the same time, existing research demonstrates that transformation processes vary not only between countries but also within individual national contexts. Regional studies of Latvia, for example, reveal significant differences in renewable energy potential, infrastructure development, energy consumption patterns, and socio-economic conditions (Kacare et al., 2021; Zeibote et al., 2025). Such findings indicate that even within a common institutional framework, enterprises may encounter substantially different transformation opportunities and challenges depending on their geographical location and resource base. Consequently, the spatial dimension of green transformation extends beyond national boundaries and encompasses intra-country variations that influence organizational decision-making and transformation trajectories.

The literature further emphasizes that green transformation is shaped by broader cultural and societal factors. As argued by Amundsen and Hermansen (2021), green transformation functions as a boundary object whose interpretation varies across stakeholders and contexts. Cultural values influence how sustainability is perceived, prioritized, and implemented, thereby affecting organizational responses to environmental challenges. Empirical studies demonstrate that national cultural characteristics, including long-term orientation, individualism, and attitudes toward uncertainty, are associated with differences in environmental governance, sustainability performance, and investments in sustainable technologies (Ringov & Zollo, 2007; Gallego-Álvarez & Ortas, 2017; Almaqtari et al., 2023). Consequently, transformation pathways are not only institutionally but also culturally embedded.

The importance of cultural context becomes particularly evident when comparing different governance models of sustainability transitions. Collectivist societies often rely on stronger state coordination and large-scale policy interventions, facilitating rapid implementation of transformation initiatives, whereas more individualistic societies tend to emphasize market mechanisms, innovation ecosystems, and decentralized decision-making (Sovacool, 2016; Liu et al., 2018; Buckley, 2021). These differences influence not only policy design but also

organizational strategies, stakeholder interactions, and the mechanisms through which transformation is implemented.

From a broader socio-technical perspective, transformation involves not only technological and institutional change but also shifts in social practices, organizational routines, and cultural meanings (Geels, 2002, 2024; Geels et al., 2016). Studies of pro-environmental behaviour similarly demonstrate that societal norms, trust, and cultural attitudes significantly influence energy consumption patterns, public acceptance of renewable technologies, and participation in sustainability initiatives (Steg & Vlek, 2009; Halkos & Tzeremes, 2013). Therefore, cultural context acts as an important mediating factor that shapes how green transformation is interpreted and enacted at both organizational and societal levels.

Overall, the reviewed literature suggests that the green transformation of energy enterprises should be understood as a geographically, institutionally, and culturally embedded process. Transformation pathways differ across countries, regions, and organizations because they are shaped by the interaction of regulatory frameworks, technological capacities, cultural values, socio-economic conditions, and organizational capabilities. Recognizing this contextual diversity is essential for developing theoretically robust and practically relevant approaches to analysing the role of HRM within sustainability-oriented transformation processes.

3. Conceptualizing HRM at energy enterprises during green transformation

While the previous section established the concept, structure, and contextual characteristics of the green transformation of energy enterprises, understanding the mechanisms through which this transformation is implemented requires a closer examination of organizational processes and managerial practices. Existing research demonstrates that sustainability-oriented transformation cannot be explained solely through technological innovation, regulatory change, or strategic adaptation. Its successful implementation ultimately depends on people, their competencies, behaviours, values, and capacity to adapt to changing organizational requirements (Ehnert, 2009; Jabbour & Santos, 2008; Renwick et al., 2012). Consequently, human resource management (HRM) occupies a central position within transformation processes because it directly influences workforce development, organizational learning, employee engagement, and the adoption of sustainability-oriented practices.

The literature further suggests that the green transformation of energy enterprises is shaped by the interaction of multiple factors operating at different analytical levels. Institutional pressures, sustainability regulations, stakeholder expectations, and socio-technical transition processes create external drivers for organizational change (Selznick, 1957; DiMaggio & Powell, 1983; Scott, 2014; Geels, 2002, 2024). At the organizational level, enterprises respond to these pressures through strategic adaptation, capability development, innovation, and organizational learning (Barney, 1991; Teece et al., 1997; Eisenhardt & Martin, 2000). At the workforce level, Sustainable and Green HRM practices contribute to the development of green competencies, environmental commitment, sustainability-oriented leadership, and employee participation in transformation initiatives (Ehnert, 2009; Jabbour, 2013; Dumont et al., 2017; Yong et al., 2020). Understanding the role of HRM during green transformation therefore requires an integrated conceptual perspective capable of linking these complementary dimensions.

To establish the theoretical foundations of such a perspective, this study synthesizes several organizational and managerial paradigms that address different aspects of sustainability-oriented transformation. Institutional and socio-technical transition theories explain the external drivers and contextual conditions shaping transformation processes; strategic management and organizational capabilities theories explain how enterprises adapt and develop the capabilities necessary for sustainability-oriented change; while Sustainable and Green HRM theories clarify the mechanisms through which workforce management contributes to organizational transformation and sustainability outcomes. The principal paradigms, their core assumptions, theoretical contributions, and representative authors are summarized in Table 3, which provides the theoretical foundation for the development of the conceptual framework proposed in this article.

Table 3. Theoretical foundations of the conceptual framework for HRM at energy enterprises during their green transformation

Paradigm	Main theoretical focus	Key concepts	Representative authors
Institutional and socio-technical context of green transformation			
Institutional and organizational adaptation paradigm	Explains how organizations respond to external institutional pressures and seek legitimacy during sustainability-oriented change	Institutionalization, legitimacy, institutional pressures, organizational adaptation, institutional isomorphism, organizational identity, stakeholder expectations	Selznick (1957); Meyer & Rowan (1977); DiMaggio & Powell (1983); Scott (2014); Delmas & Toffel (2008); Greenwood et al. (2017)
Sustainability transition and socio-technical transition paradigm	Explains how green transformation emerges and unfolds through interactions among technologies, institutions, markets, actors, infrastructures, and societal developments	Sustainability transitions, socio-technical systems, multi-level perspective, niche innovations, regimes, landscapes, organizational learning, transition pathways	Nelson & Winter (1982); Geels (2002); Schot & Geels (2008); Geels et al. (2016); Geels (2024)
Organizational adaptation and strategic transformation			
Strategic management and organizational capabilities paradigm	Explains how organizations strategically adapt to environmental change and develop capabilities required for transformation	Stakeholder management, strategic adaptation, organizational capabilities, dynamic capabilities, governance, resource allocation, organizational learning, innovation	Freeman & McVea (2001); Hart (1995); Teece et al. (1997); Barney (1991); Eisenhardt & Martin (2000)
HRM within sustainability-oriented transformation			
Sustainable and green HRM paradigm	Explains how HRM contributes to sustainability-oriented organizational transformation and environmental performance	Green HRM, Sustainable HRM, green competencies, employee engagement, environmental training, green leadership, sustainability culture, workforce transformation	Ehnert (2009); Renwick et al. (2013); Jabbour & Santos (2008); Jabbour (2013); Dumont et al. (2017); Yong et al. (2020)

Source: developed by the authors based on the analyzed scientific literature.

3.1. Institutional and socio-technical context of green transformation

Institutional and organizational adaptation paradigm

The institutional and organizational adaptation paradigm explains how organizations respond to changing external environments, seek legitimacy, and translate societal expectations into internal structures, managerial practices, and employee behaviour. Within the context of the green transformation of energy enterprises, this perspective is particularly important because sustainability-oriented change is driven not only by technological innovation but also by environmental regulations, climate policies, ESG requirements, professional standards, investor expectations, and broader societal demands for sustainable development. Consequently, energy enterprises are embedded in institutional environments that shape both the direction and the pace of transformation.

