Scientific Research Publishing

Beijing Law Review, 2025, 16(1), 76-106
https://www.scirp.org/journal/blr
ISSN Online: 2159-4635
ISSN Print: 2159-4627

Role of Law Driving Energy Transitions: A Critical View from China and Selected African Countries

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How to cite this paper: Gbomagba, M. (2025). Role of Law Driving Energy Transitions: A Critical View from China and Selected African Countries. *Beijing Law Review, 16,* 76-106.
https://doi.org/10.4236/blr.2025.161005

Received: January 20, 2025
Accepted: March 7, 2025
Published: March 10, 2025

Abstract

This paper critically analyses the legal and policy frameworks governing the global transition towards sustainable energy systems. It explores how these frameworks, operating at international and national levels, influence energy production and consumption while embodying global climate obligations under the UNFCCC, notably the Paris Agreement. The analysis focuses on understanding how these frameworks facilitate or hinder sustainable energy transitions, with a specific focus on the diverse experiences of China and select African countries. The study employs a comparative analysis of international and national legal and policy frameworks. It examines foundational international instruments and investigates how these commitments are translated into national policies in different contexts. The analysis draws on case studies of China and selected African nations to illustrate the diverse approaches to sustainable energy governance influenced by economic, social, and environmental factors. It reveals significant variations in the effectiveness of existing legal and policy frameworks in promoting sustainable energy transitions. Key findings include the identification of challenges such as inconsistent policy implementation, regulatory delays, and insufficient safeguards for vulnerable populations. It also highlights the misalignment between national policies and international obligations, creating significant barriers to achieving equitable and just transitions. This research contributes to the existing literature by providing a critical comparative analysis of legal and policy frameworks across diverse contexts, including China and selected African nations. It highlights the crucial role of law in addressing challenges associated with sustainable energy transitions, such as climate change, public health, and resource equity. By identifying key gaps and challenges, the study offers valuable insights for policymakers and practitioners seeking to improve the effectiveness of legal and policy frameworks in supporting equitable and just energy transitions. Furthermore, the emphasis on China-Africa cooperation provides a novel perspective on potential

avenues for knowledge sharing and collaborative action in advancing sustainable energy goals from the global south.

Keywords

Legal Frameworks, Sustainable Energy Transitions,
China-Africa Cooperation

1. Introduction

The global climate crisis, characterised by rising temperatures, extreme weather events, and sea-level rise, presents an existential threat to humanity and the planet. The Intergovernmental Panel on Climate Change (IPCC) has unequivocally linked these changes to human activities, primarily the combustion of fossil fuels (IPCC, 2023). This has compelled countries worldwide to re-evaluate their energy policies. As a result, as nations grapple with the dual challenges of energy access and environmental sustainability, the imperative to transition to sustainable, low-carbon energy sources has never been more urgent. The IPCC has also underscored the critical need for a rapid transition to sustainable energy systems to mitigate the adverse effects of climate change (IPCC, 2023). This global transition toward sustainable energy systems necessitates a thorough understanding of the legal and policy frameworks that govern this complex landscape. This article provides a comprehensive exploration of the intricate legal and policy frameworks that facilitate sustainable energy transitions, focusing on both international and national levels of governance. The relationship between legal structures and sustainable energy initiatives is critical. These frameworks establish the guidelines for energy production and consumption and reflect the commitments made by countries to combat climate change under the UNFCCC regime, notably the Paris Agreement.

This study employs a comparative analysis of international and national legal and policy frameworks to examine foundational international instruments. It investigates how these commitments are translated into national policies in different contexts. The analysis draws on case studies of China and selected African nations to illustrate the diverse approaches to sustainable energy governance influenced by economic, social, and environmental factors. It discusses the role of these frameworks in catalysing climate action and setting universal benchmarks for emission reduction targets. Moreover, the paper analyses national and regional frameworks, with particular attention to the unique contexts of China and select African nations. Africa needs to transition to new energy sources urgently because **Figure 1** demonstrates the continent's slow progress in electricity penetration compared to the rest of the world. These regions represent diverse approaches to sustainable energy policies, influenced by varying economic, social, and environmental factors (Oyewo et al., 2023). The research dissects these frameworks to illustrate how legal structures and regulatory systems can either facilitate or

hinder the progress of sustainable energy initiatives. It further examines the vital role of law in driving sustainable energy transitions and addresses challenges such as climate change, public health, and resource equity. It also assesses how legal mechanisms support the adoption of renewable energy technologies and enhance energy efficiency. It recognises the myriad challenges climate change poses, such as environmental degradation, energy insecurity, and social inequity. The discussion highlights how robust legal frameworks can address these challenges through effective regulation, enforcement, and public engagement, ensuring that energy transitions are both environmentally sustainable and socially just. The study does not shy away from the challenges encountered within these frameworks, including inconsistent policy applications, regulatory delays, and gaps that often leave marginalised communities at a disadvantage.

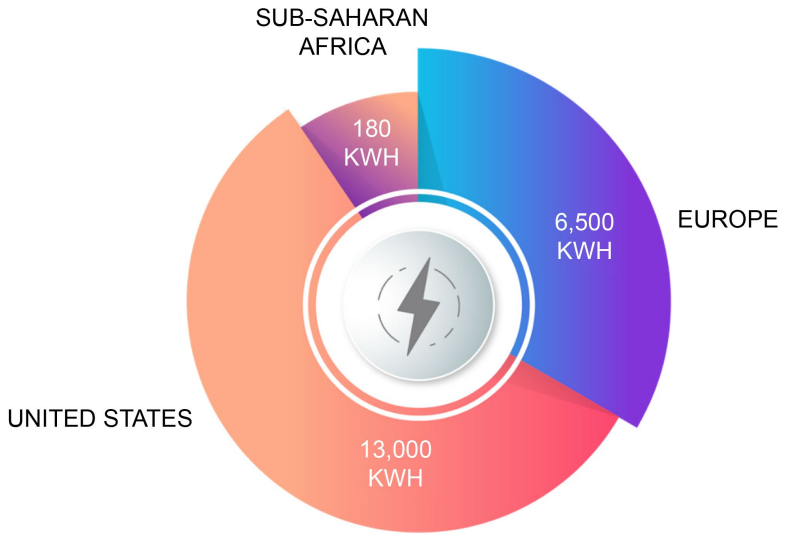

Figure 1. Sub-Saharan African electricity access rate compared to some parts of the word.

Finally, a key focus of this paper is to identify legal and policy gaps, and by doing so, it reveals critical areas that need attention, such as the lack of harmonisation between national policies and international obligations and insufficient protections for vulnerable populations. These gaps present significant barriers to achieving equitable and sustainable energy systems. Consequently, the research highlights opportunities for enhancing justice and equity in climate and energy strategies, especially within China-Africa cooperation. This cooperation is pivotal for bridging legal divides, fostering knowledge exchange, and implementing effective energy policies that consider local needs and capacities.

2. A Critical Assessment of International Frameworks for Sustainable Energy and Climate Action

The intersection of international legal frameworks and sustainable energy development is pivotal for tackling climate change and environmental degradation.

However, as Table 1 shows, a critical assessment of international frameworks for sustainable energy and climate action reveals a complex interplay of legal instruments, governance mechanisms, and the evolving landscape of global climate politics. This section provides an overview of significant international legal instruments governing sustainable energy and their implications for climate action, focusing on key treaties, the role of organisations, and emerging trends.

The United Nations Framework Convention on Climate Change (UNFCCC), established in 1992 (UNFCCC, 1992), is the foundational treaty for international

Table 1. Global treaties and policy frameworks on energy transitions.

Legal/Policy Framework	Main Regulatory Approach	Objective	Key Achievements to Date	Deficiency/Limitations
United Nations Framework Convention on Climate Change (UNFCCC, 1992)	Framework for international cooperation on climate change (global climate governance), Sets overall goals and principles	Stabilise greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system (Article 2)	Laid the foundation for international climate cooperation and action, established the Conference of the Parties (COP) as the supreme decision-making body, facilitated the development of the Kyoto Protocol and the Paris Agreement.	Slow progress in negotiations and climate action commitment; Primarily a framework, lacks specific targets and legally binding emissions reduction obligations for most countries; Does not directly address energy transitions.
Energy Charter Treaty (ECT) (1994)	Promotes energy security. Energy trade and investment protection, dispute resolution for energy sector	Facilitate cross-border energy trade and investment to ensure energy security for participating countries.	Provided a platform for energy cooperation and investment security; established energy investment protections.	Protects fossil fuel investments, potentially hindering energy transitions. Essentially unchanged since the 1990s, it is becoming outdated and one of the most litigated investment treaties globally. It is no longer compatible with climate goals under the Paris Agreement, predominantly due to concerns over continued fossil fuel investments.
Kyoto Protocol (1997)	Legally binding emission reduction targets and timetables for developed countries	Reduce greenhouse gas emissions by developed countries. Reduce greenhouse gas emissions by an average of 5.2% below 1990 levels over the commitment period (2008-2012).	Pioneered the concept of legally binding emission reduction targets for developed countries; Achieved significant emissions reductions in participating countries; introduced market emissions trading mechanisms like the Clean Development Mechanism (CDM)	Limited participation; many countries did not meet targets, reducing overall effectiveness; some countries, like the US withdrawal, did not address energy transitions.

