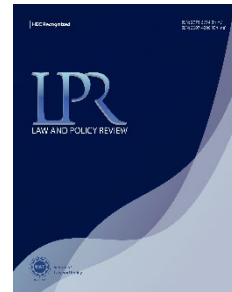


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Coal-Based Electricity Production in Pakistan Under CPEC Agreements: Environmental Impacts and Climate Law Challenges

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Abstract

Chinese firms have made significant investments in coal-fired electricity production as part of the China Pakistan Economic Corridor (CPEC) agreements. These investments have helped secure the electricity supply and, consequently, have contributed to the economic growth of Pakistan. However, due to the high carbon intensity of coal-fired power generation, this method is not compatible with the zero-emission goals necessary for managing global temperatures in line with the objectives of the Paris Agreement. To achieve these goals, all the coal-based power plants operating without carbon capture and storage must be decommissioned by 2040 (International Energy Agency, [2022](#)). The current research discusses the impacts and outcomes of the coal-based electricity generation projects in Pakistan vis a vis Paris Agreement as well as climate change standards. It aims to identify the legal and monetary challenges which may emerge from transitioning coal-based electricity generation to renewable energy sources. A qualitative research design is adopted, using an analytical method. The information gathered for this research includes an analysis of international conventions, domestic legislations, peer-reviewed articles, policies, and reports concerning coal energy projects, Chinese investments, and renewable energy transitions in Pakistan. These sources are selected based on their relevance, reliability, and contribution to the research objectives and all the extracted studies are critically evaluated. The collected data is subject to thematic analysis which is a method of analyzing, identifying and reporting patterns within the data collected from a particular study that is qualitative in nature. The objectives of this research include comprehensive study of the existing legal framework of China Pakistan coal-based energy agreements and an exploration of how Pakistan would transform energy generation through renewable sources without

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compromising energy security, while ensuring compliance with international standards of climate change.

Keywords: China Pakistan Economic Corridor, climate law, coal energy, environmental impacts, Paris agreement, renewable energy

Introduction

Amid recent global changes and commitments introduced owing to climate change shifts, the energy generation pattern of Pakistan remains uncertain and subject to fulfilment of the provisions of various international accords, including the Paris agreement. As many countries are reconsidering their electricity generation policies from fossil fuels to renewable resources after ratifying international agreements- Pakistan, a South Asian nation with weak economic situation and region's most expensive electricity production, continues to rely on coal based energy funding from China in perspective of CPEC. The current research in next sections analyzes and assesses the Pakistan's capability to deal with Chinese investment policies while also adhering the international environmental laws at the same time. China has recently introduced certain changes in foreign coal-based electricity generation investment projects with recipient countries including Pakistan. This policy shift introduced by China reflects an increased prioritization of renewable energy projects in Pakistan, along with enhanced monetary and technology support to facilitate such transitions. In light of these changes, this is now inevitable for Pakistani authorities to bring and adopt best practices which are in line with Paris agreement as well as sustainable development goals (SDGs).

Since 2010, China has invested massively in the Pakistan energy sector through the Belt & Road Initiative (BRI), primarily in coal projects. In the past, most energy systems were characterized by constant supply disruptions and a strong dependency on imported oil, making Pakistan vulnerable to the speculation and pressure of other countries and the global market. This energy insecurity forced Pakistan to explore indigenous coal potential, particularly the Thar Desert, to improve energy security (Mukhtar, [2023](#)). However, conventional international sources were reluctant to finance such ventures due to rising environmental concerns. China's entry in 2013, with substantial capital investment, appeared to be the solution and has led to the rapid development of a new extensive coal-based infrastructure under the China-Pakistan Economic Corridor (CPEC).

This initiative aimed to build several coal power plants, thereby improving Pakistan's generation capacity by thousands of megawatts (Khan et al., [2020](#)). While these statistics present a positive economic outlook, these achievements sharply contradict global trends aimed at achieving decarbonization targets, raising questions about the long-term perspectives and environmental sustainability of heavy reliance on carbon-intensive coal.

The significant regulation today is the Paris Agreement of 2015 – the United Nations agreement on climate change that outlines complex goals for the global reduction of carbon dioxide and other greenhouse gas emissions. Although the Agreement itself does not directly prohibit the use of coal, the signatory countries are expected to transition to cleaner energy sources and phase out coal usage (Tauseef et al., [2021](#)). As a Paris Agreement signatory, Pakistan has pledged to reduce greenhouse gas emissions and move to greener energy. Unfortunately, using coal to create energy makes it hard to maintain these pledges. Pakistan wants to reduce its carbon footprint and convert to cleaner energy, but coal power plants' emissions make that difficult. As a party to the treaty, Pakistan has committed to these goals and aligned its national energy policies with the treaty's directives. However, the nation faces a complex challenge: accomplishing these commitments and the concurrent responsibilities with the investments and infrastructural projects already financed by China (Mako et al., [2022](#)). While the ongoing projects under CPEC contribute to economic growth and energy security, they also conflict with the environmental objectives of the Paris Agreement. This tension between traditional economic growth models dependent on conventional energy sources and modern advances in sustainable energy reflects the broader dilemma faced by many developing countries. Pakistan must balance the need for economic growth with the requirements of global environmental agreements (Haq et al., [2021](#)). If Pakistan decides to terminate its coal-based energy deals with China, it may face legal consequences due to clauses in these agreements that include project timelines, financial provisions, and penalties for non-compliance. Potential repercussions could include litigation and financial impacts between the parties, as well as negative diplomatic consequences for both the Chinese and American governments. The most significant method for resolving the international commercial disputes between the states is arbitration and mediation. However, under CPEC agreements there is no clear and certain mechanism of resolving