One of the foundational contributions to this perspective was made by Selznick (1957), who conceptualized organizations as social institutions rather than merely technical instruments for achieving predefined goals. According to Selznick, organizations gradually develop distinctive values, identities, and commitments, while leadership plays a central role in institutionalizing organizational purpose and maintaining organizational integrity. Applied to green transformation, this perspective suggests that sustainability requires not only technological modernization but also the development of sustainability-oriented organizational values, leadership practices, and cultural norms. From this viewpoint, HRM serves as a mechanism through which sustainability principles become embedded in recruitment, training, performance management, leadership development, and organizational culture.

The relationship between organizations and their institutional environments was further developed by Meyer and Rowan (1977), who argued that organizations frequently adopt formal structures and managerial practices because these are perceived as legitimate within their external environments. Organizations therefore seek conformity with prevailing institutional expectations in order to secure legitimacy, stability, and access to resources. In the context of green transformation, sustainability-oriented HRM practices can be interpreted as institutional responses to environmental regulations, ESG frameworks, investor expectations, and societal

demands for responsible business conduct. Green recruitment, sustainability training, environmental performance management, and sustainability leadership development therefore contribute not only to organizational effectiveness but also to organizational legitimacy.

Building on this perspective, DiMaggio and Powell (1983) explain why organizations operating within the same institutional environment tend to become increasingly similar over time. Their theory of institutional isomorphism identifies three mechanisms of convergence: coercive pressures arising from laws and regulations, mimetic pressures resulting from imitation under uncertainty, and normative pressures associated with professional standards and educational systems. These mechanisms are highly relevant to the energy sector, where enterprises increasingly adopt similar sustainability-oriented HRM practices, including environmental training systems, green competencies, ESG-related performance indicators, and sustainability governance structures. Consequently, institutional isomorphism helps explain the growing standardization of green HRM models across energy industries.

A more comprehensive understanding of institutional influences is provided by Scott (2014), whose framework distinguishes between regulative, normative, and cultural-cognitive pillars of institutions. The regulative pillar encompasses environmental laws and climate policies; the normative pillar reflects professional standards and socially accepted sustainability practices; while the cultural-cognitive pillar relates to shared beliefs, values, and understandings concerning sustainability. Together, these pillars explain how external sustainability expectations become translated into organizational structures, workforce practices, and organizational culture. Importantly, Scott emphasizes that organizational actors are not merely constrained by institutions but also actively participate in reproducing and transforming them, highlighting the role of managers and employees as active agents of green transformation.

While institutional theory explains why organizations respond to sustainability pressures, Delmas and Toffel (2008) demonstrate how such pressures are translated into organizational action. Their research shows that organizations exposed to similar environmental demands may nevertheless adopt different responses depending on internal governance structures, managerial influence, and stakeholder relationships. This insight is particularly relevant for HRM because sustainability objectives must be interpreted, prioritized, and operationalized through organizational systems, leadership processes, workforce practices, and communication mechanisms. HRM therefore acts as a mediating subsystem connecting external sustainability expectations with internal organizational adaptation.

Contemporary organizational institutionalism further extends this perspective by emphasizing that organizations actively interpret, negotiate, and respond to evolving societal expectations (Greenwood et al., 2017). Green transformation therefore involves not only environmental objectives but also broader concerns related to social sustainability, workforce inclusion, employee well-being, and just transition principles. Accordingly, HRM should support organizational adaptability, stakeholder engagement, sustainability-oriented leadership, institutional learning, and equitable workforce transformation. From this perspective, HRM becomes a strategic organizational capability through which energy enterprises maintain legitimacy, balance competing stakeholder demands, and achieve long-term sustainability-oriented development.

Overall, the institutional and organizational adaptation paradigm suggests that HRM functions as a strategic mechanism connecting external institutional pressures with internal organizational transformation. Through recruitment, training, leadership development, performance management, organizational culture, and employee engagement, HRM facilitates the institutionalization of sustainability and supports the long-term adaptation of energy enterprises to changing environmental, social, and regulatory conditions.

While the institutional perspective explains why organizations transform and adapt to sustainability pressures, the socio-technical transition perspective explains how transformation unfolds through the interaction of technologies, institutions, infrastructures, markets, and social practices.

Sustainability transition and socio-technical transition paradigm

The socio-technical transition perspective was further developed through the integration of evolutionary economics, innovation studies, and sustainability transition research. Building on the evolutionary foundations established by Nelson and Winter (1982) and the multi-level perspective proposed by Geels (2002), subsequent studies increasingly emphasized that sustainability transitions are not solely technological phenomena but involve the co-evolution of technologies, institutions, organizations, markets, infrastructures, policies, and social practices. Consequently, successful green transformation requires coordinated adaptation across multiple dimensions of socio-technical systems rather than isolated technological improvements.

A significant contribution in this regard was made by Schot and Geels (2008), who developed the Strategic Niche Management (SNM) approach. According to the authors, sustainability transitions emerge through the creation of protected innovation niches where new technologies, organizational arrangements, and behavioural practices can be experimented with, refined, and gradually integrated into mainstream socio-technical regimes. The authors identify learning processes, actor networking, shared expectations, and institutional alignment as critical mechanisms facilitating successful transition pathways. For energy enterprises undergoing green transformation, this perspective highlights the importance of organizational learning, experimentation, knowledge sharing, and employee participation in innovation processes. Accordingly, HRM should facilitate continuous competence development, interdisciplinary collaboration, sustainability-oriented leadership, and organizational learning capabilities that enable employees and managers to contribute to emerging green innovation systems.

The socio-technical transition perspective has also increasingly recognized the role of organizational actors and institutional dynamics in shaping transition trajectories. Geels et al. (2016) argue that low-carbon transitions are characterized by complex interactions among incumbent firms, policymakers, technology developers, civil society organizations, and market actors. The authors distinguish several transition pathways, including transformation, reconfiguration, substitution, and de-alignment/re-alignment pathways, each associated with different organizational and institutional challenges. This perspective is highly relevant for HRM because different transition pathways require different forms of workforce adaptation, leadership approaches, organizational learning mechanisms, and change management practices. Furthermore, the authors emphasize that transition processes are inherently non-linear and frequently involve conflicts, resistance, power struggles, and competing institutional logics. Therefore, HRM systems should support employee engagement, organizational resilience, conflict management, adaptive leadership, and workforce flexibility to facilitate successful organizational adaptation under conditions of uncertainty and change.

More recently, Geels (2024) further elaborated the Multi-Level Perspective by emphasizing the multidimensional nature of sustainability transitions and the interactions between niche innovations, socio-technical regimes, and broader landscape developments. The study demonstrates that green transformation unfolds through several stages, including experimentation, stabilization, diffusion, and institutionalization, each requiring different organizational capabilities and management approaches. From an HRM perspective, these stages imply changing priorities throughout the transformation process. During the early phases, organizations require experimentation, innovation-oriented culture, employee learning, and competence development. During later phases, HRM becomes increasingly responsible for embedding sustainability-related competencies, values, and practices into organizational routines, performance management systems, leadership structures, and long-term workforce strategies.

