



**Sunrise and sunset –  
Accelerating coal phase down and  
green energy deployment in Pakistan:  
An analysis of the political economy**

Ziying Song, Christoph Nedopil, Hanea Isaad, Muhammad Basit Ghauri

**Green Finance & Development Center, FISF Fudan University**

*August 2023*

## Acknowledgements

We appreciate the support from our partner organizations Renewable First (Pakistan) and Institute of Energy Economics and Financial Analysis (IEEFA) in bringing their detailed feedback, suggestions and comments. We extend our sincere gratitude to the ten anonymous interviewees for generously sharing expertise, experiences, and perspectives, thereby enriching our understanding of the subject matter. Lastly, our study benefited from helpful discussions at a closed-door online workshop with stakeholders across Asia organized by the partners together with the Centre for Sustainable Finance at SOAS, University of London on 3 August 2023.

This brief is produced by the Green Finance & Development Center (GFDC) of the Fanhai International School of Finance at Fudan University, Shanghai, P.R. China.

The brief aims to provide a comprehensive political economic analysis of the barriers and the drivers for Pakistan’s potential coal phase-out and renewable scale-up to encourage discussion and debate. The findings, interpretations, and recommendations expressed in this paper are entirely those of the author(s) and should not be attributed in any manner to FISF or Fudan University, to its affiliated organizations, or to members of its Board of Executive Directors.

Citation and the use of material presented in this brief should take into account this provisional character.

This report was prepared with generous support by the World Resource Institute (WRI). The report does not reflect official positions from the organization.

## Please quote as:

Ziying Song, Christoph Nedopil, Haneea Isaad, Muhammad Basit Ghauri (2023): “Sunrise and sunset – Accelerating coal phase down and green energy deployment in Pakistan: An analysis of the political economy”, Green Finance & Development Center, FISF Fudan University, Shanghai, China

## Contact:

For inquiries, please contact the Green Finance & Development Center [info@greenfdc.org](mailto:info@greenfdc.org)

Cover picture: Jhimpir Wind Farm, Pakistan, by Muyaffar Bukhari

© 2023 Green Finance & Development Center, FISF  
All rights reserved



## Executive Summary

Pakistan, like many nations, faces the urgent need to mitigate climate change and reduce dependence on fossil fuels. The potential coal-phase out and renewable energy development offer Pakistan substantial prospects for enhancing energy accessibility, affordability, and fostering green growth. **However, these long-term green benefits have been superseded by Pakistan's short-term concerns regarding energy security, a persisting energy crisis, intricate political-economic circumstances, and vested interests. As a result, the overall progress towards a green transition has thus far been limited.**

Pakistan's coal expansion is primarily driven by support from the China-Pakistan Economic Corridor (CPEC). Its coal capacity has rapidly grown from 0.15 GW in 2015 to over 7 GW by June 2023, with China backing 90% of the current capacity. An important aspect of Pakistan's coal and fossil fuel-based generation is its reliance on imported fuels, which has threatened fuel supply and caused significant power shortages. However, through enhanced mining capabilities in the local Thar coal region facilitated by CPEC, **Pakistan envisions overcoming its energy crisis by leveraging its vast Thar coal reserves** and indigenous solar and wind sources over the next decade.

Despite the massive potential, support from Pakistan government and China, and favorable cost of generation and tariffs (which are already cheaper than coal and other conventional forms), the development of solar and wind capacity in Pakistan has remained slow. As of June 2022, solar and wind sources contribute only 6% to the overall capacity. **It is evident that some non-economic factors have impeded the progress of renewable development and the phase-down/out of coal in Pakistan. Achieving transformative change and diminishing the role of coal in the medium to long term requires a deep understanding of the local political economy.**

This policy brief conducts a comprehensive political-economic analysis to examine the objectives and interests of key stakeholders and their intricate interplay, which significantly influence the formation of barriers and drivers associated with Pakistan's prospective phase-down/out of coal and the parallel expansion of renewable energy sources.

The major barriers to coal phase-out and renewable scale-up point to political, economic, and legal factors.

- **Politically**, the coal mining and coal power generation industry, with stake from local governments and state-owned companies, have become symbols of resource nationalism and the preservation of vested interests. Instability in the central government has led to policy inconsistency, and slow implementation. For example, competitive bidding and trading mechanisms, which could serve as boosters for renewable energy expansion, have been under discussion for several years without much progress.
- **Economically**, Pakistan struggles with circular debt issues within the power sector exacerbated by exchange rate risks and price increases of fuel imports. These factors

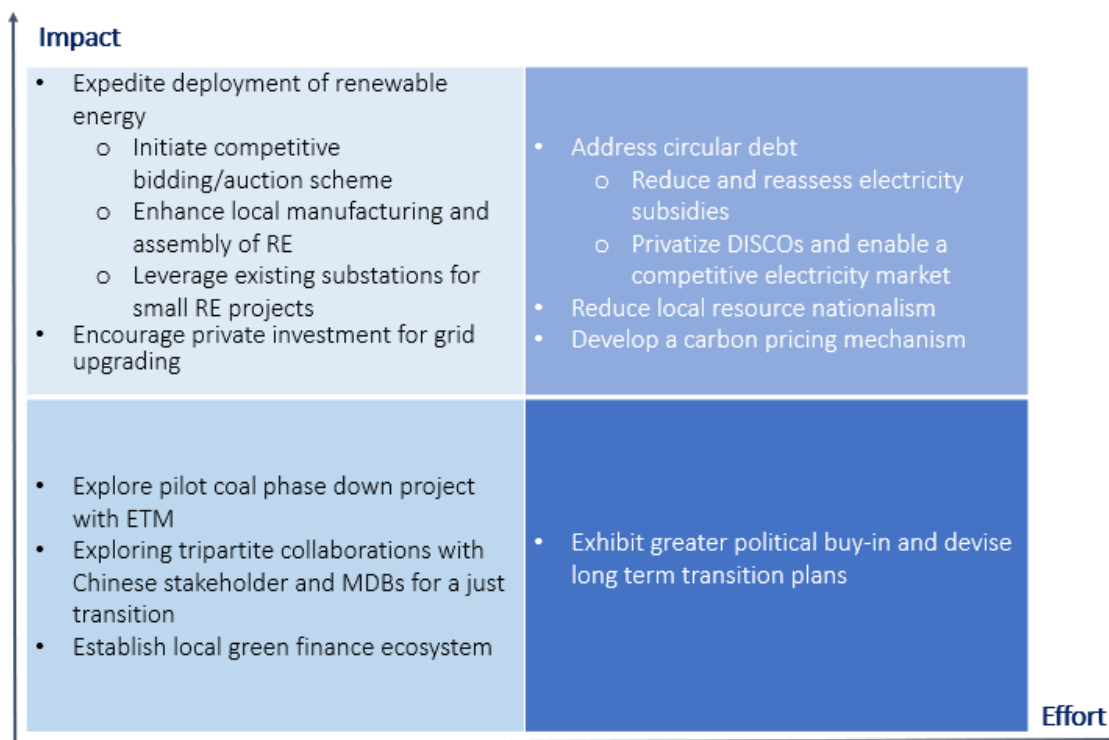
strain Pakistan's ability to allocate fiscal and financial resources to transform the current electricity structure.

- **Legally**, the young, long-term contracted, sovereign-guaranteed coal fleets in Pakistan not only add to debt issues but would require complex re-negotiations of existing contracts with investors and owners, such as Chinese state-owned enterprises and financial institutions.

At the same time, key enabling factors for an accelerated energy transition in Pakistan exist. Several global initiatives are active in Pakistan, particularly the Energy Transition Mechanism (ETM). They focus on the phase-out of fossil fuel-based power and provide essential transition mechanisms and financing tools while engaging in principles of a just transition. Notably, the ongoing research conducted by the ETM on the phased closure of coal and other fossil fuel-based plants in Pakistan represents a potential avenue for piloting a coal phase-out project.

Simultaneously, China's increasing adoption of sustainable practices in their overseas investments signals the potential for constructive dialogues regarding debt and contract restructuring to repurpose existing coal projects in Pakistan. Moreover, Pakistan's clear targets for renewable energy development, coupled with the evolving landscape of renewable energy policies and green finance frameworks, further solidify the foundation for a comprehensive green transition.