disputes is mentioned. China has adopted different mechanisms of dispute resolution with other BRI countries such as international commercial courts, joint arbitration centres, mediation centres for dispute resolution. The CPEC agreements are not publicly available, hence, makes it difficult to understand the existing dispute settlement mechanism between two states although amicable solution and arbitration is a part of the CPEC dispute settlement clauses. Pakistan may involve compensation or damages claims by Chinese investors or companies engaged in coal projects (Wang et al., [2023](#)). Additionally, the cancellation could negatively affect perceptions of project feasibility from an investor's perspective and harm Pakistan's reputation with international organizations and potential future investors in the energy sector.

However, considering future trends and the goals and principles of the Paris Agreement, Pakistan must evaluate the potential consequences of continued coal power generation. China's coal policy shifts in 2021, when it announced it would not develop new overseas coal-fired power plants and increased support for low-carbon energy projects, suggests that BRI's energy investments may be transitioning toward more sustainable forms of power. This shift is critical for Pakistan, which should capitalize on this change to drive a swift transition toward variable power sources such as wind, solar, and hydroelectric energy. Despite the investments already made in coal, the long-term environmental, social, and economic costs may outweigh the benefits of further coal implementation. Therefore, by investing in its substantial renewable energy potential, Pakistan can meet its power supply needs while aligning with its international climate obligations (Abas et al., [2019](#)). This is not merely a policy shift but a fundamental realignment of Pakistan's energy strategy toward a sustainable future, consistent with global standards and the Paris Agreement, enhancing the country's position in the fight against climate change.

Coal-Based Electricity Projects and Investments by China in Pakistan

In recent years, China has significantly contributed to Pakistan's energy sector, predominantly through coal-based projects. Chinese BRI initiatives, such as the CPEC, has facilitated this collaboration, with the Planning and Engineering Commission of Pakistan (PEC) promoting China-Pakistan cooperation. The development of energy infrastructure has been a central focus, with China financing several large-scale coal-fired power plants in Pakistan. These projects vary in scale and present both economic benefits

and environmental concerns, while also raising questions about their future viability. Pakistan has long faced electricity shortages and unreliable power supply, hindering economic growth. In response, the government has sought to diversify energy sources. Pakistan turned to coal to compensate for shortfalls in natural gas hydropower. Coal is perceived as a reliable and cost-effective energy source. However, Pakistan does not produce enough coal domestically to meet its needs, necessitating imports and foreign investments. China's expertise and abundant coal resources made it a vital partner. Through CPEC, China committed billions of dollars to Pakistan's energy industry, including the construction of several coal-fired power plants. Major coal-based electricity production projects in Pakistan include the Sahiwal coal-fired power plant (1,320 MW), Port Qasim coal-fired power plant (1,320 MW), Hubco coal-fired power plant (1,320 MW), and Thar coal power projects (over 2,000 MW). These projects aim to ensure a stable energy supply, reduce power outages, and support industrial and commercial activities.

Coal Produced Energy Impacts on Environment/Climate Change

Coal-based energy projects address energy shortages and stimulate economic growth, but they also have detrimental effects on the ecology and climate. China-funded coal-based power projects in Pakistan have adverse environmental impacts (Awan et al., [2020](#)). These initiatives contribute to air pollution, deplete water resources, degrade land, and exacerbate climate change.

Air pollution from coal-fired power stations is particularly concerning because burning coal releases hazardous pollutants such as sulphur dioxide, nitrogen dioxide, particulate matter and carbon dioxide. These pollutants harm human health and the environment. The sulphur dioxide, for instance, is a major cause of acid rain, which can damage forests, crops, and aquatic ecosystems. Additionally, people living near coal-fired power plants are at risk for health problems, particularly respiratory issues. Even though the Sahiwal and Port Qasim coal power plants use modern emissions control technologies, they still contribute to the amount of sulphur dioxide in the air, affecting the air quality in their regions (World Economic Forum, [2022](#)). CO₂ is the primary greenhouse gas responsible for global warming and altering its climate. Coal-fired power plants emit significant amounts of carbon dioxide (Aamir & Ahmad, [2022](#)). The Sahiwal, Port Qasim, and

Hubco plants all emit millions of tons of Carbon dioxide annually, contributing to Pakistan's carbon footprint and exacerbating global climate change.

Coal-based power plants require significant amounts of water for cooling and other tasks, which can impact the area's water supplies. Excessive water extraction can deplete local water bodies and groundwater, harming ecosystems and the people living nearby. Due to their large size, the Sahiwal and Port Qasim plants require substantial amounts of water for cooling (United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP], [2021](#)). Certain regions of Pakistan, such as Punjab and Sindh, already face challenges in securing adequate water supplies. These power plants exacerbate the problem by demanding additional water resources (Bashir et al., [2022](#)).