Overall, the sustainability transition and socio-technical transition paradigm suggests that green transformation is a systemic, evolutionary, and multi-actor process requiring continuous organizational adaptation, learning, innovation, and institutional change. Within this process, HRM functions as a strategic organizational capability that supports workforce transformation, competence development, organizational learning, stakeholder coordination, and the institutionalization of sustainability-oriented practices. Consequently, HRM becomes an essential mechanism through which energy enterprises adapt to evolving technological, institutional, and societal conditions associated with the transition toward sustainable energy systems.

3.2. Organizational adaptation and strategic transformation

Strategic management and organizational capabilities paradigm

The green transformation of energy enterprises represents a complex organizational process that extends beyond technological modernization and environmental compliance. It requires the reconfiguration of organizational resources, capabilities, structures, managerial systems, and organizational cultures in response to evolving environmental, technological, regulatory, and stakeholder pressures. Consequently, understanding green transformation requires a theoretical perspective capable of explaining how organizations adapt, learn, innovate, and transform over time. Strategic management and organizational capabilities theories provide such a perspective by emphasizing the role of resources, capabilities, managerial decision-making, organizational learning, and strategic adaptation in enabling long-term organizational development.

One of the foundational perspectives within this paradigm is the resource-based view of the firm. Penrose (1959/2009) conceptualizes organizations as collections of productive resources whose value depends on managerial capabilities, organizational learning, and the effective utilization of human resources. According to Penrose (1959/2009), organizational growth depends not merely on access to resources but on the ability to develop and deploy organizational capabilities, while the pace of transformation is constrained by managerial and organizational capacities, a phenomenon later conceptualized as the Penrose effect (Kor et al., 2016). Similarly, Barney (1991) argues that sustainable competitive advantage emerges from resources that are valuable, rare, difficult to imitate, and non-substitutable. Within the context of green transformation, sustainability-related competencies, environmental knowledge, innovation capabilities, leadership expertise, and sustainability-oriented organizational cultures may be regarded as strategic resources capable of generating long-term organizational competitiveness (Barney, 1991). Consequently, HRM assumes a strategic role in developing, maintaining, and renewing these resources through recruitment, training, knowledge management, leadership development, and employee engagement.

While resource-based theories explain the sources of organizational advantage, dynamic capabilities theory explains how organizations adapt these resources under conditions of environmental change. Teece et al. (1997) argue that sustainable organizational success depends not only on possessing valuable resources but also on the ability to integrate, build, and reconfigure internal and external competencies in response to changing environments. Teece (2007) further develops this perspective by identifying organizational capacities to sense opportunities and threats, seize opportunities, and reconfigure organizational resources as key mechanisms of strategic adaptation. Similarly, Eisenhardt and Martin (2000) conceptualize dynamic capabilities as identifiable organizational routines that enable firms to achieve new resource configurations under conditions of uncertainty and market dynamism. These perspectives are particularly relevant to green transformation because energy enterprises operate within rapidly evolving technological, institutional, and regulatory environments shaped by decarbonization pressures, digitalization, renewable-energy innovation, climate policy, and sustainability-related stakeholder expectations (Teece et al., 1997; Eisenhardt & Martin, 2000; Teece, 2007). Within this context, HRM functions as a strategic dynamic capability that supports workforce adaptation, organizational learning, competence development, innovation, and organizational resilience.

Recent studies further demonstrate that digital transformation increasingly interacts with sustainability-oriented organizational adaptation. Zhou et al. (2025) argue that digitalization and green innovation form a dual mechanism supporting sustainable transformation within energy enterprises. Similarly, Liu and Song (2023) demonstrate that digital transformation enhances green innovation through improvements in absorptive capability, innovation capability, organizational learning, and human capital development. These studies suggest that successful green transformation requires workforce reskilling, digital capability development, innovation-oriented behaviour, adaptive organizational cultures, and continuous learning systems (Liu & Song, 2023; Zhou et al., 2025). Consequently, HRM contributes to organizational transformation by facilitating the development of digital and sustainability-oriented competencies that support innovation and long-term adaptation.

The strategic management literature also emphasizes the importance of organizational adaptation as an emergent and evolutionary process. Mintzberg (1978) argues that strategy should be understood not only as a deliberate plan but also as a pattern emerging from organizational decisions and actions over time. This distinction between

intended and realized strategies highlights the adaptive nature of organizational transformation under conditions of uncertainty. Mintzberg et al. (1998/2009) further demonstrate that strategy formation involves multiple interconnected processes, including learning, leadership, culture, environmental adaptation, organizational power relations, and transformation. Likewise, Whittington (2006) conceptualizes strategy as a social practice enacted through the activities of managers and employees, emphasizing the importance of strategy practitioners, strategic practices, and strategic praxis. Together, these perspectives suggest that green transformation cannot be fully planned in advance but instead emerges through continuous interaction between organizational intentions, environmental changes, managerial actions, and organizational learning processes (Mintzberg, 1978; Mintzberg et al., 1998/2009; Whittington, 2006). Accordingly, HRM supports strategic adaptation through leadership development, employee participation, organizational learning, and workforce flexibility.

A complementary perspective is provided by organizational change and transformation theories. Lewin's (1951) Field Theory explains organizational change through the interaction between individuals and their organizational environments, highlighting the importance of behavioural adaptation, group dynamics, and organizational culture. Van de Ven and Poole (1995) conceptualize organizational transformation as a multidimensional process involving teleological, dialectical, evolutionary, and life-cycle mechanisms of change. Pettigrew (1997) further emphasizes the processual nature of organizational transformation, arguing that change unfolds through dynamic interactions between organizational actors, structures, contexts, and temporal processes. Chandy and Tellis (1998) add that successful transformation depends on organizational willingness to abandon established routines and embrace innovation, a capability they describe through the concept of willingness to cannibalize. Walker et al. (2010) further demonstrate that organizational innovation contributes to performance only when supported by effective management systems and performance management structures. Collectively, these theories suggest that successful green transformation requires not only technological and strategic adaptation but also behavioural, cultural, managerial, and organizational change (Lewin, 1951; Van de Ven & Poole, 1995; Pettigrew, 1997). The innovation and performance-management aspects of organizational change are further emphasized by Chandy and Tellis (1998) and Walker et al. (2010). Therefore, HRM contributes to transformation by facilitating employee adaptation, managing organizational resistance, supporting organizational learning, and fostering sustainability-oriented organizational cultures.

The literature also highlights the importance of sustainable business model innovation and stakeholder-oriented organizational transformation. Freeman's stakeholder theory argues that organizational success depends on the effective management and integration of relationships among multiple stakeholders, including employees, customers, suppliers, investors, governments, and local communities (Freeman, 1984; Freeman & McVea, 2001). Similarly, Hart (1995) emphasizes the importance of governance structures, decision-making authority, and organizational adaptability under conditions of uncertainty. Boons and Lüdeke-Freund (2013) further argue that sustainable transformation requires the redesign of organizational business models, stakeholder relationships, and value-creation processes. Together, these perspectives suggest that organizational adaptation during green transformation extends beyond internal organizational changes and requires continuous interaction with external stakeholders, institutional environments, and broader sustainability ecosystems (Hart, 1995; Boons & Lüdeke-Freund, 2013). Consequently, HRM contributes to stakeholder-oriented transformation by supporting collaboration, communication, employee participation, sustainability leadership, and organizational legitimacy.