Building upon the political and economic analysis, this brief presents actionable policy recommendations (simplified below) to harness enabling factors and navigate barriers particularly with Pakistan being a core Belt and Road Initiative country:



**Figure 1 Heat map for recommendations to accelerate Pakistan's green energy transition**



To accelerate the energy transition over the next 2-5 years, several recommendations seem relevant:

1. Expedite the deployment of renewable energy to diversify power mix, restrain additional coal-fired power plants, and pave the way for coal power to assume a diminished role.
2. Encourage private sector investment in upgrading grid infrastructure to catalyze energy transition. Pakistan should ensure that the transmission investments required to integrate renewable sources into the grid are realized and carefully coordinated with generation-expansion plans.
3. Leverage the Energy Transition Mechanism (ETM) to explore a piloting project for the flexibilization of the operation coal units and its potential phase down. The overcapacity issue could create an opportunity for Pakistan's phase down coal without compromising energy security.
4. Exploring tripartite collaborations with Chinese stakeholder and Multilateral Development Banks for concessional and innovative financing tools that could provide more opportunities for a just transition.
5. Establish local green finance ecosystem to support greater uptake of renewable energy and transition away from emission-intensive power sources.

In the long term (over the next 7-10 years), further recommendations can be taken under consideration:

6. Drive necessary reforms in the power sector to reverse the course of circular debt and restore a healthy energy economics. This includes reducing and reassessing electricity subsidies, catalyze the long-discussed privatization of DISCOs, and enable a competitive electricity market.
7. Move away from resource nationalism through repurposing coal subsidies, diversifying economics, and improving transparency and accountability for coal rich provinces.
8. Develop carbon pricing mechanism to rationalize implicit cost for coal power generation.
9. Demonstrate stronger political buy-in and devise long-term transition plans to effectively leverage international public and private financing support.



## 执行摘要 Executive Summary Chinese

巴基斯坦，如同许多国家一样，亟需减缓气候变化的影响并减少对化石燃料的依赖。燃煤发电的减少/退出伴随可再生能源发电的扩张能够为巴基斯坦增强能源可及性、可负担性以及实现绿色增长提供巨大机遇。然而，这些潜在的长期绿色效益目前受到巴基斯坦在能源安全、长期存在的能源危机、错综复杂的政治经济环境以及既得利益方面的短期考虑所制约。因此，迄今为止，巴基斯坦在绿色转型方面的整体进展仍然有限。

巴基斯坦的煤炭扩张主要受到中巴经济走廊（CPEC）的支持推动。从 2015 年的 0.15 GW 快速增长至 2023 年 6 月超过 7 GW，其中中国支持了当前产能的 90%。巴基斯坦的煤炭和化石燃料发电（约占总体容量的 55%）严重依赖进口燃料，这对燃料供应和能源安全构成了威胁。然而，在未来十年内，巴基斯坦不仅计划充分利用本土丰富的太阳能和风能资源，同时还将依托本地煤炭，作为克服能源危机的重要组成部分。

尽管巴基斯坦的太阳能和风力发电拥有巨大的潜力、得到了巴基斯坦政府和中国方面的支持，并且发电成本和电价已经具备了经济竞争力（甚至低于煤炭和其他传统发电形式），然而其在巴基斯坦的发展进程仍然滞后。截至 2022 年 6 月，太阳能和风能发电装机容量仅占总体电力产能的 6%。可以明显看出，一些非经济因素阻碍了巴基斯坦可再生能源的发展，以及逐步减少和淘汰煤炭的进程。因此，为了在中长期内减少煤炭在电力行业中的使用，实现具有变革性的能源转型，有必要更深入地了解巴基斯坦当地的政治经济动因。

本政策简报进行了较为全面的政治经济分析，以审视关键利益相关方的目标和利益，以及它们之间错综复杂的相互作用，进而分析与巴基斯坦煤电逐步减少/退出和可再生能源发电扩张相关的障碍和推动因素。

煤电逐步减少和可再生能源发电扩大的主要障碍指向政治、经济和法律等因素。

- 在政治层面上，由地方政府和国有企业控制的煤矿和燃煤发电产业已成为资源民族主义和既得利益保护的象征。中央政府的不稳定潜在导致了政策的不一致性和执行有怠。例如，竞争性招标和交易机制被认为是推动可再生能源扩张的助推器，但在几年的讨论中进展甚微。
- 从经济角度来看，巴基斯坦的电力部门面临严重的循环债务问题，由于外部市场环境导致的汇率风险和燃料进口价格的增加，让债务问题进一步恶化。这些因素使得巴基斯坦难以释放财政和金融资源用于改革现有的电力结构。
- 在法律层面上，巴基斯坦拥有的年轻的、长期购电协议和主权担保的煤炭发电机组不仅加剧了循环债务问题，还意味着需要对现有与投资者和所有者（如中国的国有企业和金融机构）进行复杂的重新谈判。

与此同时，在巴基斯坦加速能源转型方面存在一些关键的促进因素。正在进行的全球性退煤倡议 - 例如亚洲开发银行发起的能源转型机制（ETM），致力于逐步减少化石能源发电，并提供了必要的转型机制和融资工具，同时遵循公正转型的原则，这可以为巴基斯坦提供关键支持。值得注意的是，ETM 正在进行的关于逐步关闭巴基斯坦煤电设施和其他化石燃料发电厂的研究，为煤炭逐步退出的试点项目提供了潜在途径。



同时，中国作为巴基斯坦最重要的能源基础设施合作伙伴，正逐渐将海外投资的重心转向绿色能源。来自国际社会的转型压力，加之巴基斯坦煤电项目的财务风险的不确定性，为中方投资的煤电厂债务重组和合同谈判带来了有益的对话机会。此外，巴基斯坦明确的可再生能源发展目标，再加上不断发展的可再生能源政策和绿色金融框架，为绿色转型奠定了一定基础。

在基于政治和经济分析的基础上，本简报提出了可操作的政策建议（以下是简化版），以更好的撬动当前有利因素以及克服中长期障碍，特别是考虑到巴基斯坦是“一带一路”倡议的核心国家。

短期内（未来 2-5 年）加速巴基斯坦的能源转型的相关建议有：

1. 加快可再生能源部署，实现电力混合供应的多样化，抑制新增燃煤电厂，为削弱煤炭发电的角色铺平道路；
2. 鼓励私营部门投资升级电网基础设施，以加速能源转型。巴基斯坦应确保将可再生能源整合到电网所需的输电投资得以实现，并与发电扩容计划进行协调；
3. 利用能源转型机制（ETM）探索用于煤炭机组灵活化运行和逐步减少/退出的试点项目。逐步减少煤电可以和当前巴基斯坦电力产能过剩问题相结合，在不危及能源供应稳定性的情况下为巴基斯坦提供试点退煤的机会；
4. 与中国利益相关者和多边开发银行探讨三方合作，以开发优惠和创新的融资工具，如再融资，债务转气候互换/债务转可再生能源互换等，为公正转型提供更多机会；
5. 建立本地绿色金融生态系统，支持更大规模的可再生能源利用，并逐步摆脱排放强度较高的发电形式；

从长期来看（未来 7-10 年内），可以考虑进一步的建议：

6. 推动电力部门改革，扭转循环债务局面，恢复健康的能源经济。这包括减少和重新评估电力补贴，催化长期讨论的配电公司私有化，以及推动竞争性电力市场的建立。
7. 通过重新定位煤炭补贴、多元化地方经济发展以及提高煤炭丰富省份的透明度和问责制，远离资源民族主义；
8. 制定碳定价机制，理顺煤炭发电的隐含成本；
9. 对能源转型展示更强有力的政治意愿和支持，并制定长期的转型计划，以有效地撬动国际上公共和私人融资支持。



## Content

|  |           |
|--|-----------|
| <b>Executive Summary</b> .....   | <b>i</b>  |
| <b>Content</b> .....   | <b>1</b>  |
| <b>1. Introduction</b> .....   | <b>1</b>  |
| <b>2. Country Context: Power Sector in Pakistan</b> .....  | <b>3</b>  |
| 2.1 Generation Mix .....   | 3         |
| 2.2 Pakistan’s Coal Fleet .....  | 6         |
| 2.3 Renewable Development.....   | 7         |
| <b>3. Political Economy Analysis for Pakistan’s Green Energy Transition</b> .....                    | <b>9</b>  |
| 3.1 Decision-making in the energy sector .....   | 9         |
| 3.2 Stakeholder mapping .....  | 11        |
| 3.3 Barriers for accelerated energy transition (coal phase-down, renewables scaling) in Pakistan.... | 12        |
| Political factors.....   | 12        |
| Economic factors.....  | 14        |
| Social and environmental factors .....   | 17        |
| Technological factors .....  | 18        |
| Legal/Regulation .....   | 19        |
| 3.4 Drivers for accelerated green energy transition in Pakistan .....                                | 21        |
| Political factors.....   | 21        |
| Economic factors.....  | 22        |
| Social and environmental factors .....   | 24        |
| Technological factors .....  | 26        |
| Legal/Regulation .....   | 26        |
| <b>4. Recommendations to accelerate Pakistan’s green energy transition</b> .....                     | <b>27</b> |
| <b>Annex</b> .....   | <b>36</b> |
| Annex I Decarbonization Policy Overview .....  | 36        |
| Annex II Coal Projects Overview .....  | 38        |