Coal-fired power facilities harm land and habitats. The construction of coal power stations, coal storage facilities, and transportation networks requires substantial amounts of land. Land clearance for Thar coal power projects has disrupted natural habitats and led to animal displacement (Clark et al., [2022](#)). Coal mines, particularly in Thar, have devastated habitats and degraded the landscape.

Coal-fired power facilities are major contributors to carbon dioxide emissions, which cause climate change. Pakistani coal-fired power facilities release substantial amounts of carbon dioxide, impacting both the nation and the world. Every year, Sahiwal, Port Qasim, and Hubco facilities emit lots of carbon dioxide, because they utilize fossil fuels, they emit carbon dioxide and other pollutants (Yu, [2023](#)). These pollutants increase greenhouse gas emissions leading to global warming and climate change, including extreme weather, rising sea levels, and agricultural challenges. As a Paris Agreement signatory, Pakistan has pledged to reduce greenhouse gas emissions and move to greener energy (Telo & Ponjaert, [2016](#)). As a climate-sensitive nation, Pakistan's dependence on coal is detrimental to its long-term health and resilience (Sheikh et al., [2022](#)).

International Environmental Laws and Legal Framework in Pakistan

It is important to understand the legal frameworks regulating coal-based electricity projects, given the dynamic nature of international environmental laws and the current trend of increasing legal barriers to the use of coal. Pakistan, having ratified the Paris agreement and being a signatory to various international environment protection accords introduced by the UN

such as Vienna Convention on Protection of Ozone Layer, Kyoto Protocol, Sustainable Development Goals (SDGs), is under binding obligations to minimize carbon emissions (Ahmad, [2022](#)). Moreover, in the light of recent research, this article informs that the ideal temperature must be one degree and may not go beyond the two degrees celsius above pre industrial levels under any circumstances (Masson-Delmotte et al., [2018](#)). The relevant domestic legislation to control the emissions and protect the environment includes Pakistan Environment Protection Act, 1997, Climate Change Act, 2017, Pakistan National Clean Air Policy, 2023, Pakistan's Alternative and Renewable Energy Policy, 2019 and Constitutional provisions particularly under article 9 and 9A. The shift from coal-based energy to renewable resource based energy took place due to the rise of world temperature averaged five degrees celsius which seeks an immediate and serious consideration all over the world (Dwivedi et al., [2022](#)).

In recent years, Pakistan has not only ratified the international agreements concerning environment protection and climate change shifts but also introduced and amended various local legislations to align with these global commitments. However, these changes also put Pakistan in a difficult situation-balancing the need to maintain energy security while following the international and domestic legislations for getting cheap energy based on renewable resources. Failure to adhere to best international practices can reduce the global investments made for the mitigation of climate change impacts as well as weakens the relationships with other states (Wang et al., [2021](#)). Hence, it is crucial for Pakistan to navigate its domestic policy objectives and international legal responsibilities simultaneously in the sphere of strategic energy planning.

In general, Pakistan and China have signed various agreements related to coal-based energy projects; however, international laws and treaties play an important role in executing or not executing these agreements (Khan & Chaudhary, [2021](#)). The Vienna Convention on the Law of Treaties (1969) is applicable here, as China and Pakistan have agreed upon certain legal formalities and rules set by the Convention for the alterability or denunciation of treaties. This Convention maintains the principle of the obligation of the parties to perform a treaty ("pacta sunt servanda") while also recognizing the possibility to terminate or withdraw from the treaty under certain conditions, such as the consent of the parties, a subsequent change in the circumstances, or fundamental breach by one state (Graham

& Stass, [2021](#)). Regarding environmental concerns, previous research argues that accords such as the Paris Climate Accord could be cited as the basis for modifying agreements to reflect international commitments. This means that the continuation of coal projects may be inconsistent with the country's emissions reduction obligations. The use of international arbitration and other mechanisms for the settlement of disputes remains paramount in resolving conflicts that may arise from international agreements (Vajda, [2018](#)). Other agencies, such as the International Centre for Settlement of Investment Disputes (ICSID) and the Permanent Court of Arbitration, offer platforms through which parties in a dispute can seek resolution through binding neutral means. These bodies are usually responsible for cases involving state and investor-state claims, ensuring that decisions are based on the agreed legal provisions rather than the merits of the case, and they adhere to international law. A salient example is the Sri Lankan government seeking the right to cancel an infrastructure investment project by foreign investors for environmental and financial reasons through an arbitration (Nihaaj, [2016](#)). This was an ICSID arbitration case in which the investors were awarded relief. The case provides a clear indication of how state sovereignty can be compromised by legal obligations and environmentalism (Gismondi, [2023](#)).

Moreover, previous research elaborated that within these bilateral frameworks, certain aspects of the Chinese engagement and investment are predetermined. In Pakistan, they fall under the legal framework of the 2002 Power Policy, which allows for the participation of foreign investors in power production (Speed et al., [2018](#)).

Furthermore, the projects are bound by the rules and regulations of the National Electric Power Regulatory Authority (NEPRA), which is involved in tariff fixation and observing the operational guidelines of the projects. Environmental issues are also addressed; projects must comply with the Pakistan Environmental Protection Act (PEPA) 1997, which requires all projects to submit an EIA to determine and address their effects on the environment (Khan & Chang, [2021](#)). Internationally, the projects are often subject to global environmental standards, including the Paris Agreement, which promotes renewable energy over coal. Pakistan's participation in this agreement exposed its vulnerability regarding the dependence on coal, due to legal and diplomatic issues (Rashid, [2020](#)).