Overall, the strategic management and organizational capabilities paradigm suggests that successful green transformation depends on the organization's ability to develop, integrate, renew, and reconfigure resources and capabilities while simultaneously adapting organizational structures, cultures, managerial systems, and stakeholder relationships (Penrose, 1959/2009; Barney, 1991; Teece et al., 1997). This adaptive logic is further clarified by Teece (2007) and Eisenhardt and Martin (2000). Within this process, HRM emerges as a strategic organizational capability that supports organizational learning, workforce transformation, innovation, leadership development, stakeholder engagement, and long-term organizational adaptability. Therefore, HRM should be understood not merely as an administrative personnel function but as a central mechanism through which energy enterprises build the organizational capacities necessary for successful sustainability-oriented transformation.

3.3. HRM within sustainability-oriented transformation

Sustainable and Green HRM paradigm

The growing importance of sustainability challenges and the accelerating green transformation of economic sectors have substantially expanded the role of HRM within contemporary organizations. Traditionally, HRM was primarily associated with workforce administration, productivity enhancement, and organizational performance. However, sustainability-oriented transformation requires organizations not only to improve economic performance but also to simultaneously address environmental and social objectives. As a result, HRM increasingly functions as a strategic organizational capability that contributes to long-term organizational sustainability, workforce adaptation, and the successful implementation of transformation processes. Within this context, the Sustainable and Green HRM paradigm has emerged as an important theoretical perspective explaining how workforce management supports sustainability-oriented organizational transformation through the development of human capital, organizational capabilities, environmental commitment, and sustainability-oriented behaviour.

The theoretical foundations of this paradigm are largely associated with the concept of Sustainable Human Resource Management proposed by Ehnert (2009). Unlike traditional HRM approaches that emphasize short-term efficiency and organizational performance, Sustainable HRM focuses on the long-term maintenance, development, and regeneration of human resources while simultaneously contributing to organizational, social, and environmental sustainability objectives (Ehnert, 2009). According to this perspective, organizations must balance multiple and often competing demands, including economic efficiency and employee well-being, organizational flexibility and workforce stability, as well as short-term performance and long-term sustainability. Rather than eliminating these tensions, Sustainable HRM seeks to manage them through organizational practices capable of addressing multiple sustainability objectives simultaneously (Ehnert, 2009). This perspective is particularly relevant to energy enterprises undergoing green transformation because sustainability-oriented restructuring requires continuous workforce adaptation, competence development, organizational learning, and employee engagement. Consequently, HRM can be understood as a strategic organizational subsystem that supports workforce sustainability, organizational resilience, and long-term adaptation under conditions of environmental, technological, and societal change.

Building upon the broader Sustainable HRM perspective, Green Human Resource Management (Green HRM) focuses specifically on integrating environmental sustainability objectives into HRM systems and practices. Green HRM reflects the growing recognition that environmental performance cannot be achieved solely through technological innovation and environmental management systems but also depends on employee competencies, attitudes, behaviours, and organizational culture. Renwick et al. (2012) conceptualize Green HRM as the integration of environmental management and HRM practices, enabling organizations to align workforce management with environmental objectives. Drawing upon the Ability–Motivation–Opportunity framework, the authors argue that environmental performance can be enhanced through HRM practices that develop environmental competencies, motivate environmentally responsible behaviour, and provide opportunities for employee participation in environmental initiatives (Renwick et al., 2012). Accordingly, Green HRM encompasses environmentally oriented recruitment and selection, sustainability-related training and development, environmental performance appraisal, green reward systems, employee involvement, and sustainability-oriented leadership development (Renwick et al., 2012). For energy enterprises undergoing green transformation, these practices provide mechanisms through which sustainability objectives can be translated into workforce capabilities and organizational behaviour.

The strategic significance of HRM within sustainability-oriented transformation is further emphasized by Jabbour and Santos (2008), who conceptualize HRM as a central organizational mechanism connecting economic, social, and environmental dimensions of sustainability. According to the authors, HRM contributes to sustainable organizational development through the promotion of innovation, diversity and inclusion, environmental management, and organizational learning (Jabbour & Santos, 2008). From this perspective, sustainability-oriented transformation depends not only on technological modernization but also on the organization's capacity to develop sustainability-related competencies, stimulate innovative behaviour, and

cultivate sustainability-oriented organizational cultures. Consequently, HRM functions as an intermediary mechanism linking green transformation initiatives with organizational sustainability outcomes.

A particularly important element of Green HRM concerns the development of environmental competencies through environmental training and organizational learning. Jabbour (2013) identifies environmental training as a fundamental component of Green HRM and a critical mechanism supporting organizational sustainability. Environmental training enables organizations to develop the knowledge, skills, competencies, and behaviours necessary for effective environmental management and sustainability-oriented transformation (Jabbour, 2013). This function is especially important within energy enterprises, where green transformation frequently requires employees to acquire competencies related to renewable energy technologies, environmental management systems, carbon reduction strategies, resource efficiency, and environmental innovation. Furthermore, environmental training should not be treated as an isolated activity but should be integrated into broader Green HRM systems, including recruitment, performance management, reward systems, and employee involvement initiatives (Jabbour, 2013). Consequently, environmental training contributes not only to competence development but also to organizational learning, environmental commitment, and the institutionalization of sustainability-oriented behaviours throughout the organization.

While Green HRM practices establish organizational systems supporting sustainability, their effectiveness ultimately depends on employee responses and workplace behaviour. Therefore, the behavioural dimension of Green HRM has become an increasingly important area of research. Dumont et al. (2017) demonstrate that Green HRM practices influence both in-role and extra-role employee green behaviour through the development of a psychological green climate. Employees are more likely to engage in environmentally responsible behaviour when they perceive that environmental sustainability is genuinely valued, supported, and rewarded within the organization (Dumont et al., 2017). Moreover, individual green values strengthen the relationship between psychological green climate and voluntary environmental behaviour, highlighting the importance of employee attitudes and organizational culture in sustainability-oriented transformation (Dumont et al., 2017). These findings suggest that successful green transformation depends not only on formal environmental policies but also on employee commitment, participation, and behavioural adaptation. Consequently, HRM contributes to transformation by shaping organizational climate, promoting sustainability-oriented values, and encouraging environmentally responsible behaviour.

The growing maturity of Green HRM as a research field is demonstrated by the systematic literature review conducted by Yong et al. (2020). Reviewing seventy peer-reviewed studies published between 2007 and 2019, the authors identify several core dimensions of Green HRM, including green recruitment and selection, environmental training and development, green performance management, green reward systems, employee involvement, and sustainability-oriented leadership (Yong et al., 2020). The review further demonstrates that Green HRM contributes to both individual-level outcomes, such as environmental commitment, employee engagement, and green workplace behaviour, and organizational-level outcomes, including environmental performance, sustainability performance, innovation, and competitiveness (Yong et al., 2020). These findings provide substantial empirical support for the argument that Green HRM constitutes a strategic organizational capability facilitating workforce transformation and supporting sustainability-oriented organizational change.

Synthesizing the reviewed literature, the Sustainable and Green HRM paradigm suggests that human resource management plays a central role in enabling green transformation through the development of sustainability-related competencies, environmental commitment, organizational learning, and employee participation. Sustainable HRM provides the broader conceptual foundation by emphasizing long-term workforce sustainability and the integration of economic, social, and environmental objectives (Ehnert, 2009), while Green HRM operationalizes these principles through concrete workforce management practices aimed at improving environmental performance (Renwick et al., 2012; Jabbour, 2013).