## List of Figures

|  |    |
|--|----|
| Figure 1 Heat map for recommendations to accelerate Pakistan’s green energy transition .....   | ii |
| Figure 2 Analytical framework (the factors are non-exhaustive).....  | 3  |
| Figure 3 Share of electricity production by source, Pakistan .....   | 4  |
| Figure 4 Share of total installed generation capacity (GW) by sources, June 2022 in Pakistan.....  | 5  |
| Figure 5 Share of Generation Capacity (GW) by Source in 2022, 2027, and 2031, IGCEP 2022-31 .....  | 6  |
| Figure 6 Overview of operating coal plants in Pakistan by size and location.....   | 7  |
| Figure 7 Regulatory environment of Pakistan’s power sector .....   | 10 |
| Figure 8 Key stakeholder interests for Pakistan coal phase down & renewable expansion .....  | 11 |
| Figure 9 Illustration of Pakistan’s circular debt .....  | 16 |
| Figure 10 Total Occurrence and Average Economic Damage (percentage of GDP) from Natural Disasters in Pakistan between 1990 and 2019..... | 25 |
| Figure 11 Heat map for recommendations to accelerate Pakistan’s green energy transition .....  | 28 |

## List of Tables

|  |    |
|--|----|
| Table 1 Zoning for financial attractiveness of solar and wind power..... | 25 |
|--|----|

## List of Boxes

|  |    |
|--|----|
| Box 1 The role of Pakistan's coal-phase down.....                      | 1  |
| Box 2 Policy shifts as barrier for renewable energy development.....   | 13 |
| Box 3 Circular debt in Pakistan .....                                  | 15 |
| Box 4 Financing models for China-backed coal projects in Pakistan..... | 20 |
| Box 5 Recommendations for Chinese Stakeholders.....                    | 30 |



## 1. Introduction

**Reducing the use of coal as one of the most carbon-intensive fossil fuels plays a crucial role in achieving the 1.5°C goal of the Paris Agreement.** According to the Intergovernmental Panel on Climate Change (IPCC), global coal use in electricity generation needs to decline by 80% below 2010 levels by 2030.<sup>1</sup> This necessitates divestment from new coal plants, halting the construction of currently commissioned facilities, and **implementing early phase-down of existing coal-fired power plants.** However, particularly in the developing countries in Asia like in Pakistan, where the majority of existing and committed coal assets are located, progress on this coal transition is slow (see **Box 1**).

**Pakistan's coal-related built-up is a recent development over the past decade, particularly through the China-Pakistan Economic Corridor (CPEC) with China as the largest financier and partner:** Pakistan received the second-greatest amount of Chinese overseas finance of any country since 2008, and coal power projects account for over half of the nearly \$12 billion power sector investment.<sup>2 3</sup> At the same time, China also supported renewable energy projects in Pakistan including hydro, solar, and wind. **Accordingly, China holds a key position in navigating the local phase-down of coal assets in Pakistan and, simultaneously, in scaling green energy deployment.**

### Box 1 The role of Pakistan's coal-phase down

Pakistan is a relatively small emitter of carbon dioxide (CO<sub>2</sub>) in the world. Due to the fuel choices and investments, it pursues, however, Pakistan's greenhouse gas emissions are projected to rise.

Fossil power supports over half of electricity capacity in Pakistan, with coal taking up roughly a quarter. Fossil fuel used for power generation mainly relies on imports. This has exacerbated Pakistan's circular debt issues with consequent fuel shortages.

In 2020, Pakistan announced a coal moratorium to reduce dependence on imported coal and react to international pressure of phasing down coal. Moreover, in its 2021 NDC update, Pakistan revealed the funding amount needed for coal transition with necessary international financing support - an upfront cost of USD 18 billion for buying out existing coal power projects and the local Thar coal mines, and an additional estimated USD 13 billion to replace the coal power plants with solar.<sup>4</sup>

However, since this announcement, policy has shifted, and Pakistan envisages to expand utilization of currently largely untapped domestic coal resources (Thar coal) to displace imported coal units. Within the first 6 months of 2023, Pakistan increased the utilization of Thar coal by over 2 GW, which is only 1 GW less than the use of imported coal.

---

<sup>1</sup> Nick Ferris, "Why Not All Coal Phase-Outs Are Created Equal," *Energy Monitor* (blog), January 12, 2022, <https://www.energymonitor.ai/policy/market-design/why-not-all-coal-phase-outs-are-created-equal/>.

<sup>2</sup> "Growing Momentum for Coal Phase-Down in the Global South: Lessons from Pakistan," Global Development Policy Center, February 2022, <https://www.bu.edu/gdp/2022/02/15/growing-momentum-for-coal-phase-down-in-the-global-south-lessons-from-pakistan/>.

<sup>3</sup> Christoph Nedopil, "The Potential for Early Coal Plant Retirement," n.d., 8.

<sup>4</sup> "Pakistan Nationally Determined Contributions 2021," October 2021, <https://unfccc.int/sites/default/files/NDC/2022-06/Pakistan%20Updated%20NDC%202021.pdf>.



In February 2023, the Energy Minister of Pakistan also announced that the government intends to quadruple its domestic coal-fired capacity from the current 2.3 GW to 10 GW in the coming years to lower fuel costs and avoid depleting reserves of foreign exchange reserves when importing coal.<sup>5</sup>

At the same time, China ensured continued support for the 300 MW Gwadar coal plant agreed under CPEC, which operates using imported coal and which is scheduled to commence construction in 2023.<sup>6</sup>

The expansion of coal use in Pakistan is pursued despite the increasing cost competitiveness of alternatives such as solar and wind, which render most coal plants economically less attractive and put them at risk of becoming stranded assets. Thus, apart from purely economic reasons, it is crucial to **explore nonfinancial factors from political economic perspectives that shape the future of coal and alternative energy pathways.**

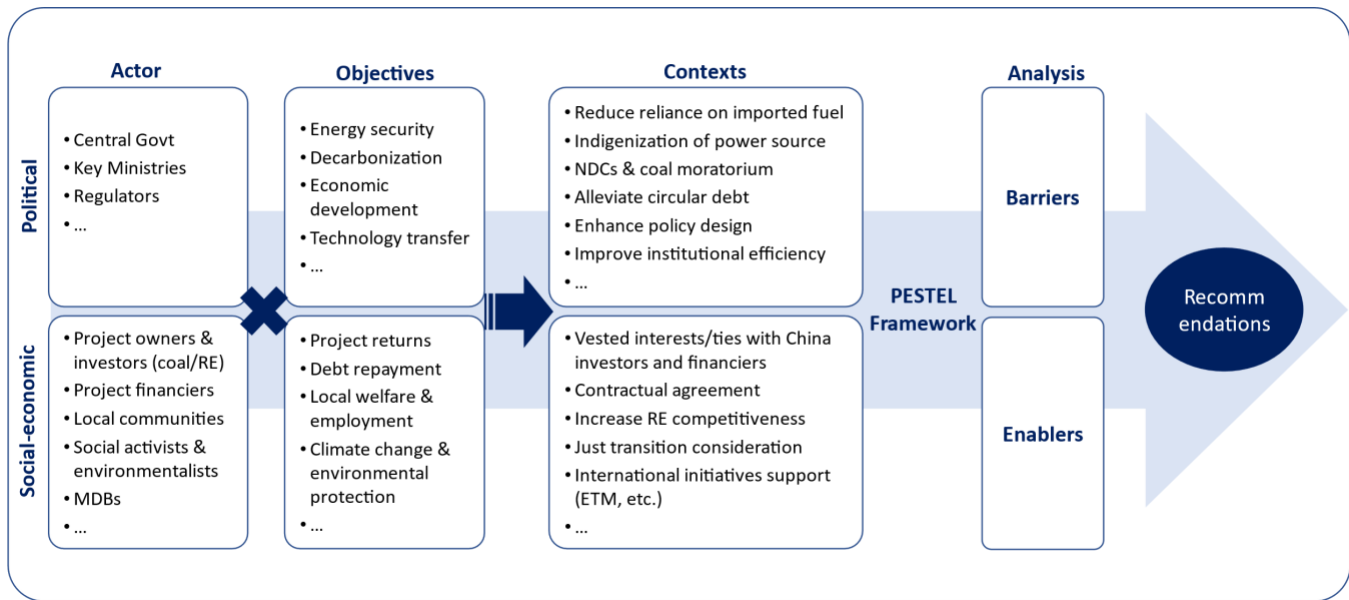
This policy brief analyzes political and economic barriers and drivers for Pakistan’s early coal phase-down (sunset) and accelerated installation of renewable energies (sunrise) and develops recommendations on how to accelerate a green transition with a specific supporting role for China. The brief draws on relevant literature, government and publicly available data, and ten interviews from local and international stakeholders to support analysis and arguments. An adapted actor, objectives, and contexts (AOC) methodology developed by Jakob et al.<sup>7</sup> has been utilized to support political and economic analysis (see **Figure 2**).