Continued

Paris Agreement (2015)	Universally agreed, Bottom-up approach with Nationally Determined Contributions (NDCs)	Limit global warming to well below 2˚C above pre-industrial levels and pursue efforts to limit warming to 1.5˚C	Over 190 countries have ratified and established a framework for regular progress reviews through Global Stocktake Increased global awareness and political momentum for climate action, facilitated international cooperation on climate finance and technology transfer, mobilised ambitious climate action from many countries.	Ambitious goals but weak enforcement mechanisms; reliance on self-reported progress, potential for insufficient ambition in NDCs.
United Nations Sustainable Development Goals (especially SDG 7, United Nations, 2015)	Comprehensive sustainable development framework; Global aspirational goals for universal access to energy, renewable energy, and energy efficiency	Achieve universal access to affordable, reliable, sustainable, and modern energy for all.	Increased global focus on energy access and sustainable energy solutions; mobilised significant investments in renewable energy and energy efficiency; emphasises affordable and clean energy (SDG 7) as essential for achieving climate goals and overall sustainability.	Non-binding framework; implementation challenges, lack of adequate financing, lack of specific accountability mechanisms, uneven progress across countries.
International Renewable Energy Agency (2009) (IRENA) Statute	Facilitates cooperation, knowledge sharing, and promotion of renewable energy, promoting the widespread adoption and sustainable use of renewable energy.	Advance the global development and deployment of renewable energy technologies and facilitate international cooperation on renewable energy.	Played a significant role in raising awareness about renewable energy, providing technical assistance and capacity-building support to developing countries, and promoting knowledge sharing and best practices in renewable energy.	Non-binding, focusing on advocacy and technical assistance rather than legal enforcement.

climate governance. While it promotes global cooperation to stabilise greenhouse gas (GHG) concentrations (UNFCCC, 1992, arts 2, 4), its effectiveness is often questioned due to the non-binding nature of some of its provisions and limited obligations imposed on state parties. The Convention primarily focuses on broad commitments and principles, leaving the specific pathways for energy transition mainly to the discretion of individual nations. This flexibility, while intended to accommodate diverse national circumstances, can also lead to a lack of ambition and accountability in addressing the urgency of the climate crisis. The principle of common but differentiated responsibilities (CBDR), which recognises the differing capacities of developed and developing nations, has faced criticism for possibly obstructing ambitious actions from significant emitters. Notably, the text of the UNFCCC does not explicitly mention renewable energy. While energy efficiency is referenced once in the Preamble, it does not appear in the operative

sections of the Convention. The closest related obligation within the framework is a broadly defined responsibility to "promote and cooperate in the development, application, and diffusion" of technologies aimed at controlling, preventing, or reducing emissions across various sectors, including energy. Despite the global push for renewable energy solutions, this structure underscores that the UNFCCC remains largely neutral regarding specific energy sources, placing the onus on individual countries to determine and implement their own approaches.

The Kyoto Protocol (KP), adopted in 1997, represents a significant evolution in climate governance by establishing binding emission reduction targets for developed countries (Kyoto Protocol, 1997). Although it encourages the exploration of renewable energy sources, it does not mandate specific actions, which limits its potential impact on energy transitions. Its Clean Development Mechanism (CDM) allows developed nations to invest in emission reduction projects in developing countries, promoting sustainable development while providing flexibility for Annex I Parties (Kyoto Protocol, arts 2(1), 3(1)). However, the effectiveness of the CDM has been questioned, as it faced criticism for potential environmental and social impacts in host countries and for contributing to limited emission reductions overall. The Protocol's focus on Annex I Parties and its limited participation from major emitters like the United States and China also ultimately constrained its effectiveness in driving global decarboniation. Building upon the foundations laid by the UNFCCC and the Kyoto Protocol, the Paris Agreement, adopted on December 12, 2015, represents another significant milestone in global climate governance. It marks a transformative shift in climate governance, aiming to limit global warming to well below 2˚C (Paris Agreement to the UNFCCC, 2015).

Nevertheless, unlike the KP, it does not impose legally binding commitments but relies on Nationally Determined Contributions (NDCs) that allow countries to tailor their climate actions based on national circumstances. The voluntary nature of Nationally Determined Contributions (NDCs) raises concerns about their ambition and enforceability. As noted by Rajamani and Werksman, alongside insights from Bodansky, the Paris Agreement is indeed recognised as a legally binding instrument among states, yet its legal character is characterised by a degree of ambiguity (Rajamani & Werksman, 2018; Bodansky, 2016). For example, the phrase "pursuing efforts" to limit global warming to 1.5˚C in the Preamble is a subjective term that suggests a more cautious, non-binding commitment, indicating that while striving towards this goal is essential, it does not constitute a rigid mandate. This flexibility may facilitate broader participation but could also lead to discrepancies in the urgency and rigor of countries' responses. Similarly, while the emphasis on transparency and support for developing nations is commendable, the lack of binding commitments may result in insufficient action to bridge the "ambition gap" between current pledges and the necessary reductions to meet global climate goals. Moreover, the provision of financial and technological support to developing countries, crucial for a just transition, remains insufficient and

unevenly distributed.

The Energy Charter Treaty (ECT) and the International Energy Charter (IEC) further complicate the landscape of international energy governance. As the first binding multilateral agreement focused on the energy sector, the ECT promotes investment protection and energy trade (Energy Charter Treaty, 1994) but has faced criticism for prioritising investor rights over environmental objectives. This focus can hinder states' regulatory capacities to implement robust climate policies. In response to these concerns, civil society organisations have initiated campaigns urging ECT contracting parties to terminate the treaty, labeling it as detrimental to climate action and referring to it as a "climate killer (Kehl & Wuschka, 2024)". Furthermore, the recent withdrawals of several member states from the ECT reflects growing concerns about its compatibility with the goals of the Paris Agreement and the need for a more balanced approach that prioritises both energy security and environmental sustainability (Kehl & Wuschka, 2024).

Regarding policy frameworks, organisations like the International Renewable Energy Agency (IRENA) play a crucial role in promoting renewable energy adoption and assisting countries in implementing their NDCs (IRENA, 2024). However, IRENA's lack of binding authority and financial resources limits its ability to drive substantive change in the global energy landscape. The agency's effectiveness depends heavily on voluntary cooperation and the willingness of member states to implement its recommendations, which can vary significantly. The 2030 Agenda and the Sustainable Development Goals (SDGs) further underscore the interconnectedness of climate action and sustainable energy development. SDG 7 emphasises access to affordable and renewable energy, while SDG 13 calls for urgent climate action, collectively influencing national policies and encouraging a transition away from fossil fuels. However, the implementation of the SDGs faces numerous challenges, including inadequate funding, lack of coordination among stakeholders, and the uneven distribution of benefits across countries and within societies. In addition, in contrast to the legal instruments previously mentioned, these two frameworks do not impose binding obligations; instead, they serve merely as policy guidelines. Nonetheless, countries like Denmark and Germany exemplify the successful integration of renewable energy, demonstrating the potential of targeted policies to facilitate clean energy adoption (Hassan et al., 2024).

In conclusion, the thorough evaluation of global frameworks for sustainable energy and climate action uncovers a landscape marked by opportunities and challenges. Treaties such as the UNFCCC, Kyoto Protocol, and Paris Agreement establish crucial frameworks for climate policy; nevertheless, their efficacy is frequently compromised by non-binding promises and disparate national goals. The interaction of legal instruments, organisational roles, and emerging trends underscores the necessity for a more unified and accountable strategy for climate action, stressing the significance of collaboration among states, non-state actors, and international organisations to attain sustainable energy transitions and effectively mitigate climate change.

3. Analysis of Energy Transitions Governance in China and Selected African Countries

In China, a comprehensive set of national policies, laws, and strategies have been implemented to promote energy efficiency, renewable energy adoption, and carbon reduction while integrating climate change mitigation into broader development goals. In contrast, many African countries, though rich in renewable energy potential, face a more fragmented legal landscape that varies significantly across the continent. This section explores how these legal frameworks operate at national and regional levels, evaluating their effectiveness in promoting sustainable energy transitions and identifying commonalities and differences between China and African countries. Through this comparison, the analysis aims to highlight best practices, challenges, and opportunities for improving energy governance and advancing a just transition in both regions.

3.1. Overview of China's National Legal Framework for Energy Transition

China has established a legal framework to facilitate its transition towards renewable energy sources, driven by the urgency of addressing pollution and climate change. The Renewable Energy Law (REL) is central to this framework, enacted in 2006 and revised in 2009 to enhance its effectiveness. It establishes the foundation for the promotion of renewable resources, setting mandates for renewable energy development, generation targets, and government-backed support mechanisms (Renewable Energy Law of the People's Republic of China, 2006). Article 1 outlines the law's purpose of increasing the energy supply, restructuring energy sources, ensuring energy security, and fostering sustainable development (Renewable Energy Law of China, Article 1). Article 2 broadens the definition of renewable energy to encompass wind, solar, hydro, bioenergy, geothermal, and ocean energy (Renewable Energy Law of China, Article 2). Key mechanisms such as national renewable energy targets, mandatory grid connections, full purchase guarantees, and feed-in tariffs (FiTs) have been pivotal. FiTs have incentivised investment by guaranteeing fixed prices for renewable electricity, providing long-term security for generators. However, challenges like grid access and energy curtailment persist, requiring continuous policy and regulatory refinement (Zhang, 2019). The law also obliges local governments to set renewable energy targets and allocate funds to support the development of solar, wind, and other clean energy technologies.

