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## Green Energy Transition in Pakistan: A Political Economy Analysis of Renewable Energy Policies (2020–2025)

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### ABSTRACT

The transition toward green energy has become a defining challenge for Pakistan's sustainable development and energy security. This study provides a comprehensive political economy analysis of Pakistan's renewable energy policies between 2020 and 2025, emphasizing how political priorities, economic structures, and institutional capacities have shaped the country's energy transition. Despite ambitious commitments under national and international frameworks, Pakistan's shift toward renewables remains constrained by bureaucratic inertia, policy fragmentation, and the entrenched influence of fossil fuel lobbies. Through a qualitative examination of policy documents, government reports, think-tank publications, and scholarly works, this research reveals how global climate governance and domestic political dynamics intersect to influence renewable energy adoption. The analysis demonstrates that while international partnerships and private investments have created opportunities for clean energy expansion, governance weaknesses and regulatory uncertainty continue to slow progress. The findings highlight that Pakistan's green energy transformation is not merely a technical or environmental reform—it is a deeply political process tied to questions of power distribution, institutional reform, and economic dependency. Ultimately, this paper argues that achieving a successful energy transition in Pakistan requires a coherent policy framework that aligns political will with sustainable development goals, institutional accountability, and inclusive growth.

**Keywords:** Green Energy Transition; Political Economy; Renewable Energy Policy; Energy Governance; Climate Change; Sustainable Development; Pakistan

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## Introduction

The 21st century marks a pivotal shift in the global energy landscape as nations transition toward renewable and sustainable energy systems. The urgency to address climate change, rising fuel prices, and energy insecurity has compelled governments to invest in green energy alternatives. Pakistan, like many developing countries, stands at a crossroads — balancing the twin challenges of economic growth and environmental sustainability. Over the past few years, Pakistan's growing population, industrial expansion, and urbanization have intensified its demand for energy, making the transition to renewable sources both a strategic necessity and a developmental opportunity (World Bank, 2022).

Pakistan's energy sector has long been characterized by chronic shortages, circular debt, and overreliance on imported fossil fuels. These structural weaknesses have not only hindered industrial productivity but have also deepened fiscal burdens and environmental degradation. Recognizing these challenges, the government initiated a policy shift toward renewables with the **Alternative and Renewable Energy Policy 2020 (ARE Policy 2020)**, aiming to increase the share of renewables to 30% by 2030. This move aligns with Pakistan's commitments under the **Paris Climate Agreement** and reflects an evolving political discourse that acknowledges energy transition as a foundation for sustainable economic development (Government of Pakistan, 2020).

From a political economy perspective, Pakistan's green energy transition is shaped by the interplay between state institutions, private investors, and international actors. Global financial institutions such as the **World Bank**, **Asian Development Bank (ADB)**, and **UNDP** have increasingly supported Pakistan's renewable sector through financing and capacity-building programs. Meanwhile, the **China-Pakistan Economic Corridor (CPEC)** has introduced new dimensions to Pakistan's energy diplomacy by integrating solar, wind, and hydro projects under its green development initiatives. However, the domestic political environment — marked by instability, bureaucratic inefficiencies, and vested interests — continues to affect the pace and effectiveness of policy implementation (Asian Development Bank, 2023).

Between 2020 and 2025, several renewable initiatives have been launched, including the **Gharo-Jhimpir wind corridor**, **Quaid-e-Azam Solar Park**, and **micro-hydro projects in Khyber Pakhtunkhwa and Gilgit-Baltistan**. Yet, despite policy reforms and investments, progress has been uneven. Institutional fragmentation, regulatory uncertainty, and the dominance of fossil fuel lobbies have constrained Pakistan's ability to achieve its renewable targets. Moreover, shifts in political leadership and governance priorities often lead to inconsistent implementation, highlighting how deeply political factors influence the trajectory of green energy transition in the country (Khan & Ahmed, 2023).

At the same time, the socio-economic benefits of renewable energy adoption are becoming increasingly evident. Green energy not only promises a reduction in greenhouse gas emissions but also offers avenues for **job creation, rural electrification, and industrial innovation**. The integration of decentralized solar and wind systems can empower remote communities and reduce the state's fiscal dependency on fuel imports. The transition, therefore, is not merely an environmental necessity but a political and economic transformation — one that requires coherent policy coordination, institutional integrity, and long-term vision (UNDP, 2021).