---

<sup>5</sup> “Exclusive: Pakistan plans to quadruple domestic coal-fired power, move away from gas”, *Reuters*, February 2023, <https://www.reuters.com/business/energy/pakistan-plans-quadruple-domestic-coal-fired-power-move-away-gas-2023-02-13/>

<sup>6</sup> Haneea Isaad, “Gwadar Coal Power Plant: One Step Forward, Two Steps Back,” March 2023, <https://thediplomat.com/2023/03/gwadar-coal-power-plant-one-step-forward-two-steps-back/>.

<sup>7</sup> Michael Jakob et al., “Actors, Objectives, Context: A Framework of the Political Economy of Energy and Climate Policy Applied to India, Indonesia, and Vietnam,” *Energy Research & Social Science* 70 (December 1, 2020): 101775, <https://doi.org/10.1016/j.erss.2020.101775>.



**Figure 2 Analytical framework (the factors are non-exhaustive)**  
 (Note: PESTEL – Political, Economic, Social, Technological, Environmental, and Legal)

## 2. Country Context: Power Sector in Pakistan

### 2.1 Generation Mix

Pakistan with support from China has installed 15.7 GW of electricity generation capacity in 7 years to bridge the gap between electricity demand and supply<sup>8</sup>, but challenges of power inaccessibility and disruptions persist. A sustainable electricity supply is crucial for a nation’s economic development. However, Pakistan continues to experience frequent power outages, impacting economic growth and lives of locals. Therefore, ensuring power supply and reducing blackouts are usually high on the policy agenda. To this end, Pakistan has grown its installed generation capacity from 22,928 MW in 2015 to 43,775 MW in June 2022, with strong support through the China-Pakistan Economic Corridor (CPEC) initiated in 2015. By May 2023, 8020 MW of coal, hydro, solar and wind projects were completed, 1,170 MW were under construction, and a further 3244 MW were under consideration, (including 1320 MW coal) under the CPEC umbrella.<sup>9</sup> The household sector is the largest consumer of electricity (47%), followed by the industrial sector (24%).<sup>10</sup> Despite installed capacity surpassing peak demand (~28,234 MW during 2021-2022<sup>11</sup>), Pakistan still faces power curtailment due to underutilized capacity

<sup>8</sup> China Global Power Database, Boston University, data retrieved July 2023, <https://www.bu.edu/cgp/>

<sup>9</sup> NEPRA, State of Industry Report 2015 & 2022. CEPC official website.

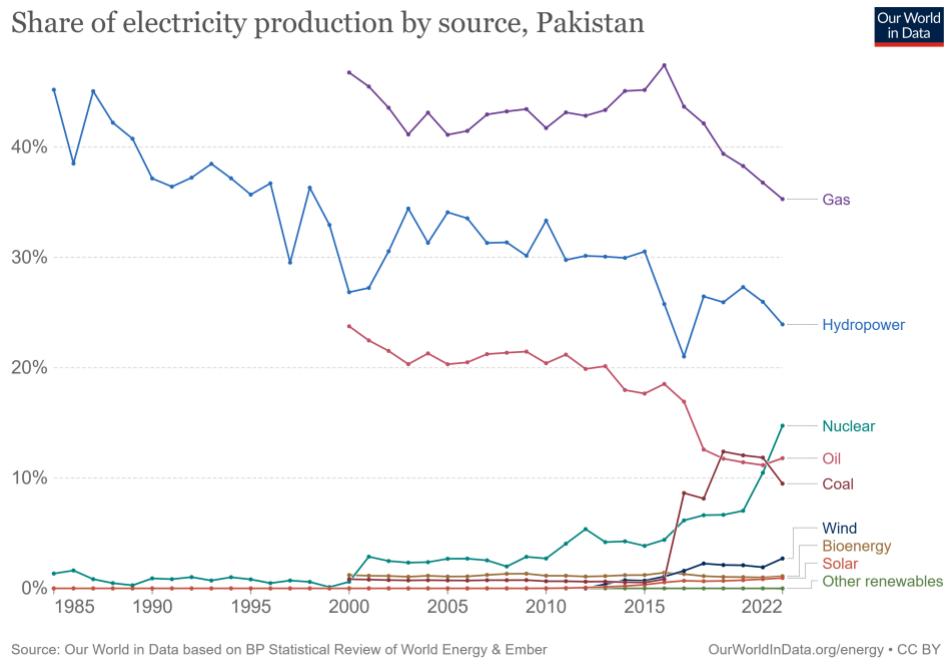
<sup>10</sup> Hassan Qudrat-Ullah, “A Review and Analysis of Renewable Energy Policies and CO2 Emissions of Pakistan,” *Energy* 238 (January 2022): 121849, <https://doi.org/10.1016/j.energy.2021.121849>.

<sup>11</sup> National Transmission and Despatch Company (NTDC), “Indicative Generation Capacity Expansion Plan (IGCEP) 2022-31,” September 2022, <https://nepra.org.pk/licensing/Licences/IGCEP/IGCEP%202022-31%20.pdf>.



(high cost of fuel supply from imports leading to managed curtailments) and underdeveloped grid systems. More than a quarter of the population in remote areas lacks access to electricity.<sup>12</sup>

**Pakistan's electricity mix is primarily characterized by a reliance on imported fossil fuels and hydropower.** Pakistan has historically relied on natural gas and oil for electricity generation (see **Figure 3**). Since 2015, coal rose from insignificance to become the third most important source of Pakistan's energy. By June 2023, over 50% of the country's coal capacity relies on imported coal (see **Annex II**), with significant risk to the country's energy security, generation costs, and economic stability due to the need to pay imported fuels in foreign currencies. Similarly, depleting domestic gas resources required Pakistan to turn to imported Regasified Liquefied Natural Gas (RLNG) to meet its energy demand.<sup>13</sup> In June 2022, the Secretary of Energy in Sindh announced a coal gasification project aimed at producing gas, diesel, and other essential products to meet the rising domestic demand, which has been intensified by soaring global prices.<sup>14</sup>



**Figure 3 Share of electricity production by source, Pakistan**  
(Source: Our World in Data based on BP Statistical Review of World Energy & Ember  
[Pakistan: Energy Country Profile - Our World in Data](#))

As of June 2022, fossil fuels account for 55% of the total installed generation capacity (coal contributes 14%) (see **Figure 3**). For renewables, hydropower has played a significant role in Pakistan's energy

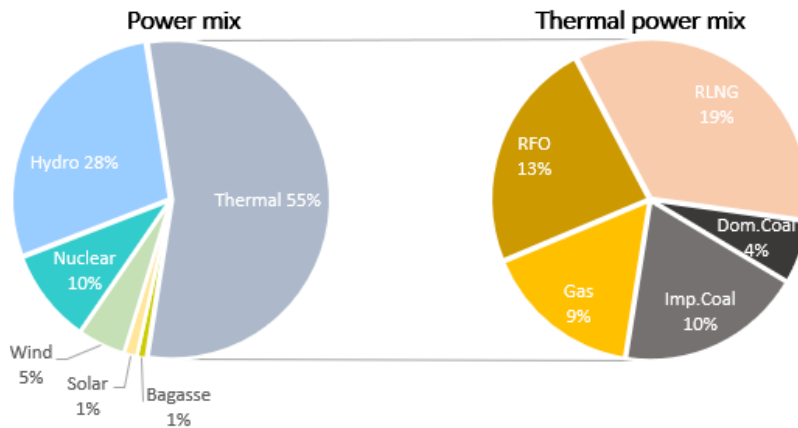
<sup>12</sup> "Rural Electrification and Poverty Decline," DAWN, 2021, <https://www.dawn.com/news/1660159>.