At the same time, organizational sustainability outcomes emerge through behavioural and cultural mechanisms that foster employee engagement, environmental commitment, and green workplace behaviour (Dumont et al., 2017). Collectively, these perspectives demonstrate that successful sustainability-oriented transformation depends not only on technological innovation and environmental management systems but also on integrated

HRM practices capable of developing green human capital, fostering sustainability-oriented organizational cultures, and supporting workforce adaptation under conditions of environmental and organizational change (Jabbour & Santos, 2008; Yong et al., 2020). Therefore, within the context of the green transformation of energy enterprises, HRM should be conceptualized as a strategic organizational capability that facilitates workforce transformation, organizational resilience, and the achievement of environmental, social, and economic sustainability objectives.

3.4. Synthesis and development of an integrated conceptual framework

The literature reviewed in the preceding sections demonstrates that the green transformation of energy enterprises is a multidimensional phenomenon that cannot be adequately explained through a single theoretical perspective. The institutional and socio-technical transition literature highlights the external drivers of transformation, including regulatory pressures, stakeholder expectations, sustainability requirements, and technological transitions that reshape organizational environments (Selznick, 1957; Meyer & Rowan, 1977; DiMaggio & Powell, 1983; Scott, 2014). The socio-technical dimension of transformation is additionally explained by Geels (2002) and Schot and Geels (2008).

Strategic management and organizational capabilities theories explain how organizations respond to these pressures through capability development, organizational learning, innovation, and strategic adaptation (Penrose, 1959/2009; Barney, 1991; Teece et al., 1997). The adaptive and emergent character of transformation is further supported by Eisenhardt and Martin (2000) and Mintzberg (1978). Finally, the Sustainable and Green HRM literature explains how workforce management contributes to sustainability-oriented transformation through the development of green competencies, employee engagement, environmental commitment, organizational learning, and sustainability-oriented organizational culture (Ehnert, 2009; Renwick et al., 2012; Jabbour & Santos, 2008). The operational and behavioural dimensions of Green HRM are further developed by Jabbour (2013), Dumont et al. (2017), and Yong et al. (2020).

Although these perspectives originate from different research traditions, they collectively suggest that successful green transformation emerges through the interaction of external transformation drivers, organizational adaptation processes, and HRM mechanisms. Institutional and socio-technical changes create pressures and opportunities for transformation; organizations respond through the development of strategic capabilities and adaptive organizational processes; and HRM facilitates the workforce transformation required to support sustainability-oriented organizational change. In this regard, HRM should be understood not merely as a supporting organizational function but as a strategic organizational capability that enables energy enterprises to translate sustainability objectives into organizational practices, employee competencies, and transformation outcomes.

To integrate these complementary perspectives, Table 4 synthesizes the principal theoretical paradigms and identifies their respective analytical contributions to the study of HRM at energy enterprises during green transformation. The table provides the foundation for the subsequent development of an integrated conceptual framework by highlighting the key concepts, mechanisms, and relationships emerging from the reviewed literature.

Table 4. Cross-paradigm synthesis for the conceptual framework

Paradigm	Main analytical focus	Key transformation mechanisms	HRM implications	Expected HRM outcomes
Institutional and socio-technical context of green transformation	Explains why green transformation emerges and how external institutional, technological, and societal pressures shape organizational change	Institutional pressures; legitimacy requirements; climate regulation; ESG expectations; socio-technical transitions; niche innovations; regime transformation; organizational learning	Development of green competencies; sustainability-oriented leadership; organizational learning; workforce adaptation; transition readiness	Sustainability-oriented workforce; institutional legitimacy; employee adaptability; readiness for transformation

Strategic management and organizational capabilities paradigm	Explains how organizations adapt strategically and develop capabilities necessary for transformation	Resource development; dynamic capabilities; organizational learning; strategic adaptation; innovation; stakeholder management; capability reconfiguration	Reskilling and upskilling; talent management; leadership development; workforce flexibility; knowledge management; innovation-oriented culture	Organizational resilience; adaptive workforce; innovation capability; strategic flexibility; competitive advantage
Sustainable and Green HRM paradigm	Explains how HRM directly contributes to sustainability-oriented transformation and environmental performance	Sustainable HRM; Green HRM practices; environmental training; psychological green climate; employee engagement; green behaviour	Green recruitment; environmental training; green performance appraisal; green rewards; employee participation; sustainability leadership	Green competencies; environmental commitment; employee green behaviour; sustainability culture; environmental and organizational performance

Source: developed by the authors based on Selznick (1957), Meyer & Rowan (1977), DiMaggio & Powell (1983), Scott (2014), Geels (2002, 2024), Schot & Geels (2008), Barney (1991), Teece et al. (1997), Eisenhardt & Martin (2000), Ehnert (2009), Jabbour & Santos (2008), Renwick et al. (2012), Jabbour (2013), Dumont et al. (2017), Yong et al. (2020).

The cross-paradigm synthesis presented in Table 4 identifies the principal theoretical perspectives that explain the role of HRM in the green transformation of energy enterprises. However, synthesizing these perspectives requires not only identifying their individual contributions but also clarifying the relationships among the key constructs and mechanisms emerging from the literature.

Collectively, the reviewed studies suggest that green transformation should be understood as a multi-level process in which external institutional and socio-technical forces influence organizational adaptation processes, which subsequently shape workforce-related practices and transformation outcomes. Consequently, the analyzed paradigms should not be viewed as separate explanatory approaches but as complementary components of a broader analytical model.

The literature further indicates that institutional pressures, sustainability regulations, ESG requirements, and socio-technical transition dynamics constitute the primary external drivers of transformation. Organizational responses to these drivers are mediated through adaptation processes, including strategic management, capability development, organizational learning, and innovation-oriented change.

Within this process, HRM performs a strategic role by translating sustainability-related transformation requirements into workforce competencies, employee engagement, sustainability-oriented behaviour, and organizational learning. Thus, transformation outcomes emerge not from the influence of any single factor but from the interaction among external drivers, organizational adaptation mechanisms, and HRM practices.

Based on this synthesis, the present study conceptualizes HRM at energy enterprises during green transformation as a strategic mechanism linking external transformation pressures with workforce-related and organizational outcomes. The proposed conceptual framework integrates insights from institutional theory, socio-technical transition theory, strategic management, organizational capabilities, and Sustainable and Green HRM to explain how sustainability-oriented transformation is initiated, mediated, and implemented within organizations. Figure 1 presents the resulting conceptual framework and illustrates the relationships among external drivers, organizational mediators, HRM mechanisms, and transformation outcomes in the context of the green transformation of energy enterprises.