However, compared to Germany's Renewable Energy Sources Act (EEG) (Energiewende-energy transition), which also uses feed-in tariffs to promote renewables, China's law reflects a centralised governance structure that prioritises rapid scale-up over local participation (Tan & Zhu, 2023). Germany's decentralised approach to renewable energy production empowers local communities to participate actively in energy generation. In contrast, China's centralised governance structure can lead to legal implementation challenges at the local level, as regional

governments may prioritise economic growth over environmental sustainability. Moreover, while both countries utilise feed-in tariffs to promote renewable energy, China's approach has been characterised by a more aggressive expansion of renewable capacity, supported by substantial government investment and state-owned enterprises (Tan & Zhu, 2023). This contrasts with the more market-driven approach seen in the European Union, where competitive bidding processes and market mechanisms often shape renewable energy policies. The differences in governance approaches significantly affect public support and the integration of renewable energy initiatives in both nations. In China, the centralised strategy may facilitate the swift implementation of renewable energy infrastructure, but it often lacks the necessary public buy-in, which is crucial for long-term sustainability. The characterisation of renewable energy initiatives as governmental impositions may lead to local dissent, evidenced by numerous cases where communities have opposed extensive solar or wind projects due to apprehensions of land utilisation and ecological consequences (Wang, Zhou, & Wen, 2023).

In contrast, Germany's decentralised governance promotes a cooperative atmosphere in which local stakeholders are actively engaged in the design and execution of renewable energy initiatives. This participatory approach not only improves public acceptance but also fosters innovation and adaptability to local conditions, ultimately resulting in more effective integration of renewable energy into the current energy system (Le Cadre, 2019). The German experience illustrates that engaged and empowered communities are more inclined to endorse and promote renewable energy schemes. To improve public acceptability and integration of renewable energy initiatives, both nations could gain from implementing best practices from each other's governance models (Wang, Zhou, & Wen, 2023; Le Cadre, 2019). China might establish procedures that promote local community involvement in the planning and decision-making processes for renewable energy initiatives. This may entail the formation of local energy councils with community representatives to guarantee that local perspectives are acknowledged and integrated into project development. Germany's decentralised strategy presents benefits, yet there is a necessity for enhanced central monitoring to ensure that local activities correspond with national energy objectives. Both nations ought to allocate resources for public awareness initiatives that inform populations about the advantages of renewable energy and rectify prevalent misconceptions. Enhancing public acceptance of renewable energy technologies and their environmental impacts can be achieved by establishing clear national targets while permitting local adaptations, thereby ensuring coherence in the overall energy transition strategy.

The Energy Conservation Law (1997, amended 2007 and 2017) complements this by enforcing stringent energy efficiency standards across various sectors, aiming to reduce energy intensity and promote conservation. Additionally, the Circular Economy Promotion Law (2008, last amended in 2018) promotes resource efficiency and recycling to support sustainable growth, while the Electric Power Law of the People's Republic of China (1995) governs power generation, transmission,

and distribution and highlights safety and efficiency within the power sector. Cleaner Production Promotion Law of the People's Republic of China. (2002) requires industries to adopt production practices that minimise environmental impact, advancing the shift towards low-carbon development in line with national energy goals. In addition to the existing multitude and robust laws governing the energy sector, on November 8, 2024, China ushered in a new era of energy governance with the enactment of the Energy Law of the People's Republic of China (National People's Congress, 2024). This landmark legislation entered into force on January 1, 2025. It provides a comprehensive framework for the nation's energy sector, addressing core issues and laying the groundwork for future regulatory developments. However, it's still too early to fully assess its impact on the country's energy transition and global energy landscape. China already has a relatively mature legislative framework for its energy sector, most notably the Renewable Energy Law of 2006 and its subsequent amendments. Notwithstanding, the new Energy Law stands out due to its comprehensive and integrated approach. It covers the entire energy chain, from production to consumption, including storage and distribution. This suggests that this law is more than just an incremental addition to the existing regulatory landscape. It presents a long-term strategic vision for China's energy sector. As such, it could serve as a catalyst for the country's energy transition and influence energy policies in other nations. Nevertheless, to fully appreciate the scope and effectiveness of this new law, it is reasonable to observe its practical implementation and analyse its interactions with other existing regulations.

Complementing these legislative measures, China's government has introduced various policies and incentives to bolster its energy transition. For instance, the Medium- and Long-Term Development Plan for Renewable Energy (National Development and Reform Commission, 2007) and subsequent Five-Year Plans (e.g., the 11th Five-Year Plan in 2008 and the 14th in 2021) set specific targets and strategic directions for renewable energy capacity. Policies like the Feed-in Tariff Policy for Wind Power Generation (National Energy Administration, 2009) and Photovoltaic Power Generation (National Energy Administration, 2011) ensure that renewable energy producers receive guaranteed pricing, thereby encouraging investment in wind and solar (Zhao et al., 2022). Additionally, mechanisms such as the Renewable Electricity Consumption Quota (National Energy Administration, 2019) and the Green Power Certificate Issuance (2017) drive demand for renewable power while certifying renewable energy consumption. The establishment of the Special Fund for Renewable Energy Development (2015) (Ministry of Finance, National Energy Administration, & State Development and Reform Commission, 2011) further allocates financial resources to projects, fostering continuous development in this sector. These specific policies indicate a structured approach to the energy transition, marked by collaboration between various governmental bodies that collectively aim to foster an environment conducive to achieving sustainable energy transition.

3.2. Regional and National Legal Frameworks Across Africa

The integration of regional legal frameworks is crucial for facilitating sustainable energy transitions in Africa. These frameworks, encompassing various treaties, strategic documents, and initiatives, not only promote cooperation among African nations but also provide a structured approach to addressing the continent's energy challenges. The African Convention on the Conservation of Nature and Natural Resources, for instance, underpins the importance of sustainable environmental practices while ensuring that natural resources are utilised responsibly. Adopted in 2003, it advocates for the conservation and sustainable management of soil, water, flora, and fauna (African Union, 2003). By integrating environmental considerations into national development plans, this Convention supports sustainable energy initiatives by ensuring that energy projects are environmentally sound and socially responsible. Its principles encourage member states to adopt policies that align economic development with environmental stewardship, fostering a sustainable energy landscape. Agenda 2063, the African Union's strategic framework for the continent's socio-economic transformation, envisions a prosperous Africa based on inclusive growth and sustainable development (African Union, 2015). This strategic plan highlights the need for regional cooperation and investment in renewable energy initiatives to combat energy poverty and achieve economic resilience. It sets out clear objectives for enhancing energy infrastructure, which is essential for the continent's industrialisation and socio-economic development. The agenda calls for member states to invest in renewable energy infrastructure and technology, thereby facilitating a shift towards sustainable energy systems that can drive economic growth while addressing climate change challenges.

Moreover, the African Continental Free Trade Area (AfCFTA) is pivotal in facilitating intra-African trade of energy resources (African Union, 2018). AfCFTA can significantly contribute to sustainable energy transitions across member states by enhancing trade in renewable energy technologies and services. The agreement facilitates cooperation among countries to develop regional supply chains for renewable energy products, thereby reducing costs and increasing access to clean energy. By lowering trade barriers and fostering a collaborative environment among nations, the AfCFTA encourages investment in energy infrastructure and technology transfer, which are necessary for promoting renewable energy projects across Africa. The African Energy Commission (AFREC) and its associated Convention are also relevant to the energy transition on the continent. The AFREC promotes cooperation among African countries in energy development while stressing sustainable practices.

Its Convention encourages member states to adopt policies that enhance energy access through renewable sources, thereby supporting national efforts toward sustainable development goals (SDGs) (African Union, 2001). AFREC's focus on regional collaboration is vital for addressing shared energy challenges and optimising resource use. In addition, the Statute of the African Minerals Development

Centre highlights the need for transparent and equitable management of mineral resources to support sustainable development (African Union, 2016). As Africa transitions to renewable energy, minerals such as lithium and cobalt are critical for battery production. This statute ensures that mineral exploitation aligns with sustainability principles, thus fostering responsible sourcing practices that support clean energy technologies. Furthermore, the African Common Position on Energy Access and Just Energy Transition is another strategic document that emphasises the need for equitable energy access across the continent while transitioning from fossil fuels to renewable energy sources (African Union, 2022). This position addresses the dual challenges of energy poverty and climate change, ensuring that Africa's development trajectory aligns with sustainable practices.

Regional Economic Communities (RECs) have also significantly promoted regional energy cooperation and transition. Institutions like the East African Centre of Excellence for Renewable Energy and Efficiency and the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) provide critical support for regional capacity building in renewable energy technologies. These centers facilitate knowledge sharing, training, and research initiatives that are essential for developing local expertise necessary for the effective implementation of renewable energy projects. For instance, the Economic Community of West African States (ECOWAS) has implemented policies and programs to promote renewable energy development and efficiency. The ECOWAS Renewable Energy Policy (EREP) and the ECOWAS Energy Efficiency Policy (EEEP) provide a roadmap for the region's energy transition. The West African Power Pool (WAPP) also facilitates regional electricity trade and promotes regional power market integration. These policies create a conducive environment for investment by providing clear guidelines for project implementation, regulatory frameworks, and financial incentives. The West Africa Clean Energy Corridor initiative seeks to enhance regional cooperation in developing renewable energy resources while ensuring grid connectivity among member states. This collaborative approach is crucial for maximising resource utilisation across borders, thereby facilitating larger-scale renewable projects that can meet regional demand sustainably.