<sup>13</sup> "Massive Gas Deficit in Upcoming Winter: Centre Endeavours to Convince Federating Units on WACOG," September 2020, <https://www.thenews.com.pk/print/711804-massive-gas-deficit-in-upcoming-winter-centre-endeavours-to-convince-federating-units-on-wacog>.

<sup>14</sup> "Sindh Undertakes Coal-Gasification Project," The International News, accessed June 12, 2023, <https://www.thenews.com.pk/print/966777-sindh-undertakes-coal-gasification-project>.



sector, while the contribution of solar and wind power, despite their recent emergence, remains relatively low.



**Figure 4 Share of total installed generation capacity (GW) by sources, June 2022 in Pakistan**

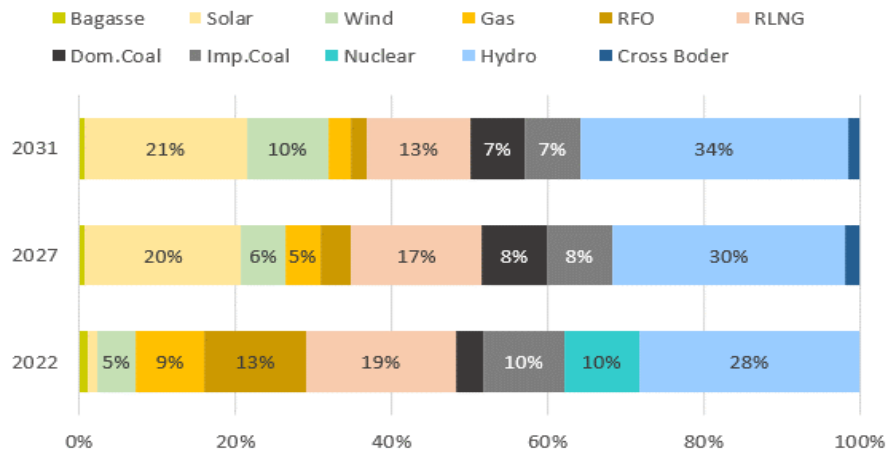
RFO = Refined Furnace Oil, RLNG = Re-gasified Liquid Natural Gas, Dom. Coal = Domestic Coal, Imp. Coal = Imported Coal

(Source: compiled by the author(s) based on data from Indicative Generation Capacity Expansion Plan (IGCEP) 2022-31)

**Over the next decade, Pakistan is envisioning an energy landscape that reduces reliance on thermal power (primarily gas, RLNG, and RFO) and prioritizes the expansion of renewable energy to meet the growing demand.** In line with the Indicative Generation Capacity Expansion Plan (IGCEP) 2022-31 (see **Figure 4**), Pakistan aims to reduce the overall share of gas, RLNG, and RFO by 2031, while consolidating the utilization of local coal to ensure a self-sufficient and cost-effective electricity supply.<sup>15</sup> Moreover, Pakistan has announced its intent to displace gas imports through coal gasification.<sup>16</sup> By 2031, the installation of renewable energy sources, particularly solar, is projected to increase tenfold, surging from around 1.2 GW to over 13 GW, while hydropower capacity will be doubled, reaching more than 22 GW from the current 10.7 GW (see **Figure 5**).

<sup>15</sup> Gibran Naiyyar Peshimam, "Exclusive: Pakistan Plans to Quadruple Domestic Coal-Fired Power, Move Away from Gas," *Reuters*, February 14, 2023, sec. Energy, <https://www.reuters.com/business/energy/pakistan-plans-quadruple-domestic-coal-fired-power-move-away-gas-2023-02-13/>.

<sup>16</sup> Peshimam.



**Figure 5 Share of Generation Capacity (GW) by Source in 2022, 2027, and 2031, IGCEP 2022-31**

FO = Furnace Oil, RLNG = Re-gasified Liquid Natural Gas, Dom. Coal = Domestic Coal, Imp. Coal = Imported Coal  
 (Source: compiled by the author(s) based on data from IGCEP 2022-31)

## 2.2 Pakistan’s Coal Fleet

**The broad utilization of coal-fired power plants in Pakistan started less than a decade ago with China’s support.** Under the China-Pakistan Economic Corridor (CPEC), Pakistan has expanded its coal power generation from 0.15 GW in 2015<sup>17</sup> to more than 7.2 GW in March 2023. Currently, there are 15 coal-fired power projects in Pakistan, with 8 in operation, 2 committed, and 5 as candidates. Of the eight operational plants, seven were sponsored by China (see *Annex II* for details).

**Accordingly, coal plants in Pakistan are relatively young yet use outdated technologies.** The current operational coal plants in Pakistan exhibit varying lifetimes, especially the ones backed by China. The oldest plant operates for approximately five years, the youngest one was commissioned in early 2023. The average age of China-backed coal plants is 2.7 years. Nearly 3 GW of coal plants in Pakistan are subcritical, which represents the most polluting and less efficient form of coal power generation (see Annex for detail). Over the lifetime of these subcritical coal plants (operated by January 2023), the total CO<sub>2</sub> emissions are projected to reach at least 117.8 million tons.<sup>18</sup>

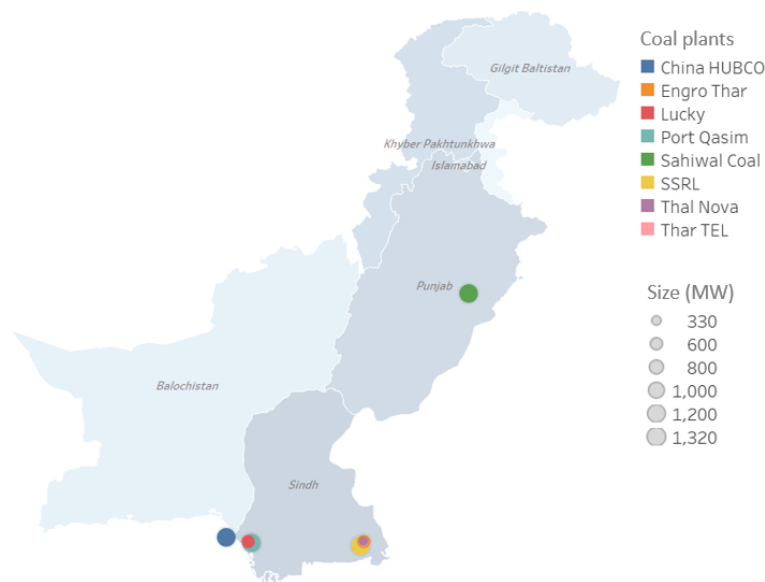
**Pakistan expands use of domestic coal to reduce import dependencies and foreign exchange reserve outflows.** Since 2020, the Thar coal mine exploits the largest coal reserves in Pakistan and is becoming an important domestic source of fuel. This leads to a shift of coal sources: During the first half year of 2022, domestic/imported coal supplied 1,320 MW/3,960 of power plants. Three more coal plants were commissioned at the end of 2022 and early 2023, adding another 1980 MW of coal plants utilizing Thar coal. With Pakistan’s ambition to replace imported gas through local coal, another 2 GW coal capacity might be commissioned before 2030<sup>19</sup>.

<sup>17</sup> Nedopil, “The Potential for Early Coal Plant Retirement.”

<sup>18</sup> Global Energy Monitor, <https://globalenergymonitor.org/projects/global-coal-plant-tracker/dashboard/>

<sup>19</sup> National Transmission and Dispatch Company (NTDC), “Indicative Generation Capacity Expansion Plan (IGCEP) 2022-31.”