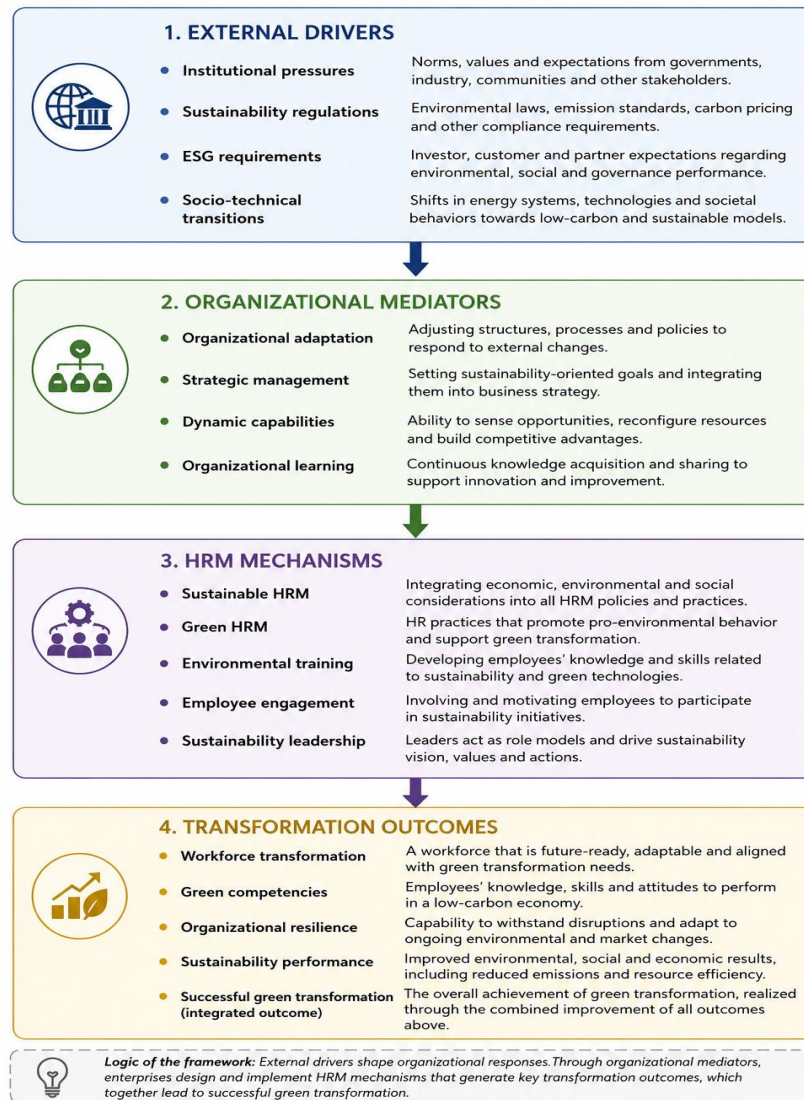


Figure 1. Integrated conceptual framework for HRM at energy enterprises during their green transformation

Note: The organizational mediators and HRM mechanisms together represent the organizational and managerial dimension of green transformation identified in Table 1. The transformation outcomes correspond to enterprise-level (micro-level) manifestations of green transformation (Table 1) and reflect the extent to which organizational adaptation processes and HRM mechanisms contribute to transformation outcomes.

Source: developed by the authors based on the analyzed scientific literature and Table 1.

The conceptual framework presented in Figure 1 synthesizes the theoretical perspectives discussed in the preceding sections and illustrates the causal logic through which HRM contributes to the green transformation of energy enterprises. The framework proposes that external sustainability-related pressures, including institutional requirements, ESG expectations, and socio-technical transition dynamics, influence organizational transformation indirectly through organizational adaptation processes and HRM mechanisms. In this way, green transformation is conceptualized as a multi-stage process in which external drivers create the conditions for change, while organizational and managerial mechanisms determine how these pressures are translated into enterprise-level outcomes.

The organizational mediators and HRM mechanisms presented in Figure 1 together represent the organizational and managerial dimension of green transformation identified in Table 1 and constitute the principal analytical

focus of the empirical investigation of HRM at energy enterprises during green transformation. Organizational mediators, including organizational adaptation, strategic management, dynamic capabilities, and organizational learning, reflect the strategic and organizational capacities through which enterprises interpret, coordinate, and respond to sustainability-related challenges. HRM mechanisms, including Sustainable HRM, Green HRM, environmental training, employee engagement, and sustainability leadership, represent the workforce-management practices through which these organizational responses are operationalized and embedded within everyday organizational activities.

The framework therefore conceptualizes HRM as an integral component of a broader organizational transformation process rather than as an isolated managerial function. Organizational adaptation processes and HRM mechanisms operate in a complementary manner: the former establish the organizational conditions necessary for transformation, while the latter translate transformation requirements into employee competencies, behaviours, engagement, and leadership practices. Together, they explain how energy enterprises develop the organizational capacity required to respond to changing environmental, regulatory, and societal expectations.

The transformation outcomes presented in Figure 1 correspond to enterprise-level (micro-level) manifestations of green transformation identified in Table 1. Workforce transformation, green competencies, organizational resilience, and sustainability performance reflect the extent to which organizational adaptation processes and HRM mechanisms contribute to sustainability-oriented organizational change. In this regard, successful green transformation should be understood not as a separate outcome but as an integrated result emerging from the combined achievement of these interrelated outcomes.

Consequently, the framework narrows the broad and multidimensional phenomenon of green transformation to those organizational and managerial processes through which energy enterprises adapt to sustainability-related pressures and implement transformation at the enterprise level. While green transformation encompasses technological, economic, institutional, innovation-related, and social dimensions, the present study focuses specifically on the organizational and managerial dimension and its micro-level manifestations within energy enterprises. This analytical focus provides the theoretical foundation for the subsequent empirical investigation of HRM at energy enterprises during green transformation.

4. Conclusions

The conducted literature review demonstrates that the green transformation of energy enterprises is a multidimensional, systemic, and context-dependent process that extends beyond technological modernization and encompasses technological, economic, organizational, institutional, and social dimensions. The analysis confirms that transformation processes are shaped by interactions across macro, meso, and micro levels and are influenced by country-specific institutional arrangements, socio-economic conditions, technological capacities, and cultural contexts. Consequently, green transformation should be understood as a non-linear process of organizational and societal change rather than solely as the adoption of environmentally friendly technologies.

The synthesis of the reviewed literature further shows that the green transformation of energy enterprises can be explained through the interaction of three complementary theoretical perspectives. Institutional and socio-technical approaches explain the external pressures and contextual conditions that drive transformation; strategic management and organizational capabilities theories explain how organizations adapt to changing environments through capability development, organizational learning, and strategic reconfiguration; while Sustainable and Green HRM perspectives explain how workforce-related mechanisms support and sustain transformation processes.

A central conclusion of the study is that HRM should be conceptualized not merely as an administrative function but as a strategic organizational capability that enables sustainability-oriented transformation. Through recruitment, training, competence development, employee engagement, performance management, and sustainability-oriented leadership, HRM translates external sustainability requirements into concrete

organizational practices and workforce-related changes. In this sense, HRM acts as a critical mechanism linking external transformation pressures with organizational adaptation and long-term sustainability outcomes.

The principal contribution of the article is the development of an integrated conceptual framework for HRM at energy enterprises during green transformation. The framework proposes a causal logic in which external institutional and socio-technical drivers influence organizations through organizational adaptation mechanisms, while HRM serves as the primary operational channel through which transformation requirements are translated into workforce transformation, green competencies, organizational resilience, and sustainability performance. By integrating insights from institutional theory, socio-technical transition theory, strategic management, organizational capabilities, and Sustainable and Green HRM, the framework provides a coherent theoretical foundation for future empirical research on the role of HRM in sustainability-oriented transformation within the energy sector.