At the national level, numerous African countries utilise legal frameworks to stimulate investments in renewable energy transitions. For instance, the Rwandan government has implemented various policies to enhance renewable energy investments, including the National Policy aimed at addressing the country's energy challenges while promoting economic and social development in an environmentally sustainable manner (World Economic Forum, 2024). The Electricity Law of 2011 and the Rwanda Energy Feed-in Tariff regulations of 2012 were established to create an enabling environment for renewable electricity generation and to attract further investments in renewable energy. As a result of these initiatives, access to electricity in Rwanda has increased dramatically, rising from just 6% in 2009 to 75% in 2024 (World Economic Forum, 2024). The Ruzizi III hydro project has contributed 145 MW to the national electricity generation capacity, which

currently totals 332.6 MW (World Economic Forum, 2024). Rwanda's ability to accelerate renewable energy investments can be attributed to the existence of effective legal frameworks supporting energy generation. Similarly, South Africa has introduced the Renewable Energy Independent Power Producer Procurement Programme, which has successfully drawn substantial investments into renewable energy projects. This program employs a structured bidding process that ensures competitive pricing and bolsters energy security. Additionally, Kenya has made notable progress with its Feed-in Tariff (FiT) Policy, which incentivises the generation of renewable energy from sources such as wind, solar, and biomass (Climate Investment Funds, 2023). The FiT mechanism guarantees a fixed payment rate for energy produced from renewable sources, thereby encouraging private-sector investments in renewable technologies. However, many African nations encounter significant challenges, including regulatory uncertainty and a lack of funding mechanisms, which hinder the effectiveness of these frameworks. Recognising these disparities is essential for crafting a cohesive strategy for energy transition across the region.

4. Comparative Analysis of Legal Frameworks and Law Driving Energy Sustainability

Both China and several African countries, including Rwanda, Kenya, and South Africa, have adopted feed-in tariff regimes as a mechanism to promote renewable energy. However, the contrasting analysis in **Table 2** reveals that these policies have experienced different limited success due to several inherent disadvantages. One significant issue is that the feed-in tariff framework often lacks sufficient legal security; typically, it exists at the regulatory level rather than as a formal law. This means that feed-in tariffs can be altered, suspended, or even revoked without the requirement for a political majority, undermining the stability required for long-term investments. Furthermore, the tariffs defined within these policies are often only maximum, implying that actual payments to producers can be lower, adversely affecting the expected returns on investment. In the context of African nations, the challenges associated with feed-in tariffs are compounded by direct cost implications, such as increases in electricity prices for end consumers and the necessity for substantial funding from national budgets. These financial demands can strain public resources and lead to consumer opposition, limiting the policy's effectiveness. Additionally, the complexity of predicting and controlling the speed of renewable energy penetration creates further uncertainties for investors, making it challenging to adjust policies timely to accommodate market dynamics.

In contrast, China has established a robust legal framework aimed at rapidly expanding renewable energy capacity. Central to this framework is the Renewable Energy Law, enacted in 2006, which mandates that grid operators purchase renewable electricity and sets a comprehensive structure for promoting renewable sources. China's ambitious targets for renewable energy generation and its commitment to achieving carbon neutrality by 2060 are supported by various

incentive mechanisms, including reliable feed-in tariffs and preferential financing for renewable energy projects. This centralised legal environment allows for swift policy implementation, effectively driving large-scale renewable energy initiatives

Table 2. Snapshot of contrasting legal energy transitions China-Africa.

Country/Region	Key Legal & Policy Frameworks	Outcomes/Impacts	Challenges
China	China Renewable Energy Law (REL 2006)/Energy Conservation Law (1997, amended 2007 and 2017)/Feed-in Tariff Policy for Wind Power Generation (2009) and Photovoltaic Power Generation (2011)	Rapid expansion of renewable energy capacity; strong industrial base; significant increase in solar and wind installations. Increased energy efficiency across sectors. Guaranteed pricing encourages significant investments in renewables.	Variability in legal implementation; balancing domestic and international commitments. Enforcement remains inconsistent across regions. Feed-in tariffs can be adjusted or suspended, risking long-term investments. Legal security issues with feed-in tariffs; reliance on coal remains high despite renewable targets. Integration of renewables into the grid presents technical challenges. Environmental and social impacts of large-scale projects Challenges in integrating variable renewable energy into the grid
Rwanda	Electricity Law of 2011/Energy Feed-in Tariff regulations of 2012	High renewable energy penetration (75% in 2024) Supported rapid development in renewable sector	Limited access to finance for renewable energy projects (dependence on funding; Lacks sufficient legal security leading to potential investment instability; Vulnerability to climate change impacts (e.g., drought)
South Africa	Renewable Energy Independent Power Producer Procurement Programme	Increased private sector investment in renewable energy Diversification of the energy mix	Complex regulatory environment; legacy coal-centric policies hinder transition. Slow progress in phasing out coal-fired power plants Challenges in grid integration and transmission
Kenya	Feed-in Tariff Policy, Energy Act 2019	Growth of the renewable energy sector Significant development of geothermal and wind power	Intermittency issues associated with renewable energy sources' Limited access to finance for off-grid renewable energy solutions High costs and market predictability issues limit effectiveness.

nationwide. Notably, while China benefits from a strong industrial base and technological advancement, many African nations must contend with challenges such as limited infrastructure and financial constraints. Moreover, many African countries experience significant variations in their legal frameworks, which are influenced by differing levels of infrastructure development, regulatory maturity, and political stability. While nations like Kenya and Rwanda have made commendable progress with supportive policies such as feed-in tariffs and targeted renewable energy incentives, others lack the robust legislation necessary for effective implementation. The disparities in regulatory environments often result in inconsistent practices that deter investment in renewable energy projects.

In China, the central government has established a comprehensive regulatory framework that supports renewable energy development. The country has implemented policies such as the Renewable Energy Law, which mandates the integration of renewable energy sources into the national grid and provides financial incentives for renewable energy projects (Hove, 2020). However, despite these robust policies, local governments sometimes fail to enforce them effectively due to competing interests or lack of resources, leading to inconsistencies in implementation across regions (Chiyemura, Shen, & Chen, 2021). For instance, local governments often prioritise coal and fossil fuel projects due to economic incentives and established interests, leading to a contradiction between the central government's push for renewable energy and the actions taken at the provincial level. While major cities like Beijing and Shanghai have made significant strides in renewable energy adoption, rural areas lag behind due to inadequate enforcement of national policies (Hove, 2020). This discrepancy is exacerbated by a lack of concrete market-related initiatives in the newly adopted Energy Law, which focuses more on planning than on creating a robust market for renewables. As a result, despite ambitious targets, the actual deployment of renewable energy projects remains inconsistent and slow, hampered by bureaucratic inertia and local interests that favor conventional energy sources. In contrast, many African nations face challenges related to weak governance and regulatory frameworks. For example, Nigeria's lack of a cohesive national energy policy has resulted in fragmented implementation of renewable energy initiatives. Nwaiwu notes that the regulatory environment is often characterised by bureaucratic inefficiencies and corruption, which impede the effective rollout of sustainable energy projects (Nwaiwu, 2021). This inconsistency is evident in the disparity between policy formulation and actual energy access, where approximately 1.2 billion people in sub-Saharan Africa still lack electricity (Nwaiwu, 2021).

Additionally, issues such as governance challenges and regulatory transparency further complicate the energy transition efforts in these countries. Regulatory delays in energy transitions typically involve various issues, including lengthy permitting processes, inconsistent policy enforcement, and bureaucratic inertia. In African countries, the prioritisation of energy policies can vary significantly. For example, while South Africa has committed to renewable energy through its Integrated Resource Plan, the implementation has been inconsistent due to political changes and economic pressures (Ajulor, 2018). The reliance on coal as a primary energy source continues to undermine efforts to transition to cleaner energy, reflecting a gap between policy aspirations and practical enforcement. Another example is regulatory uncertainty, with frequent changes in government policies and regulations that affect investor confidence and project viability (Ugwu & Adewusi, 2024). This instability can lead to significant delays in project initiation and completion, ultimately hindering the country's ability to transition to sustainable energy sources. The lack of a streamlined regulatory framework means that projects can be stalled for months or years as stakeholders navigate complex approval

processes. Moreover, regulatory delays manifest through inadequate institutional capacity and fragmented policies that impede the development of renewable energy projects. For example, while countries like Kenya and South Africa have ambitious renewable energy targets, they often struggle with bureaucratic hurdles that delay project approvals and financing. The lack of coherent regulatory frameworks can lead to uncertainty for investors, further stalling progress on renewable initiatives. Local resistance to specific projects such as wind farms or solar installations, can also exacerbate these delays. Regional efforts such as the African Continental Free Trade Area (AfCFTA) aim to facilitate collaborative energy sector initiatives among member states but face obstacles due to existing national laws that do not yet align with this regional framework. Conversely, China benefits from a cohesive legal approach, enabling a more streamlined and effective implementation of energy policies.

4.1. Legal Mechanisms for Sustainability in Energy Policies

Effective regulatory frameworks are essential for guiding the energy sector toward sustainability, serving as the foundation for establishing standards and regulations that shape energy practices. For instance, mandatory Environmental Impact Assessments (EIA) ensure that energy projects' ecological and social implications are thoroughly evaluated and mitigated before implementation. Such assessments help integrate environmental considerations into the decision-making process, safeguarding ecosystems and communities vulnerable to the impacts of energy development. Clear permits and license systems also streamline project approvals, reduce bureaucratic delays, and enhance investor confidence, fostering a more predictable regulatory environment for sustainable investments. Laws that support sustainability goals in energy production and consumption play a crucial role in shaping both national and international energy landscapes.