Legal Framework Governing International Agreements in Pakistan

The mechanism of handling international agreements primarily operates within the legal framework of Pakistan, with Constitutional provisions and statutes serving as the cornerstones. Articles 8 through 28 of the Constitution of Pakistan (1973) allow any treaty or agreement to be incorporated into domestic law once ratified by Parliament, thereby linking international obligations with the domestic legal framework (Verdier & Versteeg, [2017](#)). However, implementing such agreements requires legislative measures if these agreements are inconsistent with national laws, especially if the Ministry of Foreign Affairs is not involved in the negotiation and implementation stages. The Contract Act of 1872 and the Specific Relief Act of 1877 also give general information on the contractual agreement and the remedies which are available and include those of the international contracts (Mohan & Jain, [2020](#)). Additionally, the International Arbitration Act of 2011 recognizes international arbitration agreements and awards, which are crucial for resolving disputes arising from international agreements.

If Pakistan considers changing or even terminating its agreements on coal-based energy related projects with China, several legal provisions, laws, and statutes at both the national and international levels would be triggered (Christiansen, [2016](#)). Domestically, the Contract Act of 1872 outlines the rules governing contracts, whether the parties are from the same country or different countries, and the provisions for enforcing or dissolving contracts. Under this Act, Pakistan would need to provide justification for contract cancellation, which could include mutual consent or a material breach. Additionally, the International Arbitration Act of 2011 is crucial as it sets the rules for arbitration in international disputes involving foreign investors (Moses, [2017](#)). This Act aligns with the New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards to which Pakistan is a signatory, ensuring the recognition and enforcement of international arbitration awards (Seyadi, [2017](#)).

Internationally, if the agreements were signed under the BRI framework, they might be governed by specific Pakistan-China bilateral treaties, which typically include provisions for how and under what terms alterations or termination of the projects can occur (Chris, [2020](#)). Most of these treaties require that significant changes go through a diplomatic process and may involve international mediation. Additionally, compliance

with international environmental agreements, such as the Paris Agreement, which Pakistan has also ratified, can impact the legal process (Jaffry, [2017](#)). Pakistan may argue that continuing coal-based projects contradicts its commitment to reducing carbon emissions and may seek to renegotiate or terminate these agreements based on international environmental law principles. Furthermore, the renewable energy transition from coal-based energy projects is also in line with the BRI “green development policy” as enunciated under the Chinese policy. Under this policy, BRI ensures to promote and maintain sustainable and environment friendly use of renewable energy sources for all the relevant projects.

China and Pakistan Obligations under the Paris Agreement

An area of emerging interest is Pakistan's energy landscape, where coal-based projects and the Paris Agreement have recently gained global attention, particularly in light of CPEC-related initiatives. Recent trends and international conventions advocate against the addition of new coal-based power projects, and China's leadership has also declared a halt to the export of overseas coal power plants, casting uncertainty on future energy generation. This part of research focuses on two main topics: first, the Paris Agreement of 2015 and China and Pakistan's obligation to cease any new coal-based project, and second, the path forward for Pakistan. Pakistan's fossil fuel-based energy sector has faced several national challenges, including political instability, power crises, and reliance on fuel imports (Rafique & Rehman, [2017](#)). The country has increasingly sought energy security, with a strong focus on coal-based projects, especially under the CPEC framework aimed at addressing persistent energy shortages. The National Power Policy promoted by the Pakistani government was aligned with this objective, advocating for the development of coal-based power plants to utilize the abundant and low-cost coal resources. However, the reliance on coal raises significant environmental concerns and challenges in meeting international emission targets.

However, challenges such as negative environmental impacts, including the emission of air and water pollutants and carbon have been raised on coal projects due to the economic returns expected from such projects. This perspective aligns with the Paris Agreement's goal of limiting global warming to below 2°C with efforts towards 1.5°C and underscores the need for nations to transition away from coal in electricity generation (Greene, [2000](#)). The Pakistan's Nationally Determined Contribution (NDC) under

the Paris Agreement also aims for a balanced energy mix by 2030, with no new coal plant capacity after 2020. This commitment demonstrates that Pakistan is aware of the changing global dynamics and acknowledges that the adoption of cleaner and more sustainable energy can no longer be postponed. CPEC is a significant project for both China and Pakistan, having helped Pakistan primarily in addressing the energy crisis through China's funding of coal projects. Nonetheless, China's recent declaration of no new overseas coal plant constructions since late 2020 represents a significant move towards supporting low-carbon energy. This shift also poses challenges for ongoing coal projects in Pakistan, particularly in relation to rising global standards, climate change policies, and environmental preservation.