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Ultimately, this article seeks to examine Pakistan's renewable energy policies from a **political economy lens**, analyzing how political dynamics, institutional capacities, and external pressures shape the country's energy transformation between 2020 and 2025. It argues that Pakistan's green energy transition is both a developmental challenge and an opportunity to redefine its economic priorities in alignment with global sustainability goals. Understanding this nexus between **political power, economic interests, and energy policy** is essential for assessing how Pakistan can move from policy intent to tangible green outcomes (Rafiq & Malik, 2022).

## Literature Review

The literature on renewable energy and political economy provides a comprehensive understanding of how global transitions toward sustainable energy are deeply intertwined with governance, policy design, and institutional performance. Scholars argue that energy transitions are not purely technological phenomena but are shaped by the power relations and policy choices of states. Globally, countries undergoing green energy transformation demonstrate that effective transitions depend on coherent policies, institutional coordination, and public-private partnerships. In Pakistan's case, the literature reveals that the energy transition has been hindered by fragmented governance structures, overdependence on fossil fuels, and limited institutional reforms (Sovacool, 2021; Geels et al., 2017).

The political economy perspective emphasizes that Pakistan's energy challenges are not only due to technical deficiencies but also to structural economic and political constraints. Studies highlight that the dominance of vested interests within the conventional energy sector, including oil and gas lobbies, has created barriers for renewable energy development. Mirza et al. (2020) argue that inconsistent government policies, lack of financial incentives, and bureaucratic inertia have slowed down progress in solar and wind energy projects. Moreover, rent-seeking and corruption in energy institutions have weakened policy implementation, causing delays and inefficiencies in project execution (Mirza et al., 2020).

Empirical studies also highlight the role of international institutions and global actors in shaping Pakistan's renewable energy trajectory. The World Bank and the Asian Development Bank have financed several renewable projects in Sindh, Punjab, and Balochistan; however, bureaucratic delays, poor coordination among ministries, and inadequate regulatory frameworks have limited their impact. Rauf et al. (2021) suggest that while Pakistan's Alternative and Renewable Energy Policy (AREP 2019) introduced ambitious targets, the progress between 2020 and 2025 remained below potential due to weak institutional capacity and insufficient long-term planning (World Bank, 2022; Rauf et al., 2021).

Another strand of literature stresses the importance of local governance and community participation in the success of renewable energy transitions. Ahmad and Khan (2022) argue that Pakistan's energy governance model is overly centralized, leaving little room for community-led micro-hydropower and solar initiatives in rural areas. This centralization has resulted in energy inequality, where urban centers benefit from grid connectivity while rural communities remain energy-poor. Effective decentralization and community ownership models, as seen in Nepal and Bangladesh, could strengthen Pakistan's renewable energy adoption at the grassroots level (Ahmad & Khan, 2022).

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In comparative regional analyses, scholars such as Zhang (2020) and Sovacool (2021) demonstrate how China and India have accelerated their renewable transitions through consistent policy support and large-scale investments. China's centralized state-led model has been particularly effective in scaling solar and wind energy, while India's federal structure promotes regional experimentation and innovation. Pakistan, however, continues to face policy inconsistency, weak institutional monitoring, and political instability, which together hinder the sustainability of its green transition efforts (Zhang, 2020; Sovacool, 2021).

Finally, a critical gap in the existing literature lies in the lack of political economy analysis of Pakistan's renewable energy policies, especially between 2020 and 2025. Most prior studies have focused on the technical or environmental dimensions of renewable energy, neglecting how political transitions, leadership priorities, and institutional interests shape policy outcomes. Therefore, this study aims to fill this gap by examining Pakistan's renewable energy transformation through the lens of political economy — exploring how governance structures, economic incentives, and leadership visions collectively influence the green energy agenda (Author's synthesis, 2025).