References

- Allena-Ozoliņa, S. (2025). *Optimal Pathway to a Climate-Neutral Energy Sector in Latvia*: Summary of the PhD thesis. Riga: RTU Press. <https://doi.org/10.7250/9789934371738>
- Almaqtari, F. A., Elsheikh, T., Al-Hattami, H. M., & Mishra, N. (2023). The impact of board characteristics on environmentally friendly production: A cross-country study in Asia and Europe. *Journal of Cleaner Production*, 392, 136257. <https://doi.org/10.1016/j.jclepro.2023.136257>
- Amundsen, H., & Hermansen, E. A. T. (2021). Green transformation is a boundary object: An analysis of conceptualisation of transformation in Norwegian primary industries. *Environment and Planning E: Nature and Space*, 4(3), 864–885. <https://doi.org/10.1177/2514848620934337>
- Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- Blumberga, A., Blumberga, D., Timma, L., & Barisa, A. (2024). Impact of the 2022 energy crisis on energy transition: The role of households and policy measures. *Energy*, 300, 130641. <https://doi.org/10.1016/j.energy.2024.130641>
- Blumberga, D., Cimdīņa, G., Timma, L., Blumberga, A., & Rošā, M. (2014). Green energy strategy 2050 for Latvia: A pathway towards a low-carbon society. *Chemical Engineering Transactions*, 39, 1507–1512. <https://doi.org/10.3303/CET1439252>
- Boons, F., & Lüdeke-Freund, F. (2013). Business models for sustainable innovation. *Journal of Cleaner Production*, 45, 9–19. <https://doi.org/10.1016/j.jclepro.2012.07.007>
- Buckley, L. (2021). *Engaging with China's Ecological Civilisation: A Pathway to a Green Economy?* Green Economy Coalition & International Institute for Environment and Development (IIED). Retrieved from <https://www.greeneconomycoalition.org/assets/reports/GEC-Reports/GEC-IIED-China-EcoCivilisationPaper-A4-Feb21-V4b.pdf>
- Chandy, R. K., & Tellis, G. J. (1998). Organizing for radical product innovation: The overlooked role of willingness to cannibalize. *Journal of Marketing Research*, 35(4), 474–487. Retrieved from <https://gtellis.net/wp-content/uploads/2020/09/organizing-for-radical-product-innovation.pdf>
- Delmas, M., & Toffel, M. W. (2008). Organizational responses to environmental demands: Opening the black box. *Strategic Management Journal*, 29(10), 1027–1055. <https://doi.org/10.1002/smj.701>
- DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 48(2), 147–160. <https://doi.org/10.2307/2095101>
- Dumont, J., Shen, J., & Deng, X. (2017). Effects of green HRM practices on employee workplace green behavior: The role of psychological green climate and employee green values. *Human Resource Management*, 56(4), 613–627. <https://doi.org/10.1002/hrm.21792>
- Ehnert, I. (2009). *Sustainable Human Resource Management: A Conceptual and Exploratory Analysis from a Paradox Perspective*. Heidelberg: Physica-Verlag. <https://doi.org/10.1007/978-3-7908-2188-8>
- Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, 21(10–11), 1105–1121. [https://doi.org/10.1002/1097-0266\(200010/11\)21:10/11<1105::AID-SMJ133>3.0.CO;2-E](https://doi.org/10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E)

European Bank for Reconstruction and Development (EBRD). (n.d.). “Green”: the EBRD’s transition concept. *EBRD*. Retrieved from <https://www.ebrd.com/home/who-we-are/ebird-values/ebird-transition/green-transition-concept.html>

Freeman, R. E. (1984). *Strategic Management: A Stakeholder Approach*. Boston: Pitman Publishing. Retrieved from <https://www.scribd.com/doc/66150274/Strategic-Management-a-Stakeholder-Approach>

Freeman, R. E., & McVea, J. (2001). A stakeholder approach to strategic management. *Darden Graduate School of Business Administration Working Paper No. 01–02*. Charlottesville, VA: University of Virginia. <https://doi.org/10.2139/ssrn.263511>

Gallego-Álvarez, I., & Ortas, E. (2017). Corporate environmental sustainability reporting in the context of national cultures: A quantile regression approach. *International Business Review*, 26(2), 337–353. <https://doi.org/10.1016/j.ibusrev.2016.09.003>

Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes. *Research Policy*, 31(8–9), 1257–1274. [https://doi.org/10.1016/S0048-7333\(02\)00062-8](https://doi.org/10.1016/S0048-7333(02)00062-8)

Geels, F. W., Kern, F., Fuchs, G., Hinderer, N., Kungl, G., Mylan, J., Neukirch, M., & Wassermann, S. (2016). The enactment of socio-technical transition pathways: A reformulated typology and a comparative multi-level analysis of the German and UK low-carbon electricity transitions (1990–2014). *Research Policy*, 45(4), 896–913. <https://doi.org/10.1016/j.respol.2016.01.015>

Greenwood, R., Oliver, C., Lawrence, T. B., & Meyer, R. E. (2017). *The SAGE Handbook of Organizational Institutionalism*. Thousand Oaks, CA: SAGE Publications. <https://doi.org/10.4135/9781526415066>

Guan, D., Meng, J., Reiner, D., Zhang, N., Shan, Y., Mi, Z., Shao, S., Liu, Z., Zhang, Q., & Davis, S. J. (2018). Structural decline in China’s CO₂ emissions through transitions in industry and energy systems. *Nature Geoscience*, 11(8), 551–555. <https://doi.org/10.1038/s41561-018-0161-1>

Halkos, G. E., & Tzeremes, N. G. (2013). Carbon dioxide emissions and governance: A nonparametric analysis for the G-20. *Energy Economics*, 40, 110–118. <https://doi.org/10.1016/j.eneco.2013.06.010>

Hart, O. (1995). *Firms, Contracts, and Financial Structure*. Oxford University Press. Retrieved from <http://www.library.fu.ru/files/Hart-Firms.pdf>

Jabbour, C. J. C. (2013). Environmental training in organisations: From a literature review to a framework for future research. *Resources, Conservation and Recycling*, 74, 144–155. <https://doi.org/10.1016/j.resconrec.2012.12.017>

Jabbour, C. J. C., & Santos, F. C. A. (2008). The central role of human resource management in the search for sustainable organizations. *The International Journal of Human Resource Management*, 19(12), 2133–2154. <https://doi.org/10.1080/09585190802479389>

Kacare, M., Pakere, I., Grāvelsīņš, A., & Blumberga, D. (2021). Spatial analysis of renewable energy sources. *Environmental and Climate Technologies*, 25(1), 865–878. <https://doi.org/10.2478/rtuct-2021-0065>

Kor, Y. Y., Mahoney, J. T., Siensen, E., & Tan, D. (2016). Penrose’s *The theory of the growth of the firm*: An exemplar of engaged scholarship. *Production and Operations Management*, 25(10), 1727–1744. <https://doi.org/10.1111/poms.12572>

Kudrenickis, I., Klavs, G., & Rekis, J. (2024). Potential of renewable energy communities in Latvia’s energy sector transformation. In *Engineering for Rural Development: Proceedings of the 23rd International Scientific Conference* (Jelgava, May 22–24). <https://doi.org/10.22616/ERDev.2024.23.TF103>

Lagzdīņa, E., Brizga, J. A., Kudrenickis, I., Ikstena, R., & Ernšteins, R. (2024). Advancing energy citizenship: Hindering and supporting factors in Latvia’s energy transition. In F. Fahy & E. Vadovics (Eds.), *Energy Citizenship across Europe: Contexts and Conditions for an Emerging Energy Transition* (pp. 99–118). Springer Nature. https://doi.org/10.1007/978-3-031-70157-3_7

Lebedeva, K., Krumins, A., Tamane, A., & Dzelzitis, E. (2021). Analysis of Latvian households’ potential participation in the energy market as prosumers. *Clean Technologies*, 3(2), 437–449. <https://doi.org/10.3390/cleantechnol3020025>

Lewin, K. (1951). *Field Theory in Social Science*. New York: Harper.