Various jurisdictions implement renewable energy mandates that often set specific targets for increasing renewable energy sources, outline methodologies for technology implementation, and establish mechanisms for subsidising sustainable practices. For instance, the European Union's Renewable Energy Directive creates a comprehensive legal framework requiring member states to achieve at least a 32% share of renewable energy in their overall consumption by 2030 (Tragniuk & Boichuk, 2024). This directive not only compels member states to develop national action plans but also serves as a potent example of how legal mechanisms can codify sustainability goals, providing a structured path towards reducing reliance on fossil fuels. In Australia, the Renewable Energy Target (RET) functions as a cornerstone of the legislative framework within its climate policy (Wu, 2024). This framework aims to ensure that over four-fifths of the nation's electricity comes from renewable resources by 2030, demonstrating a strong legislative commitment to transitioning away from fossil fuel dependence. The RET encompasses dual objectives: emissions abatement and the promotion of renewable energy, thereby acting as a statutory tool for environmental management and economic

transition. China's approach to renewable energy is anchored by the Renewable Energy Law (REL). This pioneering legislation aims to enhance the development and utilisation of renewable energy while optimising the energy structure to secure energy supplies, mitigate environmental impacts, and achieve sustainable socio-economic development (Wu, 2024). The REL articulates a comprehensive mandate aligned with the country's rapid energy sector evolution, establishing a robust legal framework that promotes renewable energy initiatives. Both Australia and China exhibit a commitment to renewable energy through national targets and detailed legislative frameworks designed to support the proliferation of renewable technologies. Subnational jurisdictions within these nations also tailor their renewable energy goals and regulatory instruments according to regional renewable resource endowments. Additionally, the United States has enacted the Energy Policy Act, which promotes renewable energy through production tax credits that incentivise investment in clean energy technologies (Wu, 2024). The Act addresses various facets of energy production, including energy efficiency, renewable sources, and climate change technology. Notably, it provides loan guarantees for entities developing technologies that mitigate greenhouse gas emissions and mandates increasing biofuel mixtures in gasoline sold across the nation.

In the same vein, many African nations such as Kenya and South Africa, are also implementing legal frameworks to advance renewable energy production. Kenya's Energy Act of 2019, for example, promotes investment in renewable energy by providing incentives for green energy projects and setting ambitious targets for geothermal and wind power generation (Republic of Kenya, 2019). The Act aims to diversify the country's energy mix and improve energy security, reflecting a commitment to sustainable development. South Africa's Integrated Resource Plan (IRP) is another example of a robust legal framework aimed at enhancing renewable energy usage. The most recent IRP, updated in 2023, outlines the government's strategy to increase renewable energy's share in the national energy supply, targeting significant contributions from solar and wind resources by 2030 (Department of Mineral Resources and Energy, 2024). This plan not only sets specific targets but also emphasises the need for a transition towards a low-carbon economy and the reduction of greenhouse gas emissions. Such comprehensive legal instruments illustrate the essential role of laws and regulations in promoting sustainable energy practices across different countries.

4.2. Law Promoting Social Justice

Energy transitions are deeply intertwined with issues of social equity and justice, necessitating the establishment of robust legal frameworks that can address these challenges comprehensively. Effective legal instruments guarantee equal access to energy, particularly addressing disparities prevalent between urban and rural communities. Furthermore, such frameworks actively promote the inclusion and participation of marginalised communities in energy planning and decision-making processes to safeguard their rights and interests. To promote equal access to

energy, legal mandates are essential. For example, in the European Union, the Clean Energy for All Europeans package incorporates legislative measures aimed at ensuring universal access to energy services (European Commission, 2019). This framework promotes the principle of energy justice by mandating that vulnerable groups receive targeted support to overcome energy poverty, particularly highlighting the differences in access between urban and rural areas. The focus is not solely on increasing energy availability but also on ensuring that the transition to renewable sources does not exacerbate existing inequities.

In Africa, countries like Kenya are addressing social justice through their legal frameworks. The Kenyan Energy Act of 2019 highlights the need for equitable access to energy and includes provisions specifically designed to address disparities faced by rural communities. This legislation mandates the government to work towards providing reliable electricity in underserved areas, ensuring that rural populations benefit from the country's expanding renewable energy initiatives. The Law also places an obligation on the Government to facilitate the provision of affordable energy services to all Kenyans and develop a conducive environment for the promotion of investments in energy infrastructure development, including the facilitation of the acquisition of land for energy infrastructure development in accordance with the Law. This obligation specifically reflects the notion of justice in the course energy transition. The incorporation of social equity into energy policy, Kenya demonstrates a commitment to address historical disadvantages in energy access reflecting the notion of just transition. Moreover, the United States illustrates the importance of including marginalised communities in energy policy through the Justice40 Initiative, which aims to allocate at least 40% of the benefits from federal investments in clean energy to disadvantaged communities (US Department of Energy, n.d.). This initiative underscores the legal obligation to involve these communities in energy planning and implementation. Through this policy, the US government recognises that energy transitions should not only focus on technological advancements but also must ensure that all individuals, regardless of their background, are considered in the decision-making processes that affect their energy futures.

China also provides a notable example of promoting social justice within its energy sector through regulation. The government's 14th Five-Year Plan consistently highlights poverty alleviation and equitable access to energy as essential components of its developmental strategy. A recent White Paper stresses that China's energy transition is guided by the principle of putting people first, recognising that energy is fundamental to daily life (The State Council Information Office of the People's Republic of China, 2024). Adopting a people-centered development philosophy, the government has significantly enhanced energy services across society, ensuring a reliable supply of clean energy that fosters a greater sense of gain, fulfillment, and security among its citizens. Moreover, the government has successfully maintained generally stable energy prices, securing access to energy for over 1.4 billion people (The State Council Information Office of the

People's Republic of China, 2024).

This stability is crucial for ensuring ongoing energy security and illustrates China's commitment to prioritising the welfare of its population throughout the energy transition. It also demonstrates its dedication to integrating social justice into its energy policies, ensuring that all citizens benefit from the nation's advancements in renewable energy. Legal frameworks also include mechanisms that encourage the participation of marginalised communities in energy planning. The South African Constitution explicitly enshrines the right to access sufficient water and electricity, thus tying basic human rights to energy access (Dube & Moyo, 2022). Additionally, the Integrated Resource Plan for Electricity outlines public consultation processes that include feedback from various societal sectors, ensuring that marginalised voices are heard in the energy transition discourse. These various legal frameworks that promote social justice within energy transitions highlight the role of law in mandating equal access to energy and ensuring the inclusion of marginalied communities in decision-making processes.

4.3. Addressing Climate Change Challenges

The legal framework for tackling climate change is crucial, encompassing both international obligations and national laws that govern emissions reduction (mitigation) and adaptation measures. The international climate regime is anchored by key legal instruments, including the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, and the Paris Agreement, along with decisions made during the Conference of the Parties (COPs). These hard laws are further supported by multilateral environmental agreements (MEAs), such as the Convention on Biological Diversity (CBD), the United Nations Convention to Combat Desertification (UNCCD), and the Montreal Protocol. Together, these instruments form a comprehensive legal framework designed to combat the adverse impacts of climate change on a global scale, fostering cooperation among and within nations. In tandem with these hard laws, the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs) serve as essential, albeit softer, instruments that guide state behavior in addressing pressing climate challenges. Although classified as less stringent, the SDGs play a critical role by promoting sustainability and resilience, thereby influencing how states structure their policies and actions related to climate change.

The UNFCCC established the foundational framework for international climate action, with its objectives articulated in Article 2, which aims to stabilise greenhouse gas concentrations in the atmosphere. This framework emphasises sustainable development and climate justice through principles outlined in Article 3, notably the principle of common but differentiated responsibilities. This principle holds developed nations accountable for providing necessary financial and technical assistance to developing countries, enabling them to meet their climate targets while encouraging all parties to integrate climate considerations into their social, economic, and environmental policies (Article 4(1)(e)). Furthermore,

Article 4(2)(a) compels countries to adopt national policies and measures for mitigating climate change by limiting anthropogenic greenhouse gas emissions. Among these legal instruments, the Paris Agreement stands out as the most ambitious and transformative framework for inciting climate action within the UNFCCC structure. It mandates that all signatory nations establish their Nationally Determined Contributions (NDCs), which detail their climate action strategies.

However, while parties are legally obligated to have an NDC, and to pursue measures to achieve it, achievement of the NDC is not a legally binding or enforceable commitment. The Paris Agreement aims to limit global warming to well below 2˚C, with efforts targeted towards containing it to 1.5˚C above pre-industrial levels. This legally binding accord compels countries to report transparently on their greenhouse gas emissions and progress toward their commitments, thereby fostering accountability and collaboration in climate initiatives. Nevertheless, the extent to which this goal is realisable remains questionable. Significantly, the Paris Agreement enshrines the importance of a just transition in its Preamble, highlighting the need for decent work and quality jobs that align with nationally defined development priorities. The notion of a just transition was formally recognised during COP24 in 2018, where a declaration was made affirming the necessity of equitable pathways to transition (Hizliok, Monsignori, & Scheer, 2024). At COP26 in 2021, countries collectively endorsed just transition principles, affirming their commitment to fairness and inclusivity in the transition processes (Hizliok, Monsignori, & Scheer, 2024). Also, at COP28 in 2023, nations initiated a work programme to implement just transition pathways through international cooperation, highlighting the growing recognition of social equity in climate policies.