Recent studies also underscore the geopolitical and economic dimensions of Pakistan's green energy transition within the context of regional cooperation and international commitments. With the growing global emphasis on climate diplomacy, Pakistan's energy policies between 2020 and 2025 have been influenced by multilateral frameworks such as the Paris Agreement and the United Nations Sustainable Development Goals (SDGs). According to Naseem and Gul (2023), Pakistan's participation in international climate forums has created external pressure to reform its domestic energy mix, yet the translation of these commitments into actionable policy remains inconsistent. The lack of fiscal space and political continuity has made Pakistan heavily dependent on international funding and technology transfers from developed economies, making its energy sovereignty vulnerable to external interests. Consequently, the literature calls for a more autonomous and strategically aligned renewable policy that can balance international obligations with domestic priorities (Naseem & Gul, 2023).

Moreover, the literature increasingly highlights the intersection of energy transition and social equity in Pakistan's political economy. Energy poverty remains a persistent challenge, where the benefits of renewable energy are disproportionately concentrated in affluent or urban regions. Qureshi and Abbas (2024) argue that without inclusive policy mechanisms, the renewable energy shift risks replicating existing inequalities rather than addressing them. Rural populations in Khyber Pakhtunkhwa, Balochistan, and Gilgit-Baltistan continue to face limited access to affordable clean energy despite the expansion of solar and wind projects in other provinces. To ensure an equitable transition, researchers suggest integrating social protection measures and targeted subsidies into renewable policies, ensuring that marginalized groups are not left behind in the transition process (Qureshi & Abbas, 2024).

## Research Objectives

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**To examine the evolution and effectiveness of Pakistan’s renewable energy policies (2020–2025)** in promoting a sustainable and inclusive green energy transition.

**To analyze the political economy factors** including governance structures, institutional interests, and economic constraints—that shape renewable energy policymaking and implementation in Pakistan.

**To assess the role of international commitments, foreign investments, and technological partnerships** in influencing Pakistan’s shift toward renewable energy within the context of global climate diplomacy.

### Research Questions

**How effective have Pakistan’s renewable energy policies (2020–2025) been** in advancing the transition toward a sustainable and low-carbon energy system?

**What political economy factors**, such as governance mechanisms, vested interests, and institutional capacities, affect the formulation and implementation of renewable energy policies in Pakistan?

**In what ways do international collaborations, investments, and climate agreements** influence Pakistan’s green energy transition and its long-term energy security goals?

### Research Methodology

This study adopts a qualitative research design grounded in the political economy approach to analyze Pakistan’s renewable energy transition from 2020 to 2025. It focuses on understanding how political institutions, governance mechanisms, and economic interests shape renewable energy policies. The research uses a descriptive and analytical method to examine policy frameworks such as the Alternative and Renewable Energy Policy 2019 and the National Electricity Policy 2021.

Data is collected through secondary sources, including government reports, international publications, think tank studies, and academic journals. These materials provide insights into institutional challenges, investment trends, and governance structures affecting Pakistan’s green energy transition.

The study employs content analysis to identify key themes, policy gaps, and emerging trends in renewable energy governance. This qualitative method ensures a comprehensive understanding of how political and economic factors influence policy effectiveness and the country’s progress toward sustainable energy development.

### The Political Economy of Green Energy in Pakistan

The political economy of Pakistan’s energy sector is deeply rooted in its historical dependence on centralized planning, rent-seeking behavior, and external economic dependencies. Since the 1970s, Pakistan’s energy policies have often been influenced by international donors, political elites, and bureaucratic interests, resulting in an uneven distribution of energy resources and persistent inefficiencies. Rather than pursuing a coherent long-term strategy, successive governments have focused on short-

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term fixes such as subsidies, ad-hoc energy imports, and populist pricing mechanisms. These measures may provide temporary relief but contribute to structural deficits and circular debt. As a result, energy policy in Pakistan has become a political tool rather than a sustainable national strategy, reflecting power struggles between public institutions, private lobbies, and external financiers (Mirza et al., 2022).

A key dimension of Pakistan's energy politics lies in the dominance of fossil fuel-based generation and the influence of powerful vested interests that profit from it. The country's overreliance on imported oil and liquefied natural gas (LNG) has made it highly vulnerable to global price volatility. The political clout of energy cartels and oil-importing firms discourages diversification toward renewables, as it threatens existing profit networks. Similarly, the bureaucracy's resistance to policy change and weak implementation capacity create additional obstacles to reform. These political economy constraints have slowed progress toward energy self-sufficiency and delayed the integration of sustainable alternatives such as solar, wind, and hydropower (Siddiqui & Zaman, 2021).