**Operating coal plants are located near ports and close to the Thar coal mine region.** Three of the eight operating coal plants (Port Qasim, China HUBCO, Lucky) are in the far South of Sindh Province. These plants are close to Port Qasim to facilitate utilization of imported coal. Another four plants are located close to the Thar coal region (Thar TEL, Thal Nova, Engro Thar, SSRL), also in Sindh Province, allowing them to use domestic coal resources. The only coal plant that runs on imported coal not in Sindh Province is Sahiwal. It is located in Punjab Province, the middle east region of Pakistan (see **Figure 6**). Another coal project, supported by China and currently under construction, is Gwadar, situated on the southwestern coast of Balochistan, Pakistan. Despite Pakistan hopes to negotiate the deal to shift to local coal in order to alleviate the country's fuel expenses, the project will operate using imported coal as original planned, as there will be significant extra costs associated with transporting domestic coal.



**Figure 6 Overview of operating coal plants in Pakistan by size and location**

(Note: Thal Nova and Thar TEL are overlapped; Source: compiled by author (s) in March 2023)

### 2.3 Renewable Development

**Pakistan has successfully expanded the use of hydropower:** Hydropower is an established electricity source in Pakistan, with an installed capacity of 10,752 MW. Hydropower currently contributes to more than 25%-28% of electricity generation.<sup>20</sup> By 2031 hydropower capacity is envisaged to be doubled, reaching more than 22 GW.

**Utilization of solar and wind energy has expanded their share in the energy mix from almost zero to 6-7% in less than a decade, but further growth has been hampered.** Renewables saw limited growth since 2018 due to the delayed compulsory competitive bidding. By June 2022, 36 private wind farms in generation totaling 1,838MW all sit on the southern coastline of Sindh Province, each with around 50MW capacity. Solar PV projects are relatively fewer, with 7 projects of 630MW capacity installed in

<sup>20</sup> National Transmission and Despatch Company (NTDC).





Punjab Province.<sup>21</sup> By 2031, the installation of renewable energy sources, particularly solar, is projected to increase tenfold, surging to over 13 GW.

**Pakistan possesses significant untapped potential for renewable power generation, especially wind, solar, and hydro:**

- **Wind:** the southern and coastal areas of Sindh and Baluchistan provinces exhibit significant potential for harnessing wind power, offering a capacity of over 20 GW of economically viable wind power potential.<sup>22</sup>
- **Solar:** Pakistan's annual average of 3,000-3,300 hours of sunshine provides significant opportunities for solar power generation,<sup>23</sup> especially in the southwestern province of Baluchistan and the Northeastern part of Sindh.<sup>24</sup> Pakistan has a solar energy potential of 50 GW.<sup>25</sup>
- **Hydropower:** the northern region of Pakistan presents a significant potential for the development of hydropower. Pakistan has approximately a total potential of 54 GW for hydropower generation.<sup>26</sup>

**Pakistan has issued a series of fiscal and financial policies to drive investment into renewable power development, yet uncertainties exist in the short timeframe.** The country's first renewable energy policy was initiated in 2006 (RE Policy 2006), kickstarting large-scale renewable energy investment from the private sector (mostly hydroelectric). Subsequent policies, such as feed-in-tariff and net metering in 2015, and the Renewable Energy Financing Scheme in 2016, further boosted the rollout of renewable energies in Pakistan. The Alternative and Renewable Energy Policy (ARE 2019 Policy), building upon the favorable elements of the RE Policy 2006, set ambitious targets of 20% non-hydro renewables by 2025 and 30% by 2030. One of its key highlights was the emphasis on the replacement of expensive fossil fuels. The policy also mandated a competitive bidding framework for new renewable projects. In the wake of the new policy, pipeline projects at various stages of project approval were categorized into three groups depending upon their relative stage of advancement. While Category I and II projects could go forward under the current regime as they were in advanced stages of development, Category III projects could only be realized if they were able to secure a spot in the upcoming auctions. However, these Category III renewable energy projects<sup>27</sup> with a combined capacity of approximately 6.7 GW, are still awaiting auctions to proceed ahead. No tangible progress

---

<sup>21</sup> National Transmission and Despatch Company (NTDC).

<sup>22</sup> Abdul Ghafoor et al., "Current Status and Overview of Renewable Energy Potential in Pakistan for Continuous Energy Sustainability," *Renewable and Sustainable Energy Reviews* 60 (July 1, 2016): 1332–42, <https://doi.org/10.1016/j.rser.2016.03.020>.

<sup>23</sup> Ibid.

<sup>24</sup> Sheeba Habib et al., "Renewable Energy Potential in Pakistan and Barriers to Its Development for Overcoming Power Crisis," *Journal of Contemporary Issues in Business and Government* 27 (February 15, 2021): 6836–46, <https://doi.org/10.47750/cibg.2021.27.02.653>.

<sup>25</sup> NTDC. Power system statistics, 43rd ed. National Transmission & Despatch Company, Islamabad, Pakistan, 2018

<sup>26</sup> Ghafoor et al., "Current Status and Overview of Renewable Energy Potential in Pakistan for Continuous Energy Sustainability."

<sup>27</sup> Category III renewable projects: Renewable projects that have acquired Letter of Intent (LOI), in development prior to tariff determination.



has been made thus far, significantly impeding the advancement of renewable development. In recent years, the introduction of competitive trading, specifically the Competitive Trading Bilateral Contracts Market (CTBCM) proposed in 2020, along with the implementation of the Solar Fast Track Guidelines in 2022, has brought new impetus for renewables development. Nevertheless, the challenges associated with policy implementation and political factors have introduced certain uncertainties amid the immense untapped potential and a burgeoning market (see next chapter for further details). **Annex I** provide a summary of Pakistan’s renewable energy policies.

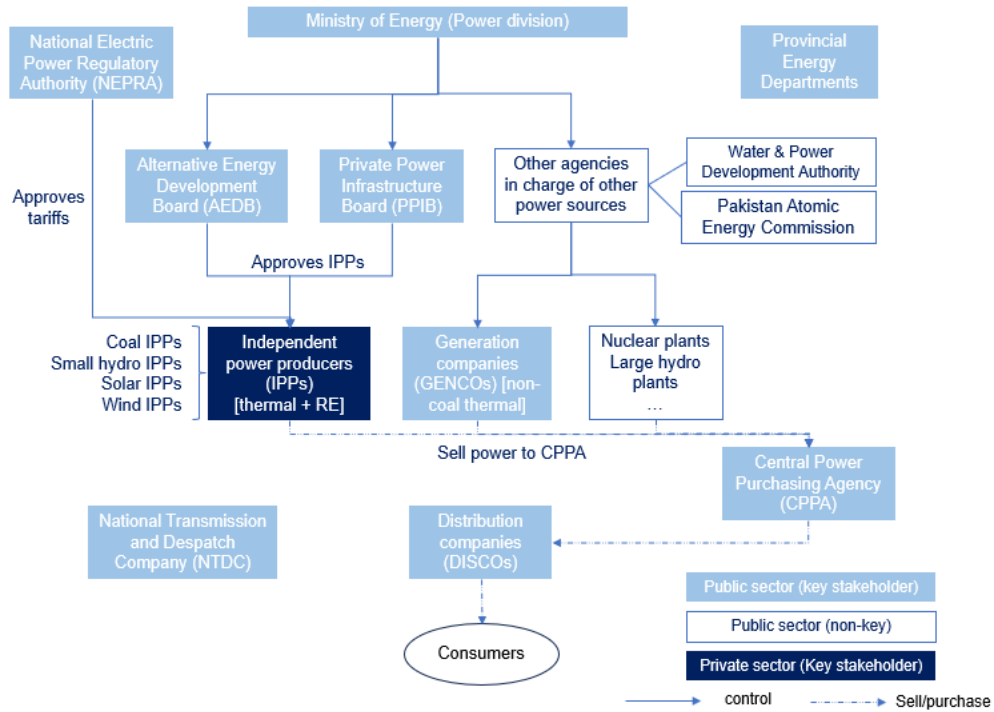
### 3. Political Economy Analysis for Pakistan’s Green Energy Transition

#### 3.1 Decision-making in the energy sector

**The power sector in Pakistan’s governance is complex with involvement of multiple ministries and government agencies, with coordination facilitated by provincial-level energy departments. Figure 7** illustrates the organizational structure of Pakistan’s power sector and highlights the key decision-makers responsible for the coal phase-down and the promotion of renewable energy development.