Nations have effectively translated international climate commitments into domestic legal and policy frameworks within their national borders. As a result of the Paris Agreement, all participating countries have submitted their Nationally Determined Contributions (NDCs) and subsequently reviewed and revised them for a second round, outlining their specific efforts to reduce greenhouse gas emissions through 2030 (UNFCCC, n.d.). For example, China updated its NDC in 2020 with ambitious targets: aiming for CO_2 emissions to peak before 2030 and achieve carbon neutrality by 2060 (UNFCCC, 2021a). Further commitments include reducing CO_2 emissions per unit of GDP by over 65% compared to 2005 levels, increasing the share of non-fossil fuels in primary energy consumption to around 25%, enhancing forest stock volume by 6 billion cubic meters from the 2005 level, and ramping up its total installed capacity of wind and solar power to over 1.2 billion kilowatts by 2030 (UNFCCC, 2021a).

The European Union has taken significant steps to integrate climate objectives into its legal framework through its Climate Law, which legally mandates a reduction of net greenhouse gas emissions by at least 55% by 2030, relative to 1990 levels (European Parliament & Council, 2021). This comprehensive legal architecture enables EU member states to formulate and enforce national legislation that aligns

with this overarching target, thereby promoting collective progress toward climate goals across the region. Similarly, South Africa's updated NDC for 2021 aims for a 31% reduction in greenhouse gas emissions, establishing a target range of 398-510 MtCO2e for 2025 and narrowing it to 350-420 MtCO2e for 2030 (UNFCCC, 2021b). This specificity in targets reflects a strategic approach to emissions reduction that is tailored to the national context.

In many countries, national legislation further directs attention to specific sectors such as agriculture, transportation, and urban planning, mandating the implementation of policies that foster sustainable practices. For instance, Kenya, Nigeria, Ethiopia and India have developed National Action Plans that integrate climate resilience into their broader development strategies, with a strong focus on enhancing renewable energy deployment and improving energy efficiency (IRENA, 2023). Morocco provides a notable example of successfully leveraging national legislation to attract investment in renewable energy. The country's Law on Renewable Energy has drawn significant foreign investment into solar and wind energy projects, positioning Morocco as a leader in renewable energy production in Africa (IRENA, 2023).

Moreover, Nigeria's government has established the Renewable Energy Master Plan (REMP), which sets an ambitious goal of sourcing at least 30% of the country's electricity from renewable sources by 2030 (IRENA, 2023). This framework includes legal incentives designed to encourage private sector participation and promote green investments, thus creating an environment conducive to sustainable economic growth. Adaptation to climate change impacts is another critical aspect where law plays an essential role. Legal frameworks establish guidelines for disaster risk reduction, land use management, and environmental protection to enhance resilience against climate-related hazards.

5. Identified Gaps in Legal and Policy Documents and Opportunities

Despite significant strides made in developing legal and policy frameworks for energy transition, several gaps persist within the legal landscapes of China and African nations. Gaps identified in the legal and policy frameworks governing energy transitions in China and African countries, focusing on the barriers that impede the effective implementation of just and equitable energy strategies. While both regions have made considerable progress in developing legal instruments to support the transition to sustainable energy, numerous challenges remain. These gaps include inadequate integration of social justice principles, limited mechanisms for stakeholder participation, and insufficient alignment between energy policies and broader socio-economic development goals. By identifying these shortcomings, this section also highlights the opportunities for legal and policy reforms that could bridge these gaps, ensuring a more inclusive and effective energy transition. The analysis explores potential solutions that could enhance the coherence and impact of energy transition policies in both China and African nations, fostering a more just and sustainable future.

5.1. Existing Legal and Policy Gaps

One of the pivotal gaps is the lack of harmonisation between national laws and international obligations, which often leads to inconsistencies and inefficiencies in policy implementation. The misalignment between national policy and international commitments poses a substantial obstacle to efficient energy transitions, especially for China and several African countries. This misalignment frequently appears in various forms, such as conflicting priorities between economic development and environmental sustainability, inadequate incorporation of international climate obligations into national frameworks, and insufficient mechanisms for policy coherence across diverse governance levels. For example, in China, swift economic expansion frequently compromises environmental sustainability. National policies have emphasised industrial growth and energy generation, resulting in considerable environmental deterioration. Tang et al. (2015) emphasise that China's national policies have fostered economic expansion while concurrently leading to elevated energy consumption and environmental repercussions. This problem engenders a tension between the necessity for economic development and the commitments under international accords like the Paris Agreement, which mandates significant reductions in greenhouse gas emissions. To address this conflict, China could implement a legal framework that explicitly integrates international climate commitments into national economic planning. This could involve establishing a national climate action plan that aligns economic development goals with emissions reduction targets, ensuring that all sectors contribute to sustainability objectives. In the same way, many African countries have signed international agreements, such as the Paris Agreement, yet domestic laws often lag behind. Despite its commitment to reduce greenhouse gas emissions, South Africa's regulatory framework includes outdated coal-centric energy policies that conflict with its international obligations. This disconnect can lead to inefficient policy implementation and a failure to achieve climate targets, as seen in Angola, where the mismatch between national energy policies and international best practices hampers progress on sustainable energy initiatives. It is neccessaty then for African nations to establish legal provisions that require regular reporting on progress toward international climate commitments. This could involve creating independent oversight bodies that assess compliance with international agreements and provide recommendations for policy adjustments. Additionally, integrating climate commitments into national development plans can help ensure that all sectors are aligned with international obligations.

Another critical gap lies in the insufficient legal protection of vulnerable populations affected by energy projects. Energy projects often disregard the rights and interests of marginalised communities such as Indigenous peoples and small-scale farmers, exposing them to environmental degradation and displacement. In Kenya, for instance, the implementation of large-scale renewable energy projects has led to the disruption of local livelihoods without adequate compensation or engagement. These communities often lack voice and representation, making

them particularly susceptible to the negative impacts of energy development. Similarly, community engagement has been insufficient, which poses a risk to the project's social legitimacy. Many local stakeholders feel marginalised during crucial decision-making processes, leading to dissatisfaction and opposition to the project. Specifically, the compensation for land use has been a contentious issue, with affected individuals often feeling inadequately compensated for their losses. The absence of clear strategies for local integration into energy projects further exacerbates this issue, as it entrenches inequalities by failing to create pathways for meaningful participation and collaboration. Many energy transition policies fail to account for the unique challenges faced by low-income communities, particularly in rural areas. For instance, in Nigeria, the energy transition has predominantly favored urban centers, leaving rural populations without adequate access to clean energy solutions (Ugwu & Adewusi, 2024). This disparity exacerbates existing inequalities and limits the socio-economic development of marginalised groups. To remediate that, legal provisions should mandate that energy transition policies include specific targets for renewable energy access in underserved communities. This could involve establishing a framework for community-based renewable energy projects that prioritise local needs and ensure that vulnerable populations are not left behind. For example, the implementation of incentive-based programs that support the installation of solar panels in low-income households could be legislated to promote equitable access. Another critical area where protections are lacking is in the assessment of socio-economic impacts resulting from energy transition policies. Current regulatory frameworks often overlook the potential negative effects on vulnerable populations, such as job losses in traditional energy sectors or increased energy costs due to the transition to renewable sources. This oversight can lead to significant hardships for communities that rely on fossil fuel industries for their livelihoods (Yahya & Rafiq, 2019). Legislation should therefore, require comprehensive socio-economic impact assessments (SEIAs) for all energy transition projects. These assessments should evaluate how proposed policies will affect vulnerable populations, including potential job losses, changes in energy costs, and access to energy services. By incorporating SEIAs into the regulatory process, policymakers can better anticipate and mitigate adverse effects on marginalised communities.

5.2. Opportunities for Improvement

Enhancing cooperation between China and African nations presents unique opportunities to bridge existing legal and policy gaps. Joint ventures can facilitate knowledge transfer between China and African countries, particularly in technology and financing. For instance, collaborations on renewable energy projects, such as solar power initiatives, can empower local capacities through technology sharing and expertise development. Leveraging China's advancements in renewable technologies, African nations can enhance their energy production while ensuring that local skills are cultivated and retained. There is a pressing need for

collaborative efforts focused on creating coherent legal frameworks that address both local needs and international commitments. For example, establishing regional agreements that align national climate policies with the African Union's Agenda 2063 and the Paris Agreement could streamline efforts to tackle climate challenges collectively and facilitate cross-border renewable energy investment, trade, and cooperation. Such harmonisation would not only improve policy effectiveness but also bolster solidarity among nations facing similar environmental issues.

In terms of China-Africa energy transition cooperation, the Benban Solar Park and the Lake Turkana Wind Power project exemplify how Chinese financing can effectively support critical infrastructure, facilitate technology transfer, and foster economic engagement in the renewable energy sector. The Benban Solar Park stands as a significant example of successful China-Africa cooperation in renewable energy. Located in Egypt, this solar park is one of the largest globally, with a capacity of 165.5 MW (Carbon Brief, 2024). It utilises 494,030 specially designed Astronergy solar modules tailored for desert conditions (Astronergy, 2024). This project has substantially increased Egypt's renewable energy consumption to 20% of its total domestic energy usage, thereby enhancing the country's energy security and contributing to economic growth (Astronergy, 2024). Furthermore, it has created approximately 8000 jobs for local residents during its operational phase, illustrating the socio-economic benefits of such collaborations (Astronergy, 2024). As a flagship initiative under China's Belt and Road Initiative (BRI), the Benban Solar Park exemplifies how international partnerships can foster sustainable development and technological advancement in the renewable sector. Another prominent example is the Lake Turkana Wind Power Project in Kenya, which features a total capacity of 310 MW generated by 365 wind turbines (Omolere, 2023). This project is notable for being the largest private investment in Kenya's history and plays a crucial role in supplying electricity to over one million homes. The wind farm has significantly contributed to Kenya's clean energy transition goals by providing reliable and low-cost energy while reducing carbon emissions by approximately 64,000 tons annually (Development Reimagined, 2024). The collaboration involved not just financial investment but also technological expertise from Chinese firms, showcasing the potential for impactful partnerships in renewable energy.