Pakistan's energy sector, particularly within the CPEC framework, has been impacted by China's recent decision to cease financing for new coal power facilities abroad. This policy shift aligns with global intentions, as outlined in the Paris Agreement, to reduce greenhouse gases and adopt sustainable energy sources. The overseas development finance Pakistan has received from China has been substantial, totaling around forty billion dollars since 2008, with the power sector being one of the primary beneficiaries. Since 2012, Chinese policy banks and companies have actively financed gigawatts (GW) of generating capacity in Pakistan, with an additional seven GW. However, the power sector's market capacity remains heavily reliant on coal, constituting approximately 50 percent, raising concerns about new planned coal projects. If the planned 4.7 Coal projects in Pakistan (nine GW) move ahead, they will add nearly 23.75 million tonnes of CO₂ emissions annually, thus increasing the existing volume of emissions in the country by 10 percent. This highlights the urgency for Pakistan to reconsider its energy choices and align with global efforts to combat climate change. Transitioning from coal and other fossil fuels to cleaner energy sources is crucial for Pakistan to reduce its carbon footprint and support global climate change mitigation efforts. Major energy sources have been environmentally damaging and costly to maintain for many years (Upadhyaya, [2020](#)). China's recent policy measures, including stopping the financing of new coal power projects overseas, present both challenges and opportunities for Pakistan's energy sector. For Pakistan to successfully transition, the government must adopt renewable energy, improve policies related to renewable energy, and engage in bilateral and multilateral relationships. This gradual shift aligns with the

global targets outlined in the Paris Agreement and provides a viable path for positive progression in Pakistan.

Potential of Renewable Resources in Pakistan

Pakistan has several green energy sources that can change its energy mix, with solar, wind, hydropower, and biomass being the most promising renewable energies. Pakistan's geographic location makes it a promising solar energy market. Sunlight is abundant in regions like Balochistan, Sindh, and southern Punjab. Studies suggest that Pakistan could generate about 2.9 million MW of solar power annually. Large-scale PV and solar thermal systems can harness this energy. Sindh and Balochistan's coastal areas, particularly the Gharo-Keti Bandar wind corridor, hold significant potential for wind generation. The corridor alone has the potential to generate 50,000 megawatts of power. In these high-potential areas, wind turbines can provide reliable energy (Arshad, [2023](#)). Although Pakistan has utilized electricity for years, the northern region holds untapped potential. With 9,000 MW of existing capacity, the country can generate 60,000 MW of hydropower. Both small and large hydropower projects can enhance this capacity. Organic waste from urban areas, farms, and livestock may generate biomass energy. Pakistan's numerous farms produce biomass that can be converted into biogas and energy (Asif et al., [2022](#)). This resource might considerably enhance rural energy needs and cut fossil fuel use.

Current Landscape of Renewable Energy

Karachi's green energy sector has grown in recent years, but has not yet reached its full potential. Currently, less than 5% of the country's power comes from renewable sources such as the sun, wind, and biogas. There are about 1,235 MW of installed wind power and about 530 MW of installed solar power (Kanwal et al., [2022](#)). Hydropower remains the most important green energy source, accounting for about 30% of the country's electricity. Pakistan's government has initiated a number of programs and projects to support clean energy. The government created the Alternative Energy Development Board (AEDB) to assist green energy projects in starting up. It also passed the National Electric Power Regulatory Authority (NEPRA) Act, which manages rates and finances green energy projects. Increasingly more companies are showing interest in investing in clean energy. Companies from around the world are now operating solar and wind projects in various parts of the country (Haris et al., [2021](#)).

Challenges in Transitioning to Renewable Energy

Renewable energy holds significant potential for Pakistan, but the transition from coal-based power must be gradual. One of the main issues is that green energy projects currently lack the necessary infrastructure. The grid is not equipped to manage intermittent green energy sources such as wind and solar power effectively (Raza et al, [2022](#)). To maximize the benefits of renewable energy, it is necessary to develop smart technologies and strengthen the grid. Furthermore, green energy projects require substantial upfront investment. A big problem is still getting access to credit on good terms. Although the government provides incentives to attract substantial investments, there is a need for more robust financial systems and support from international financial institutions (Tang et al., [2024](#)). Despite existing policies, investors require clearer and more stable long-term policy guidelines. An optimal environment for developing renewable energy necessitates streamlined processes, reduced bureaucratic hurdles, and clear regulatory guidelines. Personnel in the renewable energy industry need specific technical expertise for designing, installing, and maintaining systems. Developing local skills is crucial, and this can be achieved by investing in research and development, training programs, and partnerships with international experts. Public awareness about the benefits of green energy needs to be increased, and concerns about its reliability and cost must be addressed.

Recommendations

Pakistan requires a strategic and holistic approach that addresses legal, financial, and diplomatic perspectives to achieve a comprehensive and meaningful transition from coal-based to renewable energy production. The primary objective is to maintain and enhance energy security in alignment with the country's development strategy and international commitments to combat climate change. In this section, the authors provide the recommendations and outcomes of the discussions of this research with respect to energy security and sustainable environment. According to the findings, Pakistan currently is having strong dependence of coal power, which is being subsidized through investments made under the BRI and the CPEC initiatives which increased energy generation for the country. However, such dependence means that Pakistan is contrary to the provisions of the Paris Agreement whose main focus is to limit the emissions of greenhouse gases. Thus, it is imperative that the policymakers in Pakistan

develop and implement long term strategies on policy changes, technological development, international relations, and restructuring of the economy. The first recommendation relates to policy on energy whereby effective policies should be formulated and emphasis being placed upon renewable energy sources. There shall be establishment of the ARE (Alternative and Renewable Energy) policy and it must be rigorously in nature in order to prevent unrealistic figures set on the percentage of renewable energy that will be utilized to determine the future actions. There is need to place more focus on smart grid technologies and integration of enhanced energy storage to make sure energy stability and security.