Within the central government, the Ministry of Energy (Power Division) holds the authority to make critical policy and planning decisions. It also assumes responsibility for coordinating power projects under the China-Pakistan Economic Corridor (CPEC). Under the Ministry of Energy, agencies like the Private Power & Infrastructure Board (PPIB) and the Alternative Energy Development Board (AEDB, currently merged with PPIB) have key roles in coal and renewable power projects. PPIB oversees thermal independent power producer (IPP) projects, including those under CPEC, while AEDB formerly managed renewable IPP projects, also under CPEC. The National Electric Power Regulatory Authority (NEPRA), an independent entity parallel to the Ministry of Energy, regulates the tariff structure and grants approval for power purchase agreements (PPAs). At the provincial level, mineral resources are under the ownership of the respective provincial governments. For example, the Sindh government holds jurisdiction over the Thar coal mine located in Sindh province.

**On the market side, the power sector in Pakistan is a multi-seller, single buyer model with Independent Power Producers (IPPs) and single government-owned buyer, and a government-owned distribution network.** IPPs account for approximately 70% of the thermal capacity and almost all renewable power capacity. The National Transmission and Dispatch Company (NTDC) and the distribution companies (DISCOs) are publicly owned entities responsible for controlling the transmission and distribution system, as well as granting grid connection approvals for renewable projects. The Central Power Purchasing Agency (CPPA), a government-controlled entity, operates as the sole power off-taker, purchasing electricity on behalf of the DISCOs. Currently, the CPPA is actively supporting Pakistan's transition towards a competitive trading market.

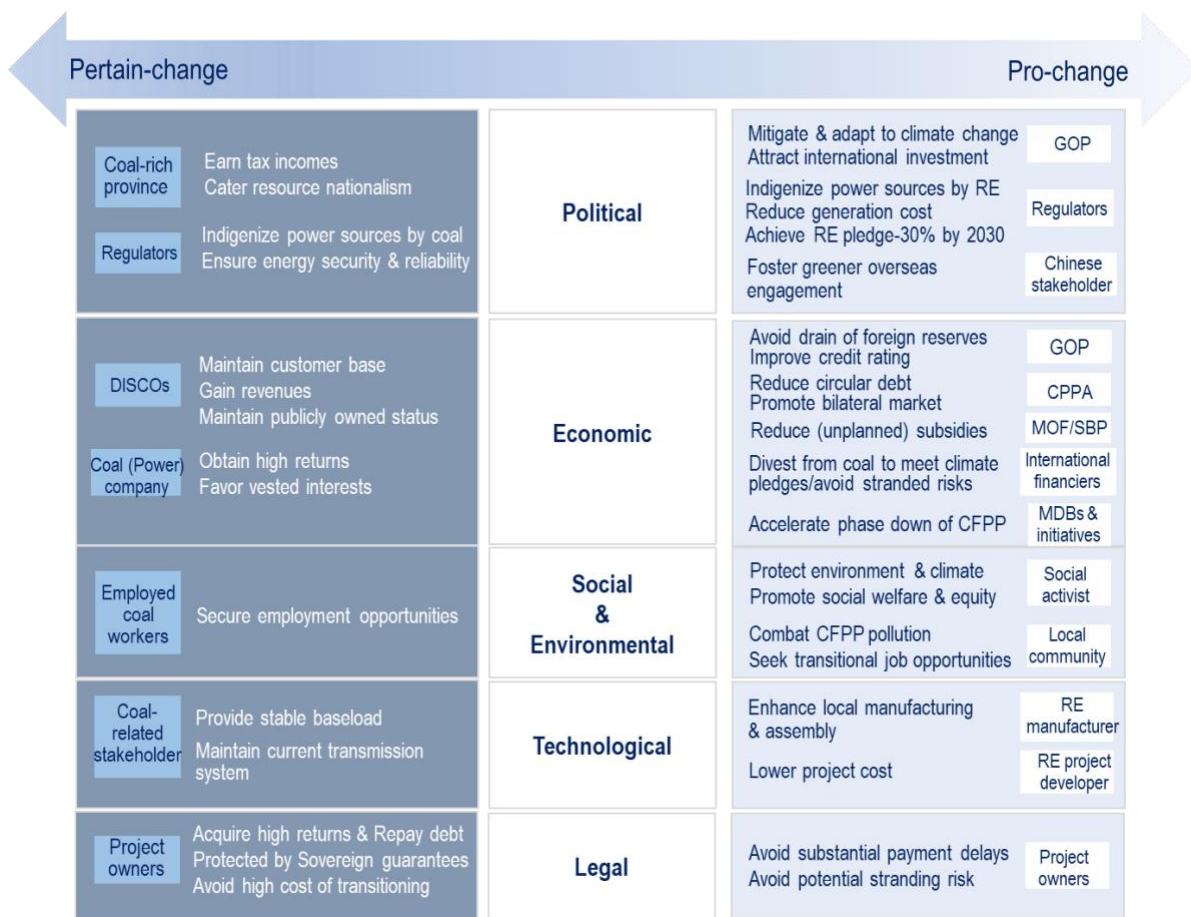


**Figure 7 Regulatory environment of Pakistan’s power sector**  
 (Source: Compiled by the author (s))

### 3.2 Stakeholder mapping

**Pakistan’s green energy transition with the phasing down of coal and other fossil fuels (sunset) and accelerating green energy utilization (sunrise) touches a complex set of stakeholders in Pakistan and beyond.** Stakeholders include regulatory bodies that influence macro policy signals and regulate asset strategy and financial mechanisms; it further includes socio-economic actors such as project developers and project owners that are financially impacted by coal plant closure and renewables expansion. Furthermore, workers and communities rely on incomes through coal plant operations or coal mining as well as might benefit from further investments in alternative power sources.

**Figure 8** describes stakeholders and their interests in the change of early coal phase down and further renewables expansion in Pakistan.



**Figure 8 Key stakeholder interests for Pakistan coal phase down & renewable expansion**

Note: GOP – government of Pakistan; MOE - Ministry of Energy; MOF – Ministry of Finance; CPPA – Central Power Purchase Agency; DISCOs – distribution companies; T&D – transmission and distribution (Source: compiled by the author (s))



### 3.3 Barriers for accelerated energy transition (coal phase-down, renewables scaling) in Pakistan

The following barrier analysis as well as the subsequent enablers analysis are based on literature review and on in-depth interviews with ten stakeholders in Pakistan and internationally conducted between policymakers, project developers, local communities, and energy sector experts.

#### Political factors

**Pakistan's government currently prioritizes short-term energy security, impeding long-term decarbonization objectives.** Unreliable power supply and escalating tariff rates impact the daily lives of Pakistan's people and the productivity of industrial sectors. Load-shedding is estimated to cost USD 49 million annually (7% of GDP in 2016)<sup>28</sup>. The ambition to improve energy supply was one of the major goals of coal projects developed under the CEPC initiative (since 2015). The expanding exploration of local Thar coal fits the government's goal to indigenize power sources and reduce exposure to coal price fluctuations on international markets. Pakistan also seeks to expand Thar coal's downstream uses like coal gasification to reduce imports of natural gas.

**Resource nationalism has grown in the coal-rich provinces of Pakistan.** The term "resource nationalism" refers to the various forms of state involvement in extracting, processing, and marketing natural resources.<sup>29</sup> In provinces where substantial coal reserves are found, and significant coal power projects are established, such as Sindh province, resource nationalism emerges. The ownership of coal resources can fuel aspirations for increased power and influence, both politically and economically, and shape the power landscape of the region and in larger scope through the coal industry.

**Vested interests support coal in Pakistan.** Aside from concerns about energy security, powerful political actors, business owners, and foreign investors in Pakistan benefit from the current reliance on coal and have influenced government energy policies and plans, particularly in coal producing regions like Sindh province<sup>30 31</sup>: Coal mines in Pakistan are under the control of provincial governments and corresponding government-controlled enterprises. The largest coal mine, Thar coal mine, is operated by Sindh Engro Coal Mining Company (SECMC), a joint venture between the Government of Sindh, partners like Habib Bank Limited (HBL), and strategic investors from China, including China Machinery Engineering Corporation (CMEC).<sup>32</sup>

---

<sup>28</sup> Dawn.com, "7 Facts about Pakistan's Energy Crisis — and How You Can Help End It," DAWN.COM, 2016, <http://www.dawn.com/news/1275116>.

<sup>29</sup> Shiquan Dou et al., "Critical Mineral Sustainable Supply: Challenges and Governance," *Futures* 146 (February 1, 2023): 103101, <https://doi.org/10.1016/j.futures.2023.103101>.