In South Africa, Chinese enterprises have also participated in various solar projects, including Soutpan, Witkop, Lesedi, and Letsatsi, where they have provided essential financial resources and technological expertise. Notably, GCL-POLY has invested in both the Lesedi and Letsatsi solar PV power plants (Bhorat et al., 2024). These projects not only contribute to the country's renewable energy targets but also exemplify the collaborative spirit of Sino-South African relations in the energy sector. The financial resources and technological know-how provided by Chinese companies have been crucial in advancing South Africa's renewable energy agenda. Furthermore, in Ethiopia, projects like the Gilgel Gibe III and the

Grand Ethiopian Renaissance Dam underscore China's commitment to supporting Ethiopia's energy aspirations through significant financing from the Export-Import Bank of China (EXIM) (Chiyemura, 2020). The Genale Dawa III project, constructed by the China Gezhouba Group, and the Adama Wind Farm, which marked Ethiopia's foray into wind energy generation, further illustrate the effectiveness of Sino-Ethiopian collaboration in achieving energy transition goals. These initiatives not only facilitate energy generation but also enhance local infrastructure and economic development. These examples collectively illustrate how past cooperations between China and African nations have laid a solid foundation for future collaborations aimed at achieving energy transitions and sustainable development across the continent.

5.3. Strategic Recommendations

To effectively implement these opportunities and address the identified gaps, it is essential to implement strategic recommendations for improvement. To address the regulatory inconsistencies observed between policy formulation and enforcement across various regions, particularly in the context of energy transitions, a multi-faceted approach is essential. This approach should encompass the establishment of robust frameworks that facilitate collaboration among stakeholders, the enhancement of transparency and accountability mechanisms, and the promotion of capacity building to ensure effective implementation of policies. Countries should not only design comprehensive legal frameworks that integrate energy, environmental, and social policies but also ensure their effective implementation and monitoring mechanisms. Such frameworks should prioritise a multidimensional approach to enhance synergies across various sectors. For example, incorporating elements of social equity into climate policies can ensure that the benefits of energy projects are distributed fairly among different population groups. These frameworks should provide clear guidelines for the development, financing, and operation of energy projects. Increased stakeholder participation is essential for developing inclusive energy strategies. Engaging local communities, civil society, and the private sector in decision-making processes ensures that energy projects reflect the needs and voices of those impacted. Engaging these stakeholders can also build trust and improve the legitimacy of energy initiatives. The success of renewable energy initiatives in Morocco demonstrates how involving local stakeholders can lead to more sustainable and accepted energy solutions.

Furthermore, another step in this direction is the creation of a unified regulatory framework that standardises policies across different jurisdictions. This can be achieved through enhanced collaboration among regulatory bodies at local, regional, and national levels, fostering communication that aligns policies and enforcement strategies. By developing standardised terminology and procedures for regulatory compliance, misunderstandings and misinterpretations can be minimised, ensuring uniform enforcement. Additionally, the implementation of technology-driven solutions can facilitate real-time monitoring of compliance with

established policies, while ongoing training programs for stakeholders involved in enforcement will ensure a comprehensive understanding of regulations. To maintain consistency in policy enforcement, it is crucial to establish a system for continuous monitoring and evaluation. Regular compliance audits can assess adherence to regulations across different regions, focusing on identifying gaps in enforcement and providing recommendations for improvement. Creating feedback mechanisms for stakeholders affected by regulatory policies will help pinpoint areas where policies may be ineffective or inconsistently enforced, allowing for timely adjustments. Recognising that differences in institutional design can lead to inconsistent enforcement, tailored approaches should be developed that consider the unique contexts of each region. This may involve adapting enforcement mechanisms to fit local governance structures while adhering to the overarching unified framework. Furthermore, establishing incentive structures for regulators can encourage consistent policy enforcement, ultimately bridging the gap between policy formulation and enforcement and promoting effective energy transitions and sustainable development across regions.

6. Conclusion

The preceding analysis has underscored the pivotal role of law in driving sustainable energy transitions. The exploration of legal and policy frameworks for sustainable energy transitions reveals significant insights and implications critical for stakeholders at all levels. The findings indicate that robust legal frameworks grounded in international agreements, such as the Paris Agreement, serve as foundational pillars for effective sustainable energy governance. These frameworks outline commitments and create accountability mechanisms essential for tracking progress and ensuring compliance. The analysis, however, finds that their implementation requires robust national and regional policies. Furthermore, the comparative study of national and regional frameworks underscores the necessity for tailored approaches that recognise context-specific challenges and opportunities. In particular, the contrasting strategies employed by China and selected African nations serve as valuable case studies that provide critical lessons in policy integration and implementation. When effectively crafted and executed, these examples showcase how legal frameworks can foster innovative energy solutions that simultaneously address socio-economic inequalities. China, as a global renewable energy powerhouse, has demonstrated the potential of strong domestic policies to accelerate renewable energy deployment and reduce carbon emissions. However, challenges remain, including the need to address social and environmental impacts, and to ensure a just transition for all.

Moreover, addressing the identified gaps in existing frameworks is imperative for achieving equity in sustainable energy transitions. The research highlights that without intentional reform and the integration of inclusive policies, marginal communities may continue to experience adverse effects from unsustainable energy practices. Stakeholders must prioritise justice and equity, ensuring that all

voices are heard in the energy transition discourse. Finally, the chapter reinforces the essential understanding that sustainable energy transitions are not solely technical or economic endeavors; they are profoundly legal and social imperatives. As countries strive to meet their sustainable energy goals, a commitment to ongoing legal and policy reform, alongside collaborative actions such as China-Africa partnerships, will be vital for achieving equitable and sustainable energy futures. In this light, the chapter contributes to a broader discourse on the synergistic relationship between law, policy, and sustainable development, advocating for a comprehensive approach to energy governance that harmonises environmental, social, and economic objectives.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

African Union (2001). *Convention of the African Energy Commission.*

African Union (2003). *African Convention on the Conservation of Nature and Natural Resources.*

African Union (2015). *Agenda 2063: The Africa We Want.* https://www.nepad.org/agenda2063

African Union (2016). *Statute of the African Minerals Development Centre.*

African Union (2018). *Agreement establishing the African Continental Free Trade Area.*

African Union (2022). *African Common Position on Energy Access and Just Energy Transition.*

Ajulor, O. V. (2018). The Challenges of Policy Implementation in Africa and Sustainable Development Goals. *People: International Journal of Social Sciences, 3,* 1497-1518. https://doi.org/10.20319/pijss.2018.33.14971518

Astronergy (2024). *Egypt Benban 165.5MW Solar Park.* https://www.astronergy.com/cases/egypt-benban-165-5mw-solar-park/

Bhorat, H. et al. (2024). *Just Transition and the Labour Market in South Africa: Measuring Individual and Household Coal Economy Dependence (Research Report).* University of Cape Town, Development Policy Research Unit. https://oms-www.files.svdcdn.com/production/downloads/reports/Just-Transition-and-the-Labout-Market-in-South-Africa.pdf

Bodansky, D. (2016). The Legal Character of the Paris Agreement. *Review of European, Comparative & International Environmental Law, 25,* 142-150. https://doi.org/10.2139/ssrn.2735252

Carbon Brief (2024). *In-Depth: China's Finance for African Renewables Rebounds after two-Year Lull.* https://www.carbonbrief.org/in-depth-chinas-finance-for-african-renewables-rebounds-after-two-year-lull/#:~:text=According%20to%20Development%20Reimagined's%20analysis,target%20of%20300GW%20by%202030

Chiyemura, F. (2020). *Contextualizing African Agency in Ethiopia-China Engagement in wind Energy Infrastructure Financing and Development (IKD Working Paper No. 88).* Innovation, Knowledge and Development Research Centre, The Open University.

https://www5.open.ac.uk/ikd/sites/www.open.ac.uk.ikd/files/files/working-papers/Contextualizing%20African%20Agency%20IKD%2088.pdf

Chiyemura, F., Shen, W., & Chen, Y. (2021). *Scaling China's Green Energy Investment in Sub-Saharan Africa: Challenges and Prospects.* The African Climate Foundation. https://africanclimatefoundation.org/wp-content/uploads/2021/11/800539-ACF-NRDC-Report.pdf

Cleaner Production Promotion Law of the People's Republic of China (2002). Adopted at the 28th Session of the Standing Committee of the Ninth National People's Congress on June 29, 2002. Entered into force on January 1, 2003.

Climate Investment Funds (2023). *Kenya CIF-REI Program Submission.* https://www.cif.org/sites/cif_enc/files/2023-12/december_2023_final_kenya_cif-rei_program_submission.pdf

Department of Mineral Resources and Energy (South Africa) (2024). *Amendments to the Electricity Regulations on New Generation Capacity (GN 4238 GG 49974).* https://www.gov.za/sites/default/files/gcis_document/202401/49974gon4238.pdf

Development Reimagined (2024). *Database: Tracking China Africa Climate Actions since FOCAC.* https://developmentreimagined.com/database-tracking-china-africa-climate-actions-since-focac-8/

Dube, F., & Moyo, C. (2022). The Right to Electricity in South Africa. *Potchefstroom Electronic Law Journal, 25,* 1-21. https://doi.org/10.17159/1727-3781/2022/v25ia11839

Electric Power Law of the People's Republic of China (1995). Adopted at the 17th Meeting of the Standing Committee of the Eighth National People's Congress on December 28, 1995. Entered into Force on April 1, 1996.