China and developed countries shall develop strong international relationships when it comes to renewable energy projects. With the development of existing expertise and technology, China can partner with Pakistan on wind, solar and hydroelectric power projects. The establishment of additional joint research and development centers and the promotion of technology transfer agreements will improve Pakistan's potential in renewable energy. Furthermore, working with countries like Germany and Denmark with successful energy transition experience, will add value. In order to alleviate the economic burden of the coal phase-out, Pakistan needs to introduce financial instruments such as carbon pricing, green bonds, and climate finance. Through the introduction of a carbon tax or cap-and-trade approaches, revenue can be raised to deal with the financing of the development of renewable energy, and to cut back on the usage of carbon products.

Pakistan surely requires to devise a detailed energy transition plan which is in line with the scope of the Paris Agreement. The devised plan needs to outline specific goals and timeframes to initiate and complete the process of replacing the energy mix from coal based energy to renewable energy sources. The plan should further add timeframe for the expansion of the existing connected grid and the transmission facilities, as well as for the incorporation of renewable energy solutions in the existing system. Owing to Pakistan current coal energy dependency, Pakistan needs to reinforce its policy and legal frameworks to move towards cleaner sources of energy. This includes changing NEPRA regulations and AEDB policies to increase the motivation for renewable energy implementation. The government should prioritize the aim of improving the investment climate by improving the speed of the approval process and reducing unnecessary bureaucracy red

tape with respect to energy projects. The establishment of renewable energy facilities entails huge amounts of financial resources. Thus, Pakistan should also engage with innovative climate finance mechanisms, for instance, green bond schemes, PPPs and international climate finance. Furthermore, the government may set up a renewable energy fund which can further aid renewable energy projects through the provision of loans and grants.

Conclusion

The current research concludes that the Paris Agreement enforceable since 2015 is one of the most remarkable international efforts to combat climate change, to which all signatory countries agreed to make an effort to keep the rise in global mean temperature above pre industrial levels to no more than 2 degrees Celsius. Moreover, in recent studies, it was discussed that the aim of the Paris agreement is to guide and direct the world to clean energy systems, which will only be achieved through extensive reforms in almost all countries particularly in the developing nations (Mansoor, [2021](#)). In conclusion, the authors argued that the Pakistan is in a deciding stage in its energy ladder. The shift from coal into leading renewable energy source is a complex process that is quite necessary for the development and future of environment. Therefore, this research establishes the fact that there is need for multi-disciplinary analysis of the legal, economic, environmental and social factors as a way of managing this transition in the right manner. From becoming a renewable energy power house, promoting international collaboration on climate change to putting in place sound laws and regulations, Pakistan can accomplish the objectives set forth under climate change. This transition may be a challenging one as stated above nevertheless the long-term benefits include economic security and stability, environmental preservation and enhancement of public health while ranking Pakistan as a responsible state that is combating climate change.

Pakistan's energy policy grapples with these challenges, particularly in terms of financial and technological resource availability. Although the Paris Agreement necessitates significant legal and policy changes, meeting its standards has proven complex for many countries for several reasons and particularly developing nations would need to overhaul their regulatory systems to meet the global climate change standards set by the Agreement. The authors conclude that for Pakistan, this shift from coal-centered energy projects to renewable energy involves numerous challenges, including economic and political obstacles. Furthermore, previous research indicates

problems with decarbonization efforts. While acknowledging the necessity of this move for mitigating climate change, the support structures for developing countries appear insufficient. The authors find that international funding and technical cooperation are essential for the countries to meet the Paris Accord goals, but such funding is often difficult or delayed.

Conflict of Interest

The authors of the manuscript have no financial or non-financial conflict of interest in the subject matter or materials discussed in this manuscript.

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References

- Aamir, M., & Ahmad, M. (2022). CPEC and challenges for India and Pakistan. *Annals of Human and Social Sciences*, 3(2), 201–212. [https://doi.org/10.35484/ahss.2022\(3-II\)19](https://doi.org/10.35484/ahss.2022(3-II)19)
- Abas, N., Saleem, M. S., Kalair, E., & Khan, N. (2019). Cooperative control of regional transboundary air pollutants. *Environmental Systems Research*, 8, Article e10. <https://doi.org/10.1186/s40068-019-0138-0>
- Ahmad, M. (2022). The discourse of limitations and strengths of the Paris Climate Agreement. *Pakistan Journal of Criminal Justice*, 2(1), 7–16.
- Arshad, M. (2023). Sustainability of renewable energy options as compared to coal-fired power plants in Pakistan. *Green and Low-Carbon Economy*, 2(3), 162–173. <https://doi.org/10.47852/bonviewGLCE32021320>
- Asif, M., Umar, M. S., Saqina, A., Gul, M., & Reema, A. (2022). Renewable and non-renewable energy resources of Pakistan and their applicability under current scenario of Pakistan. *OPEC Energy Review*, 46(3), 310–339. <https://doi.org/10.1111/opec.12230>
- Awan, M. Z., Asim, M., & Manzoor, S. (2020). A retrospective and prospective overview of the developmental trends of environmental