Moreover, Pakistan's federal structure complicates energy governance. After the 18th Amendment to the Constitution, provinces gained a greater role in energy development, yet institutional coordination between the federal and provincial levels remains inadequate. Conflicts of interest over energy tariffs, licensing, and revenue sharing often stall renewable energy projects. Provincial governments, lacking technical expertise and financial autonomy, depend on federal directives and donor assistance. This fragmentation reinforces the centralization of power within federal ministries, undermining the effectiveness of energy reforms and discouraging private investment in renewable sectors (Khan, 2023).

Economic challenges also play a critical role in shaping the political economy of energy. The chronic issue of circular debt—arising from poor recovery rates, line losses, and government subsidies—has destabilized the financial structure of the energy supply chain. Independent Power Producers (IPPs) often receive delayed payments, reducing investor confidence and creating a chain reaction that affects energy generation and distribution. At the same time, global institutions such as the World Bank, IMF, and Asian Development Bank exert pressure for reforms that prioritize fiscal austerity over equitable energy access. These competing pressures between international financial stabilization and domestic political survival shape an environment in which meaningful renewable energy transition becomes secondary to short-term economic management (Rauf et al., 2023).

Despite these structural challenges, Pakistan's energy transition holds significant potential if anchored in a reformed political economy framework. The nation possesses abundant renewable energy resources—solar irradiance in Balochistan and Sindh, hydropower in Khyber Pakhtunkhwa and Gilgit-Baltistan, and wind corridors along the coast of Karachi and Gharo. However, unlocking this potential requires dismantling entrenched patronage systems, improving institutional transparency, and ensuring policy continuity across political regimes. Encouraging private sector participation, fostering local manufacturing of renewable technologies, and integrating green financing models could redefine Pakistan's energy trajectory. Thus, reforming the political economy of energy is not merely a technical adjustment but a transformative step toward sustainable development and energy sovereignty (Ali & Yousaf, 2024).

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Finally, the broader geopolitical context cannot be ignored. Pakistan's strategic location between China, India, and the Middle East positions it at the crossroads of regional energy corridors such as the China–Pakistan Economic Corridor (CPEC). While CPEC initially prioritized coal-based projects, recent realignments toward renewable energy signal a gradual shift in policy thinking. Yet, the success of such transitions depends on how effectively domestic political actors align their interests with sustainable development goals. Only by depoliticizing energy governance and strengthening accountability can Pakistan transform its energy sector into a driver of national stability and inclusive growth rather than a source of economic vulnerability (Rehman, 2023).

### **Renewable Energy Policies (2020–2025): An Overview**

Between 2020 and 2025, Pakistan's renewable energy policies have undergone notable transformations aimed at addressing chronic energy shortages, reducing import dependence, and aligning with global commitments to climate change mitigation. The cornerstone of this policy evolution is the Alternative and Renewable Energy (ARE) Policy 2019, which laid the foundation for the subsequent reforms during the 2020–2025 period. This policy envisions achieving 30% renewable energy in the national energy mix by 2030 and 60% clean energy (including hydropower). During this period, the government initiated key reforms to attract foreign investment, simplify project approvals, and promote public-private partnerships. The policy also aimed to streamline tariff determination through competitive bidding, thereby reducing the high costs associated with earlier power purchase agreements. These measures signaled a significant policy shift from ad-hoc, donor-driven projects toward a structured, market-oriented renewable energy framework (Government of Pakistan, 2020).

The implementation of these policies has largely been shaped by institutional coordination between the Alternative Energy Development Board (AEDB), the National Electric Power Regulatory Authority (NEPRA), and provincial energy departments. From 2020 to 2025, NEPRA introduced regulations for net metering and distributed generation, allowing households and industries to sell surplus solar energy back to the grid. This regulatory mechanism encouraged a surge in rooftop solar installations across urban centers such as Lahore, Karachi, and Islamabad. Simultaneously, the AEDB facilitated the development of wind and solar corridors, particularly in Sindh and Balochistan, where projects like the Jhimpir Wind Corridor and Quaid-e-Azam Solar Park were expanded. Despite these developments, bureaucratic delays and policy inconsistencies continued to hinder timely implementation, reflecting the structural governance issues that persist in Pakistan's energy sector (NEPRA, 2022).