Energy Charter Treaty (1994). *Energy Charter Secretariat.* https://www.encharter.org/fileadmin/user_upload/document/EN.pdf

European Commission: Directorate-General for Energy (2019). *CLEAN energy for All Europeans.* Publications Office. https://data.europa.eu/doi/10.2833/9937

European Parliament & Council (2021). *Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 Establishing the Framework for Achieving Climate Neutrality and Amending REGULATIONS (EC) No 401/2009 and (EU) 2018/1999 (European Climate Law).* http://data.europa.eu/eli/reg/2021/1119/oj

Hassan, Q., Viktor, P., J. Al-Musawi, T., Mahmood Ali, B., Algburi, S., Alzoubi, H. M. et al. (2024). The Renewable Energy Role in the Global Energy Transformations. *Renewable Energy Focus, 48,* Article ID: 100545. https://doi.org/10.1016/j.ref.2024.100545

Hizliok, S., Monsignori, G., & Scheer, A. (2024). Are We Getting Any Closer to Ending Fossil Fuel Subsidies? *LSE Business Review.*

Hove, A. (2020). *Trends and Contradictions in China's Renewable Energy Policy.* Center on Global Energy Policy. https://www.energypolicy.columbia.edu/publications/trends-and-contradictions-china-s-renewable-energy-policy/

Intergovernmental Panel on Climate Change (IPCC) (2023). *Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II, and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.* https://doi.org/10.59327/IPCC/AR6-9789291691647

International Renewable Energy Agency (2009). *Statute of the International Renewable Energy Agency (IRENA).* https://www.irena.org/-

/media/Files/IRENA/Agency/About/Statute/IRENA_Statute_English.pdf.

International Renewable Energy Agency (IRENA) (2023). *Renewable Energy Roadmap Nigeria: Summary of Key Recommendations and Findings.* https://www.nigeria-energy.com/content/dam/markets/emea/nigeria-energy/en/2023/docs/NE23-NigeriaEnergyRoadmap-Report.pdf

International Renewable Energy Agency (IRENA) (2024). *Climate Action and the Energy Transition: IRENA Member Survey on Nationally Determined Contributions.* IRENA. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2024/Jun/IRENA_Climate_action_Members_NDC_survey_2024.pdf

Kehl, P., & Wuschka, S. (2024). The Energy Charter Treaty at a Tipping Point-Modernization Efforts, Withdrawal Plans and Their Legal Consequences. *ZEuS: Zeitschrift für Europarechtliche Studien, 27,* 59. https://doi.org/10.5771/1435-439x-2024-1

Kyoto Protocol (1997). Kyoto Protocol to the United Nations Framework Convention on Climate Change. United Nations Treaty Series, 2303, 162.

Le Cadre, H. (2019). On the Efficiency of Local Electricity Markets under Decentralized and Centralized Designs: A Multi-Leader Stackelberg Game Analysis. *Central European Journal of Operations Research, 27,* 953-984. https://doi.org/10.1007/s10100-018-0521-3

Ministry of Finance, National Energy Administration, & State Development and Reform Commission (2011). *Special Fund for Renewable Energy Development (2015).*

National Development and Reform Commission (2007). *Medium- and Long-Term Development Plan for Renewable Energy*.

National Energy Administration (2009). *Regulations on Wind Power Generation*. People's Republic of China.

National Energy Administration (2011). *Regulations on Photovoltaic Power Generation*. People's Republic of China.

National Energy Administration (2019). *Notice on the Establishment and Implementation of the Renewable Electricity Consumption Quota System*. People's Republic of China.

National People's Congress (2024). *291 Laws in Force.* https://m.thepaper.cn/baijiahao_16998667

Nwaiwu, F. (2021). Digitalisation and Sustainable Energy Transitions in Africa: Assessing the Impact of Policy and Regulatory Environments on the Energy Sector in Nigeria and South Africa. *Energy, Sustainability and Society, 11,* Article No. 48. https://doi.org/10.1186/s13705-021-00325-1

Omolere, M. P. (2023). *China's Renewable Energy Empire in Africa: Lifeline or Debt Trap?* Earth.Org. https://earth.org/chinas-renewable-energy-empire-in-africa-lifeline-or-debt-trap/

Oyewo, A. S., Sterl, S., Khalili, S., & Breyer, C. (2023). Highly Renewable Energy Systems in Africa: Rationale, Research, and Recommendations. *Joule, 7,* 1437-1470. https://doi.org/10.1016/j.joule.2023.06.004

Paris Agreement (2015). Paris Agreement to the United Nations Framework Convention on Climate Change (Paris Agreement to the UNFCCC). T.I.A.S. No. 16-1104.

Paris Agreement to the United Nations Framework Convention on Climate Change (Paris Agreement to the UNFCCC) (2015). *T.I.A.S. No. 16-1104.*

Rajamani, L., & Werksman, J. (2018). The Legal Character and Operational Relevance of the Paris Agreement's Temperature Goal. *Philosophical Transactions of the Royal Society*

A: Mathematical, Physical and Engineering Sciences, 376, Article ID: 20160458. https://doi.org/10.1098/rsta.2016.0458

Renewable Energy Law of the People's Republic of China (2006). *Standing Committee of the National People's Congress.*

Republic of Kenya (2019). *Energy Act 2019 (No. 1 of 2019).* https://kenyalaw.org/kl/fileadmin/pdfdownloads/Acts/2019/EnergyAct__No.1of2019.PDF

Tan, R., & Zhu, Y. (2023). National Stances and Governance Systems: A Comparative Study of Low Carbon Governance in Germany, the United States, and China. *Global Public Policy and Governance, 3*, 219-238. https://doi.org/10.1007/s43508-023-00071-4

Tang, X., McLellan, B., Snowden, S., Zhang, B., & Höök, M. (2015). Dilemmas for China: Energy, Economy and Environment. *Sustainability, 7,* 5508-5520. https://doi.org/10.3390/su7055508

The State Council Information Office of the People's Republic of China (2024). *China's Energy Transition.* http://english.scio.gov.cn/whitepapers/2024-08/29/content_117394384.htm

Tragniuk, O., & Boichuk, D. (2024). Renewable Energy Sources as an Element of Increasing the Level of EU Energy Security: Legal Aspect. *Law and innovations, 4,* 14-20. https://doi.org/10.37772/2518-1718-2023-4(44)-2

Ugwu, M. C., & Adewusi, A. O. (2024). Navigating Legal and Policy Challenges in the Energy Transition: Case Studies from the United States and Nigeria. *International Journal of Applied Research in Social Sciences, 6,* 506-517. https://doi.org/10.51594/ijarss.v6i4.988

UNFCC (n.d.). *NDC Synthesis Report.* https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs/ndc-synthesis-report/ndc-synthesis-report

UNFCCC (2021a). *China's Achievements, New Goals and New Measures for Nationally Determined Contributions.* https://unfccc.int/sites/default/files/NDC/2022-06/China%E2%80%99s%20Achievements%2C%20New%20Goals%20and%20New%20Measures%20for%20Nationally%20Determined%20Contributions.pdf

UNFCCC (2021b). *South Africa First Nationally Determined Contribution under the Paris Agreement.* https://unfccc.int/sites/default/files/NDC/2022-06/South%20Africa%20updated%20first%20NDC%20September%202021.pdf

United Nations (2015). *Transforming Our World: The 2030 Agenda for Sustainable Development.* https://sdgs.un.org/2030agenda

United Nations Framework Convention on Climate Change (UNFCCC) (1992). *United Nations Framework Convention on Climate Change.*

US Department of Energy (n.d.). *Justice 40 Initiative.* https://www.energy.gov/justice/justice40-initiative

Wang, Y., Zhou, F., & Wen, H. (2023). Does Environmental Decentralization Promote Renewable Energy Development? A Local Government Competition Perspective. *Sustainability, 15,* Article 10829. https://doi.org/10.3390/su151410829

World Economic Forum (2024). *Legislation Driving Renewable Energy Investments in Africa.* https://www.weforum.org/stories/2024/10/legislation-drive-renewable-energy-investments-

africa/#:~:text=Africa%20has%20a%20cru-cial%20role,now%20stands%20at%20332.6%20MW

Wu, F. (2024). Legal Imperatives and Regulatory Mechanisms for Sustainable Energy Development: A Comparative Analysis of Renewable Energy Policies in Australia and China. *Lecture Notes in Education Psychology and Public Media, 35,* 206-211. https://doi.org/10.54254/2753-7048/35/20232106

Yahya, F., & Rafiq, M. (2019). Unraveling the Contemporary Drivers of Renewable Energy Consumption: Evidence from Regime Types. *Environmental Progress & Sustainable Energy, 38,* Article ID: 13178. https://doi.org/10.1002/ep.13178

Zhang, H. (2019). Prioritizing Access of Renewable Energy to the Grid in China: Regulatory Mechanisms and Challenges for Implementation. *Chinese Journal of Environmental Law, 3,* 167-202. https://doi.org/10.1163/24686042-12340041

Zhao, F., Bai, F., Liu, X., & Liu, Z. (2022). A Review on Renewable Energy Transition under China's Carbon Neutrality Target. *Sustainability, 14,* Article 15006. https://doi.org/10.3390/su142215006