- laws in Pakistan. *European Journal of Environment and Earth Sciences*, 1(1), 1–7. <https://doi.org/10.24018/ejgeo.2020.1.1.1>
- Bashir, S., Kanwal, S., & Majeed, A. (2022). Integrated energy planning and modeling (IEPM) for sustainable electricity generation in Pakistan: Challenges and limitations. *Energy Exploration & Exploitation*, 40(6), 1806–1836. <https://doi.org/10.1177/01445987221105098>
- Chris, L. (2020). *Securing the Belt and Road Initiative: Cases in Pakistan and Sri Lanka* [Doctoral dissertation, Naval Postgraduate School]. Dudley Knox Library. <https://hdl.handle.net/10945/64004>
- Christiansen, S. A. (2016). Fuel for thought: Mid-August–October 2016. *Energy & Environment*, 27(8), 942–1044.
- Clark, A., Benoit, P., & Walters, J. (2022). Government shareholders, wasted resources and climate ambitions: Why is China still building new coal-fired power plants? *Climate Policy*, 23(1), 25–40. <https://doi.org/10.1080/14693062.2022.2062285>
- Dwivedi, Y. K., Hughes, L., Kar, A. K., Baabdullah, A. M., Grover, P., Abbas, R., Andreini, D., Abumoghli, I., Barlette, Y., Bunker, D., Kruse, L. C., Constantiou, I., Davison, R. M., De, R., Dubey, R., Fenby-Taylor, H., Gupta, B., He, W., Kodama, M., . . . Wade, M. (2022). Climate change and COP 26: Are digital technologies and information management part of the problem or the solution? An editorial reflection and call to action. *International Journal of Information Management*, 63, Article e102456. <https://doi.org/10.1016/j.ijinfomgt.2021.102456>
- Gismondi, G. E. (2023). *International environmental law and international human rights law in investment treaty arbitration: The contribution of host states' argumentation in re-shaping international investment law*. Wolters Kluwer.
- Graham, J., & Stass, K. G. (2021). *Essay: The Vienna convention on the law of treaties and the notion of hardship*. Social Science Research Network. <https://doi.org/10.2139/ssrn.3982620>
- Greene, L. A. (2000). Ehpnet: United Nations framework convention on climate change. *Environmental Health Perspectives*, 108(8), Article e353. <https://doi.org/10.1289/ehp.108-a353>

- Haq, A. U., Jalal, M., Hassan, M. A., Sindi, H., & Ahmad, S. (2021). Implementation of smart grid technologies in Pakistan under CPEC project: Technical and policy implications. *IEEE Access*, 9, 61594–61610. <https://doi.org/10.1109/ACCESS.2021.3074338>
- Haris, M., Yang, Q., & Bi, Y. (2021, October 15–17). *Relying on coal: The drivers of coal in the energy mix of Pakistan* [Paper presentation]. In Proceedings of the 5th International Conference on E-Business and Internet, University of Singapore, Singapore.
- International Energy Agency. (2022). *Coal in net zero transitions*. <https://www.iea.org/reports/coal-in-net-zero-transitions>
- Jaffry, S. (2017). *Development of environment law by the UN: Case of implementation in Pakistan* [Bachelor's thesis, Helsinki Metropolia University of Applied Sciences]. Thesus. <https://www.theseus.fi/handle/10024/141902>
- Kanwal, S., Mehran, M. T., Hassan, M., Anwar, M., Naqvi, S. R., & Khoja, A. H. (2022). An integrated future approach for the energy security of Pakistan: Replacement of fossil fuels with syngas. *Renewable and Sustainable Energy Reviews*, 156, Article e111978. <https://doi.org/10.1016/j.rser.2021.111978>
- Khan, M. I., & Chang, Y. C. (2021). Love for the climate in Sino–Pakistan economic romance: A perspective of environmental laws. *Clean Technologies and Environmental Policy*, 23(2), 387–399. <https://doi.org/10.1007/s10098-020-01938-4>
- Khan, M. I., Khan, I. A., & Chang, Y. C. (2020). An overview of global renewable energy trends and current practices in Pakistan: A perspective of policy implications. *Journal of Renewable and Sustainable Energy*, 12(5), Article e056301. <https://doi.org/10.1063/5.0005906>
- Khan, M., & Chaudhry, M. N. (2021). Role of and challenges to environmental impact assessment proponents in Pakistan. *Environmental Impact Assessment Review*, 90(6), Article e106606. <https://doi.org/10.1016/j.eiar.2021.106606>
- Mako, W. P., Nabi, I., Mahmood, A., & Khan, S. (2022). *Recent developments in climate finance: Implications for Pakistan* (Working Paper No. PAK-22034). International Growth Centre & Consortium for

Development

Policy

Research.

<https://www.theigc.org/sites/default/files/2022/09/Mako-et-al-2022-Working-paper.pdf>

Mansoor, A. (2021). *China Pakistan Economic Corridor: Is Pakistan ready for technology catch-up?* [Doctoral dissertation, Hong Kong University of Science and Technology]. Rare & Special e-Zone. <https://lbezone.hkust.edu.hk/rsc/?p=59194>

Masson-Delmotte, V., Zhai, P., Pörtner, H.-O., Roberts, D., Skea, J., Shukla, P. R., Pirani, A., Moufouma-Okia, W., Péan, C., Pidcock, R., Connors, S., Matthews, J. B. R., Chen, Y., Zhou, X., Gomis, M. I., Lonnoy, E., Maycock, T., Tignor, M., & Waterfield, T. (Eds.). *Global Warming of 1.5°C*. Cambridge University Press.