Between 2020 and 2025, Pakistan also began aligning its renewable energy goals with international climate frameworks, notably the Paris Agreement and the United Nations Sustainable Development Goals (SDGs). The federal government's Nationally Determined Contributions (NDCs) set targets for reducing greenhouse gas emissions by 20% by 2030, conditional upon international financial support. These commitments catalyzed international cooperation and financial assistance, particularly from institutions like the Asian Development Bank (ADB), World Bank, and China's Green Energy Fund. Projects under the China-Pakistan Economic Corridor (CPEC) also began integrating renewable components, marking a strategic transition from coal-heavy

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investments to solar and wind projects. However, the progress remains uneven due to institutional inertia, limited grid capacity, and financial constraints (ADB, 2023).

At the provincial level, renewable energy policies have evolved in distinct trajectories, reflecting local governance priorities and resource endowments. Sindh has emerged as a leading province in wind energy, while Punjab and Khyber Pakhtunkhwa have prioritized small hydropower and solar initiatives for rural electrification. These decentralized initiatives reflect a growing realization that Pakistan's energy transition must be regionally adapted rather than centrally imposed. The period 2020–2025 has also seen increasing engagement of the private sector and international developers in renewable energy tenders, though bureaucratic hurdles and delayed payments to Independent Power Producers (IPPs) continue to deter large-scale investment. Strengthening regulatory predictability and ensuring policy continuity remain essential for sustaining investor confidence and accelerating project completion (Khan & Rehman, 2024).

Overall, Pakistan's renewable energy policy framework between 2020 and 2025 represents an ambitious but uneven transformation. While the policy direction clearly aligns with global sustainability goals, its effectiveness depends on consistent implementation, institutional reform, and financial innovation. The government's shift toward competitive market-based models and decentralized energy production marks progress toward a more transparent and participatory energy economy. However, to realize the full potential of these reforms, Pakistan must address its governance bottlenecks, enhance grid infrastructure, and foster greater collaboration between the federal and provincial governments. Only through such systemic adjustments can the country achieve a stable, inclusive, and sustainable green energy transition in the years ahead (Ahmed & Malik, 2025).

## Challenges to the Green Energy Transition

Despite the progressive vision of Pakistan's renewable energy policies between 2020 and 2025, the country continues to face multifaceted challenges that hinder the pace of its green energy transition. The foremost challenge lies in the institutional and regulatory inefficiencies within the energy governance framework. While several institutions, such as the Ministry of Energy, the Alternative Energy Development Board (AEDB), and the National Electric Power Regulatory Authority (NEPRA) are mandated to oversee renewable initiatives, overlapping jurisdictions and bureaucratic delays have resulted in fragmented policy implementation. The absence of a unified national energy authority has further complicated coordination among federal and provincial stakeholders, leading to inconsistent project approvals and delayed regulatory clearances. These structural inefficiencies undermine investor confidence and prolong the gestation period of renewable energy projects (Khan, 2023).

A second critical barrier is Pakistan's financial and infrastructural limitations. The renewable energy sector requires substantial capital investment, technological modernization, and long-term financing mechanisms — areas where Pakistan remains significantly constrained. The volatility of the national currency, rising inflation, and limited access to concessional financing have deterred both local and international investors. Moreover, transmission and distribution (T&D) losses continue to exceed 18%, reflecting outdated infrastructure incapable of integrating variable renewable

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energy sources such as wind and solar. This lack of grid modernization restricts the scalability of renewable energy projects, resulting in frequent curtailments and inefficiencies that discourage private investment (World Bank, 2023).

The political economy of energy subsidies also poses a major challenge to Pakistan's green transition. Successive governments have maintained heavy subsidies on fossil fuels and conventional energy production to ensure short-term affordability and political stability. However, these subsidies distort market dynamics, making renewable energy comparatively less competitive. The persistence of circular debt — which surpassed PKR 2.6 trillion by 2024 — further limits the government's fiscal space to invest in renewable infrastructure. The entrenched interests of existing Independent Power Producers (IPPs), oil importers, and political elites exacerbate resistance to policy reforms that might shift incentives toward cleaner alternatives (Siddiqui & Jamil, 2024).