Liu, C., Chen, L., Vanderbeck, R. M., et al. (2018). A Chinese route to sustainability: Postsocialist transitions and the construction of ecological civilization. *Sustainable Development*, 26(6), 741–748. <https://doi.org/10.1002/sd.17>

Liu, Y., & Song, P. (2023). Digital transformation and green innovation of energy enterprises. *Sustainability*, 15(9), 7703. <https://doi.org/10.3390/su15097703>

Meyer, J., & Rowan, B. (1977). Institutionalized organizations: Formal structure as myth and ceremony. *American Journal of Sociology*, 83(2), 340–363. <https://doi.org/10.1086/226550>

Mintzberg, H. (1978). Patterns in strategy formation. *Management Science*, 24(9), 934–948. <https://doi.org/10.1287/mnsc.24.9.934>

Mintzberg, H., Ahlstrand, B., & Lampel, J. (1998/2009). *Strategy Safari: The Complete Guide through the Wilds of Strategic Management*. Harlow: Pearson Education Limited.

Nelson, R., & Winter, S. (1982). *An Evolutionary Theory of Economic Change*. Cambridge, MA: Harvard University Press. https://www.inctpped.org/spiderweb/pdf/2/Dosi_1_An_evolutionary-theory-of_economic_change..pdf

Penrose, E. T. (1959/2009). *The Theory of the Growth of the Firm*. Oxford University Press.

Pettigrew, A. M. (1997). What is a processual analysis? *Scandinavian Journal of Management*, 13(4), 337–348. [https://doi.org/10.1016/S0956-5221\(97\)00020-1](https://doi.org/10.1016/S0956-5221(97)00020-1)

Plotkin, J., Levchenko, N., Shyshkanova, G. A., & Levchenko, S. (2023). Development of energy enterprises in the context of green transformation. *Journal of Engineering Sciences*, 10(1), G22–G33. [https://doi.org/10.21272/jes.2023.10\(1\).g3](https://doi.org/10.21272/jes.2023.10(1).g3)

Renwick, D. W. S., Redman, T., & Maguire, S. (2012). Green human resource management: A review and research agenda. *International Journal of Management Reviews*, 15(1), 1–14. <https://doi.org/10.1111/j.1468-2370.2011.00328.x>

Ringov, D., & Zollo, M. (2007). The impact of national culture on corporate social performance. *Corporate Governance: The International Journal of Business in Society*, 7(4), 476–485. <https://doi.org/10.1108/14720700710820551>

Schaltegger, S., & Wagner, M. (2011). Sustainable entrepreneurship and sustainability innovation: Categories and interactions. *Business Strategy and the Environment*, 20(4), 222–237. <https://doi.org/10.1002/bse.682>

Schot, J., & Geels, F. W. (2008). Strategic niche management and sustainable innovation journeys: Theory, findings, research agenda, and policy. *Technology Analysis & Strategic Management*, 20(5), 537–554. <https://doi.org/10.1080/09537320802292651>

Scott, W. R. (2014). *Institutions and Organizations: Ideas, Interests, and Identities* (4th ed.). Thousand Oaks, CA: SAGE Publications.

Sovacool, B. K. (2016). How long will it take? Conceptualizing the temporal dynamics of energy transitions. *Energy Research & Social Science*, 13, 202–215. <https://doi.org/10.1016/j.erss.2015.12.020>

Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, 29(3), 309–317. <https://doi.org/10.1016/j.jenvp.2008.10.004>

Strielkowski, W., Chygryn, O., Drozd, S., & Koibichuk, V. (2024). Sustainable transformation of energy sector: Cluster analysis for the sustainable development strategies of selected European countries. *Heliyon*, 10, e38930. <https://doi.org/10.1016/j.heliyon.2024.e38930>

Sun, X., Zhang, B., Tang, X., McLellan, B. C., & Höök, M. (2016). Sustainable energy transitions in China: Renewable options and impacts on the electricity system. *Energies*, 9(12), 980. <https://doi.org/10.3390/en9120980>

Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350. <https://doi.org/10.1002/smj.640>

Thomas, A., Scandurra, G., & Carfora, A. (2024). Conceptualizing an interpretative framework for energy transition among Italian innovative small and medium enterprises. *Energy Policy*, 195, 114392. <https://doi.org/10.1016/j.enpol.2024.114392>

Tvaronavičienė, M., & Černevičiūtė, J. (2015). Technology transfer phenomenon and its impact on sustainable development. *Journal of Security and Sustainability Issues*, 5(1), 87–97. [https://doi.org/10.9770/jssi.2015.5.1\(7\)](https://doi.org/10.9770/jssi.2015.5.1(7))

United Nations Development Programme (UNDP). (2025). What is the sustainable energy transition and why is it key to tackling climate change? *Climate Promise*, February 3. Retrieved from <https://climatepromise.undp.org/news-and-stories/what-sustainable-energy-transition-and-why-it-key-tackling-climate-change>

Van de Ven, A. H., & Poole, M. S. (1995). Explaining development and change in organizations. *Academy of Management Review*, 20(3), 510–540. Retrieved from https://web.mit.edu/curhan/www/docs/Articles/15341_Readings/Organizational_Learning_and_Change/Ven_de_Ven_Pool_Explaining_Development_and_Change_in_Orgs.pdf

Vosylius, E., Rakutis, V., & Tvaronavičienė, M. (2013). Economic growth, sustainable development and energy security interrelations. *Journal of Security and Sustainability Issues*, 2(3), 5–14. [https://doi.org/10.9770/jssi.2013.2.3\(1\)](https://doi.org/10.9770/jssi.2013.2.3(1))

Walker, R. M., Damanpour, F., & Devece, C. A. (2010). Management innovation and organizational performance: The mediating effect of performance management. *Journal of Public Administration Research and Theory*, 20(2), 367–386. <https://doi.org/10.1093/jopart/muq043>

Whittington, R. (2006). Completing the practice turn in strategy research. *Organization Studies*, 27(5), 613–634. <https://doi.org/10.1177/0170840606064101>

World Economic Forum. (2025). *Fostering Effective Energy Transition 2025*. World Economic Forum. Retrieved from https://reports.weforum.org/docs/WEF_Fostering_Effective_Energy_Transition_2025.pdf

Yong, J. Y., Yusliza, M.-Y., & Fawehinmi, O. O. (2020). Green human resource management: A systematic literature review from 2007 to 2019. *Benchmarking: An International Journal*, 27(7), 2005–2027. <https://doi.org/10.1108/BIJ-12-2018-0438>

Zeibote, Z., Balodis, J., Kokarēviča, A., Kudiņš, J., & Čižo, E. (2025). Transportation efficiency in Latvia in the context of economic productivity and environmental sustainability. In I. Kabashkin et al. (Eds.), *Reliability and Statistics in Transportation and Communication*, LNNS 1337, 638–648. https://doi.org/10.1007/978-3-031-87532-8_57

Zhou, H., Wu, M., He, S., & Peng, Z. (2025). Digitalization, green innovation, and green transformation of energy enterprises in China. *Sustainability*, 17(23), 10619. <https://doi.org/10.3390/su172310619>

Zhou, Z., Ma, Z., & Lin, X. (2022). Carbon emissions trading policy and green transformation of China's manufacturing industry: Mechanism assessment and policy implications. *Frontiers in Environmental Science*, 10, 984612. <https://doi.org/10.3389/fenvs.2022.984612>

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