Mohan, M. P., & Jain, A. (2020). Exclusion clauses under the Indian contract law: A need to account for unreasonableness. *NUJS Law Review*, 13(4), 1–32.

Moses, M. L. (2017). *The principles and practice of international commercial arbitration* (2nd ed.). Cambridge University Press.

Mukhtar, A. (2023). A critique of prevailing policies and practices in the energy sector of Pakistan. In A. Mukhtar (Ed.), *The dilemma of energy security: Political and institutional hazards in case of Pakistan (1947-2020)* (pp. 134–180). Brill

Nihaaj, N. M. (2016). *Critical analysis of arbitration method used in the construction industry in Sri Lanka* [Doctoral dissertation, University of Moratuwa]. Digital Library. <http://dl.lib.mrt.ac.lk/handle/123/13045>

Rafique, M. M., & Rehman, S. (2017). National energy scenario of Pakistan—Current status, future alternatives, and institutional infrastructure: An overview. *Renewable and Sustainable Energy Reviews*, 69, 156–167. <https://doi.org/10.1016/j.rser.2016.11.057>

Rashid, A. (2020). *Understanding the prospective role of renewable energy in Pakistan's energy security strategy under Vision 2025: A qualitative inquiry* [Doctoral dissertation, Izmir University of Economics]. Council of Higher Education. https://acikbilim.yok.gov.tr/bitstream/handle/20.500.12812/96425/yokAcikBilim_10331394.pdf?sequence=-1&isAllowed=y

- Raza, M. A., Aman, M. M., Rajpar, A. H., Bashir, M. B., & Jumani, T. A. (2022). Towards achieving 100% renewable energy supply for sustainable climate change in Pakistan. *Sustainability*, 14(24), Article e16547. <https://doi.org/10.3390/su142416547>
- Seyadi, R. M. (2017). *The effect of the 1958 New York Convention on foreign arbitral awards in the Arab Gulf states*. Cambridge Scholars Publishing.
- Sheikh, M. A., Ahmed, S. M., & Rana, A. A. (2022). Economic security in Pakistan: Indicators, issues, impacts and way forward. *Pakistan Journal of Social Research*, 4(1), 990–999. <https://doi.org/10.52567/pjsr.v4i1.1268>
- Speed, P. A., Qiu, M., & Len, C. (2018). Chinese engagement in Southeast Asian energy and mineral resources. In E. T. Yeh (Ed.), *The Routledge handbook of geoeconomics and geopolitics of Chinese development and investment in Asia* (pp. 42–68). Routledge Publishing.
- Tang, S., Raza, M. Y., & Lin, B. (2024). Analysis of coal-related energy consumption, economic growth and intensity effects in Pakistan. *Energy*, 292, Article e130581. <https://doi.org/10.1016/j.energy.2024.130581>
- Tauseef, A., Rehman, S. M. S., & Muhammad, S. (2021). Pakistan energy situation, policy, and issues. In M. Jeguirim (Ed.), *Recent advances in renewable energy technologies* (pp. 387–428).
- Telo, M., & Ponjaert, F. (2026). *The EU's foreign policy: What kind of power and diplomatic action?* Routledge Publishing Press.
- United Nations Economic and Social Commission for Asia and the Pacific. (2021). *Coal phase out and energy transition pathways for Asia and the Pacific*. <https://repository.unescap.org/items/a2c3fa34-f7e4-413c-8100-bc1cc831af99>
- Upadhyaya, S. (2020). *India's maritime strategy: Balancing regional ambitions and China*. Routledge.
- Vajda, C. (2018). The EU and beyond: Dispute resolution in international economic agreements. *European Journal of International Law*, 29(1), 205–224.

- Verdier, P. H., & Versteeg, M. (2017). Modes of domestic incorporation of international law. In W. Sandholtz, J. A. McCone, & C. A. Whytock (Eds.), *The research Handbook on the politics of international law* (pp. 149–175). Edward Elgar Publishing.
- Wang, K. H., Umar, M., Akram, R., & Caglar, E. (2021). Is technological innovation making world greener? An evidence from changing growth story of China. *Technological Forecasting and Social Change*, 165(1), Article e120516. <https://doi.org/10.1016/j.techfore.2020.120516>
- Wang, M. X., Zameer, H., & Song, H. (2023). Can Chinese outward foreign direct investment help the Belt and Road low-carbon development? Evolutionary game in China's environmental responsibility. *Environment, Development and Sustainability*, 26, 1–40. <https://doi.org/10.1007/s10668-023-03207-y>
- World Economic Forum. (2022, January 14). *Advancing the green development of the Belt and Road Initiative: An insight report*. <https://www.weforum.org/publications/advancing-the-green-development-of-the-belt-and-road-initiative-harnessing-finance-and-technology-to-scale-up-low-carbon-infrastructure/>
- Yu, K. (2023). *China's energy security in the twenty-first century: The role of global governance and climate change*. Hong Kong University Press.