Additionally, the technological and human resource gaps within Pakistan's energy sector represent a significant constraint. The country heavily depends on imported solar panels, wind turbines, and related components, primarily from China, due to the absence of a domestic manufacturing base. This dependence increases vulnerability to global supply chain disruptions, as seen during the COVID-19 pandemic and the 2022 global energy crisis. Furthermore, the shortage of skilled technical personnel and energy economists has hampered the efficient operation, maintenance, and policy evaluation of renewable energy systems. Without substantial investment in research, innovation, and higher education, Pakistan's renewable energy transition will continue to rely on external expertise (Rafiq & Zhao, 2024).

Lastly, policy inconsistency and lack of public awareness continue to hinder societal acceptance and long-term sustainability of green energy projects. Frequent political transitions have led to abrupt changes in energy priorities, with each administration revising targets and altering financial incentives. Public awareness about the benefits of renewable energy and environmental sustainability also remains low, particularly in rural and semi-urban areas. The lack of community participation in project design and implementation has generated local resistance to wind and solar park developments. Therefore, public engagement and education must be central to any comprehensive strategy aimed at achieving an inclusive and equitable green transition (Ahmed & Hussain, 2025).

## Opportunities and Future Prospects

Despite the existing challenges, Pakistan possesses enormous potential to achieve a sustainable green energy transition by capitalizing on its natural resources, strategic location, and evolving policy landscape. The country is endowed with abundant renewable energy resources, including an estimated 2.9 million megawatts of solar potential and over 340,000 megawatts of wind potential, primarily in the Sindh and Balochistan regions. Similarly, the hydropower potential in the northern areas remains largely untapped, providing a clean and cost-effective energy source. These resources, if harnessed efficiently, can not only ensure energy security but also reduce dependence on imported fossil fuels, which have been a major burden on Pakistan's balance of payments (National Electric Power Regulatory Authority [NEPRA], 2023).

Another key opportunity lies in Pakistan's strategic alignment with global renewable

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energy trends and international cooperation. The country's participation in initiatives such as the China–Pakistan Economic Corridor (CPEC) Phase II offers significant prospects for clean energy investment. The inclusion of wind and solar projects in the CPEC portfolio represents a critical shift from coal-centric development toward greener alternatives. Moreover, Pakistan's eligibility for international climate financing mechanisms—such as the Green Climate Fund (GCF) and Global Environment Facility (GEF)—creates new avenues for mobilizing concessional funding to expand renewable infrastructure and capacity-building initiatives (Hussain & Zhao, 2024).

The policy evolution between 2020 and 2025 also marks a turning point for Pakistan's energy transition. The Alternative and Renewable Energy (ARE) Policy 2019 set ambitious targets to achieve 30% renewable energy share by 2030, which is further reinforced by provincial renewable energy strategies in Sindh, Punjab, and Khyber Pakhtunkhwa. These policy frameworks have introduced competitive bidding processes, net-metering regulations, and fiscal incentives for independent power producers (IPPs). Furthermore, the National Transmission and Dispatch Company (NTDC) has initiated grid modernization projects to facilitate the integration of variable renewable energy into the national grid. Such institutional developments lay the foundation for a more resilient and market-driven energy ecosystem (Ministry of Energy, 2023).

The emergence of private sector participation and technological innovation also represents a positive trajectory for Pakistan's renewable future. The rapid decline in the cost of solar photovoltaic (PV) systems and the proliferation of off-grid solutions have made renewable technologies increasingly accessible. Start-ups and private companies are now investing in distributed generation systems, rooftop solar installations, and mini-grid networks in rural communities. Additionally, advancements in battery storage, smart metering, and hybrid renewable systems can significantly improve energy efficiency and reliability. These technological shifts, combined with digitalization and artificial intelligence-based grid management, are expected to revolutionize Pakistan's energy landscape by 2030 (Ahmed & Malik, 2024).

Equally important are the socio-economic benefits associated with renewable energy development. The expansion of green industries can generate millions of jobs across engineering, installation, maintenance, and research sectors. A transition to renewable energy will not only mitigate carbon emissions but also improve public health by reducing air pollution from fossil fuel combustion. Furthermore, decentralization of renewable energy systems can empower marginalized and remote communities, providing them with affordable and sustainable energy access. This inclusive development model aligns with the United Nations Sustainable Development Goals (SDGs), particularly Goal 7—Affordable and Clean Energy—and Goal 13—Climate Action (United Nations Development Programme [UNDP], 2024).

Looking forward, the future prospects of Pakistan's renewable energy transition depend on sustained political commitment, regional cooperation, and long-term investment in innovation. If current policy momentum continues, Pakistan could emerge as a renewable energy hub for South Asia, leveraging its geographic proximity to energy markets in China, Central Asia, and the Gulf region. The adoption of green hydrogen technology, offshore wind projects, and electric mobility systems could further diversify Pakistan's energy mix in the next decade. To ensure sustainability, a

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comprehensive national energy transition framework must integrate climate resilience, community engagement, and transparent governance mechanisms (Rafiq & Ullah, 2025).

## Conclusion

The Shanghai Cooperation Organization (SCO) Summit 2025 emerges as a landmark event that underscores Pakistan's growing role in Eurasian politics, economics, and security. For Islamabad, the summit is more than a diplomatic gathering; it is a strategic opportunity to reposition itself as a bridge between South Asia, Central Asia, and China's Belt and Road Initiative. Pakistan's participation highlights both the immense opportunities and the daunting challenges it faces—ranging from leveraging CPEC and energy corridors to grappling with internal economic fragility, governance inefficiencies, and persistent tensions with India. Yet, the SCO offers Pakistan an unparalleled platform to strengthen regional connectivity, diversify its foreign policy beyond Western dependence, and project itself as a responsible stakeholder in regional peace and stability.

More importantly, Pakistan's engagement in the SCO carries implications far beyond its borders. By contributing to counterterrorism under the Regional Anti-Terrorist Structure (RATS), facilitating Afghan peace and reconstruction, and promoting trade linkages with the Central Asian Republics, Pakistan can emerge not only as a beneficiary but as a guarantor of regional stability. Such a role requires Islamabad to transcend narrow bilateral rivalries and embrace a cooperative, multilateral outlook that prioritizes common security and shared prosperity. This strategic shift could elevate Pakistan's diplomatic standing and strengthen its bargaining power in an increasingly multipolar world.

Looking forward, the future of Pakistan in the SCO will depend on its ability to align domestic reforms with regional commitments. Economic diversification, institutional coherence, and balanced diplomacy with China, Russia, and India will be key to ensuring Pakistan's long-term relevance within the organization. If these challenges are met with vision and consistency, Pakistan has the potential to transform from a passive participant into an agenda-setter within the SCO framework. Ultimately, the Summit 2025 may prove to be not just an external opportunity but also a catalyst for Pakistan's internal renewal, enabling it to redefine its role as a stabilizing force and a driver of regional integration in Eurasia.

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## Findings

**Policy Fragmentation** Despite the introduction of renewable energy policies, institutional overlap and weak coordination between federal and provincial departments continue to slow down implementation.

**Dependence on Fossil Fuels** More than 60% of Pakistan's energy mix still depends on imported oil, coal, and gas, creating fiscal pressure and vulnerability to global price shocks.

**Underutilized Renewable Potential** Pakistan's solar and wind energy potential remains largely untapped, with less than 10% of total installed capacity derived from renewable sources despite vast natural resources.

**Circular Debt Crisis** The persistent issue of circular debt—crossing Rs. 2.6 trillion—continues to cripple the energy sector, diverting funds away from renewable investment.

**Inadequate Technological Infrastructure** Limited technological capacity and dependence on imported equipment hinder the scalability and cost-effectiveness of renewable projects.

**Lack of Green Financing Mechanisms** Financial institutions in Pakistan have been slow to adopt green finance instruments, restricting access to credit for renewable projects and startups.

**Policy Instability** Frequent political transitions between 2020 and 2025 have resulted in inconsistent energy strategies, discouraging long-term private and foreign investment.

**Unequal Energy Access** Rural and marginalized regions remain largely excluded from renewable energy development, perpetuating regional inequalities in access to electricity.

**Public Awareness Deficit** Public understanding of renewable energy benefits and climate-related challenges remains low, resulting in weak societal ownership of green initiatives.

**Global Engagement Gap** Pakistan has yet to fully capitalize on international climate funds, regional green partnerships, and technology-sharing opportunities available through multilateral frameworks.

## Recommendations

**Formulate a Unified National Renewable Energy Framework** The federal and provincial governments should harmonize existing renewable energy policies under a single, long-term national strategy that ensures institutional coordination, accountability, and efficient resource utilization.

**Expand Renewable Energy Investment Portfolios** Pakistan should attract both domestic and international investors by offering tax incentives, streamlined approval processes, and public-private partnership (PPP) frameworks for solar, wind, and hydropower projects.

**Resolve the Circular Debt Crisis** Comprehensive financial restructuring, better tariff regulation, and improved governance mechanisms are needed to eliminate circular debt and ensure liquidity for new renewable investments.

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**Promote Local Manufacturing and Technology Transfer** The government should incentivize local production of solar panels, turbines, and batteries to reduce dependency on imports and create new green jobs within the country.

**Establish Green Financing Mechanisms** The State Bank of Pakistan should expand its green financing portfolio through low-interest credit lines, carbon trading mechanisms, and sustainability-linked bonds to support renewable energy entrepreneurs and industries.

**Integrate Renewable Energy in Rural Electrification** Targeted renewable energy initiatives must focus on off-grid and remote regions to ensure energy equity, social inclusion, and poverty reduction, particularly in Balochistan, Khyber Pakhtunkhwa, and rural Sindh.

**Strengthen Regulatory and Monitoring Institutions** Independent energy regulators must be empowered with greater autonomy to monitor policy implementation, evaluate renewable energy projects, and ensure compliance with environmental standards.

**Enhance Public Awareness and Education** National campaigns, school curricula, and media programs should emphasize the socio-economic and environmental benefits of renewable energy to foster public participation in sustainable practices.

**Leverage International Climate Partnerships** Pakistan should actively engage with global green alliances such as the Green Climate Fund (GCF), Asian Development Bank (ADB), and China–Pakistan Economic Corridor (CPEC) Energy Cooperation to access technology and financing.

**Develop a Just Transition Framework** Policymakers must ensure that the shift from fossil fuels to renewables protects workers, promotes retraining programs, and addresses the social impacts of structural energy change to maintain economic stability.

## Results

The analysis reveals that Pakistan has made **incremental progress** in its transition toward renewable energy between 2020 and 2025, yet the pace remains below the global average for developing economies. The findings indicate that solar and wind power have emerged as the fastest-growing segments, contributing approximately **6–8%** of total electricity generation by 2025. However, institutional inefficiencies, inconsistent policy execution, and financial bottlenecks continue to restrict large-scale transformation.

The results also highlight a **persistent urban–rural energy divide**, where urban regions benefit from pilot renewable projects, while rural and peripheral areas—particularly in Khyber Pakhtunkhwa and Balochistan—remain under-electrified. This imbalance underscores weaknesses in decentralized energy governance and points to the need for equitable policy mechanisms.

From a political economy perspective, the study finds that **bureaucratic inertia, vested interests of fossil fuel lobbies, and governance fragmentation** have slowed renewable sector reform. Despite the government’s formal commitment to the Alternative and Renewable Energy (ARE) Policy 2019, implementation gaps remain due to overlapping jurisdictions among the Ministry of Energy (Power Division), NEPRA, and provincial energy departments.

Furthermore, **foreign investment flows** into Pakistan’s renewable energy sector—though promising under CPEC’s green initiatives—are constrained by regulatory

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uncertainty and weak contract enforcement. This has discouraged long-term commitments from international firms, particularly in the solar and wind segments.

On the positive side, the study notes **increasing public and institutional awareness** regarding climate change mitigation and sustainable development goals (SDGs). Academic research, civil society engagement, and private innovation in renewable technologies are gradually influencing the national energy narrative. Additionally, Pakistan's alignment with global climate financing programs and multilateral partnerships indicates a growing political will to diversify its energy mix.

Overall, the results suggest that Pakistan stands at a **critical crossroads**: while its renewable energy potential is immense, its realization depends on coherent policy action, transparent governance, and a sustained commitment to economic and institutional reform. The study's outcomes emphasize that political economy factors—rather than technical limitations—remain the primary determinants of success or stagnation in Pakistan's green energy transition.

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