<sup>30</sup> "Lobbies at Work to Turn Energy Mix in Their Favour," *The Express Tribune*, April 24, 2018, <https://tribune.com.pk/story/1693962/lobbies-work-turn-energy-mix-favour>.

<sup>31</sup> "COP27: Sharp Rise in Fossil Fuel Industry Delegates at Climate Summit," *BBC News*, November 10, 2022, sec. Science & Environment, <https://www.bbc.com/news/science-environment-63571610>.

<sup>32</sup> "Sindh Engro Coal Mining Company (SECMC)," n.d., <https://www.secmc.com.pk/>.



These entities have played significant roles in major Thar coal power projects, such as the 330MW HUBCO Thar Coal Power Project and the 660MW Engro Thar Block II Power Plant. The Sindh government believes the Thar coal industry has the potential to create regional employment, prosperity, and long-term income for the government and investors, given its vast resource reserves.

**Sindh Province political leaders support local Thar coal and actively promote the transition of coal plants from imported coal to locally sourced Thar coal.** Some sources claim that state-owned coal enterprises may receive implicit subsidies and preferential policies from the local government, further reinforcing the symbiotic relationship between the coal industry and the government.

Moreover, on the renewable energy side, **Pakistan's political instability and policy inconsistencies have undermined investor confidence for clean energy alternatives.** Given the strategic importance of the power sector and the pressing issue of mounting debt, successive governments have prioritized its management. However, the political landscape of Pakistan has experienced significant turmoil in 2022 and 2023, capturing public attention. These government upheavals have the potential to shift policy priorities, reverse previous plans, and delay decision-making processes. Consequently, this creates a highly uncertain policy environment, failing to foster the larger ecosystem of investors and developers of renewable energy projects, desired by the government.

#### **Box 2 Policy shifts as barrier for renewable energy development**

**Example 1.** Pakistan's previous government implemented a moratorium on imported coal plants while simultaneously setting ambitious renewable energy targets. It also embarked on a collaboration with the Asian Development Bank (ADB) for a pre-feasibility study on Pakistan's early coal retirement. The current government (since April 2022) has been actively promoting the further development of both local coal and renewables (i.e., Solar Fast Track Initiative 2022) to address energy security and affordability concerns and has shown limited interest or emphasis on early coal retirement.

**Example 2.** Category III solar and wind projects as mentioned previously, which were promised the first right of auctions during the transition to the competitive bidding mechanism, have faced significant delays. Moreover, the government introduced a parallel scheme, the Solar Fast Track Program, aiming to add 10 GW of solar capacity. This initiative, focused on new projects, undermined and impacted the Category III projects. As a result, the implementation of renewable energy projects has been delayed.

**Example 3.** To address the mounting circular debt in the power sector, many wind generators entered into memorandum of understanding (MoUs) with the Pakistani government to renegotiate their tariffs in 2020.<sup>33</sup> However, the impact of these renegotiations were detrimental to renewable energy providers. Most of them were compelled to reduce their

---

<sup>33</sup> "Revised power tariff: All 47 IPPs sign Master Agreements," The International News, March 2021, <https://www.thenews.com.pk/print/784220-revised-power-tariff-all-47-ipp-sign-master-agreements>.



tariffs for a period exceeding 15 years, significantly longer than the average remaining contract period for thermal generators, which was less than five years. As a result, the return on equity (ROE) for renewable energy investors has been adversely affected. This has ignited investor's fears that sovereign independent agreements with the government of Pakistan could be subject to renegotiation.

**Conflicting political powers of relevant regulators slow the privatization of the energy sector and may slow the progress of the implementation of renewable projects.** Despite being first introduced in the early 2000s, privatization of the power distribution sector has been slow, and the ten DISCOs are still publicly owned. According to NEPA<sup>34</sup>, DISCOs, currently serve most of the areas in Pakistan, view the growing trend for net-metering and other distributed generations as a threat to their consumer base.

**Lack of adequate capacity and expertise in the development of a competitive marketplace have impeded expansion of distributed renewable energies.** Competitive bidding, i.e., auction, is critical for generation cost reduction and efficient resource allocation (e.g., reduce unnecessary subsidies from government). It can also send clear demand signals to investors and drive RE investments. Yet the launch of auction system by AEDB (now combined with PPIB) did not meet the expected timeline despite technical support from the World Bank since 2020, resulting in serious delays in the realization of renewable projects, i.e., aforementioned Category III renewable projects. The same context has also occurred in the competitive trading mechanism (CBTCM). Despite been proposed in 2020 and planned launch in 2022, the bilateral electricity market has experienced persistent delays, leaving it stuck in an ongoing testing phase. Furthermore, the lack of clarity regarding the marginal price of the new market system has dampened investor interest in transitioning to this new regulatory framework.

#### Economic factors

**Pakistan's government has guaranteed higher returns for coal power projects than renewables.** Return on equity (ROE) for local and imported coal power projects was initially set by NEPA at 17% and 20% in 2013.<sup>35</sup> They were then raised to 26.5-29.5% and 24.5-27.2% (range between different plant sizes) respectively, and even higher for Thar coal-based power plants at 30.65-34.49%<sup>36</sup> (to incentivize Thar coal investment) in 2014. Renewable power projects' ROE was initially set at 17% and declined to around 12%. In 2017, NEPA proposed to introduce competitive bidding for imported and local coal power projects. However, all existing coal power capacity, whether developed before or after 2017, has been guaranteed an ROE of over 20% through a cost-plus tariff regime.

**Public investments in Pakistan's energy sector are hampered by long-embedded circular debt.** Circular debt refers to the accumulation of unpaid bills and subsidies owed to various players

---

<sup>34</sup> "State of Industry Report 2022.Pdf."

<sup>35</sup> "Notification in Respect of NEPA, Upfront Tariff for the Project of Imported Local/ Coal," September 2013, <https://nepa.org.pk/tariff/Tariff/Upfront/Notification%20upfront%20Tariff%20imported-local%20coal.PDF>.

<sup>36</sup> NEPA, "Determination of the Authority in the Matter of Thar Coal Upfront Tariff," July 2014, <https://nepa.org.pk/tariff/Tariff/Upfront/COAL%20UpFront%20Tariff.PDF>.



along the power supply chains (see **Box 3**). It is an entrenched problem for Pakistan’s government because with the wholesale electricity market yet to take shape, the government is still the sole off-taker for all the electricity and thus the biggest debtor for the upper-stream independent power producers (IPPs). By April 2023, circular debt reached USD 9.3 billion and is accumulating at a rate of USD 451 million per year despite the government's efforts in increasing the electricity tariff prices and reducing subsidies.<sup>37</sup> The unabated circular debt has significantly weakened the country's economy and its ability to phase down coal plants. Limited fiscal resources and locked-in public and private financing hinder the investment in clean alternative energies or the buyout of coal plants.

### **Box 3 Circular debt in Pakistan**

Circular debt in the power sector is a complex issue that starts with consumers' inability to fully pay their electricity bills. In Pakistan, there is low payment morale, especially from households in poor regions, due to perceived high tariffs. The unpaid bills accumulate and first negatively affect cash flows of publicly owned power distribution companies (DISCOs), which then further impacts the Central Power Purchasing Agency (CPPA), a government-controlled entity that purchases all the electricity and provides it to the DISCOs. As the CPPA is similarly affected by lack of revenues, the payment issues cascade down the power supply chain, affecting state-owned generation companies (GENCOs) and Independent Power Producers (IPPs). With lacking payments for GENCOs and IPPs, it becomes challenging for these power providers to purchase fuel and maintain operational efficiency, resulting in the underutilization of power plants.<sup>38 39 40</sup> The underutilized plants would still get paid through capacity payments (i.e., the right to be paid even if no electricity was generated), which adds burden to the circular debt.

With some IPPs having negotiated power purchasing agreements (PPAs) that compensate for operational costs (including fluctuations in fuel prices), as well as a capacity charge, paired with government guarantees that include penalties for outstanding payments, the Pakistani government is further accumulating public debt.

Thus, the main factors contributing to circular debt include the overreliance on imported fuels, fixed capacity payments for coal and other fossil fuel power plants through long-term power purchase agreements (PPAs), as well as other institutional inefficiencies. Due to the predominantly publicly owned nature of Pakistan's energy sector, all accumulated liabilities

---

<sup>37</sup> “Circular Debt Soars Past Rs4,177bn,” *The Express Tribune*, December 14, 2022, <https://tribune.com.pk/story/2391025/circular-debt-soars-past-rs4177bn>.

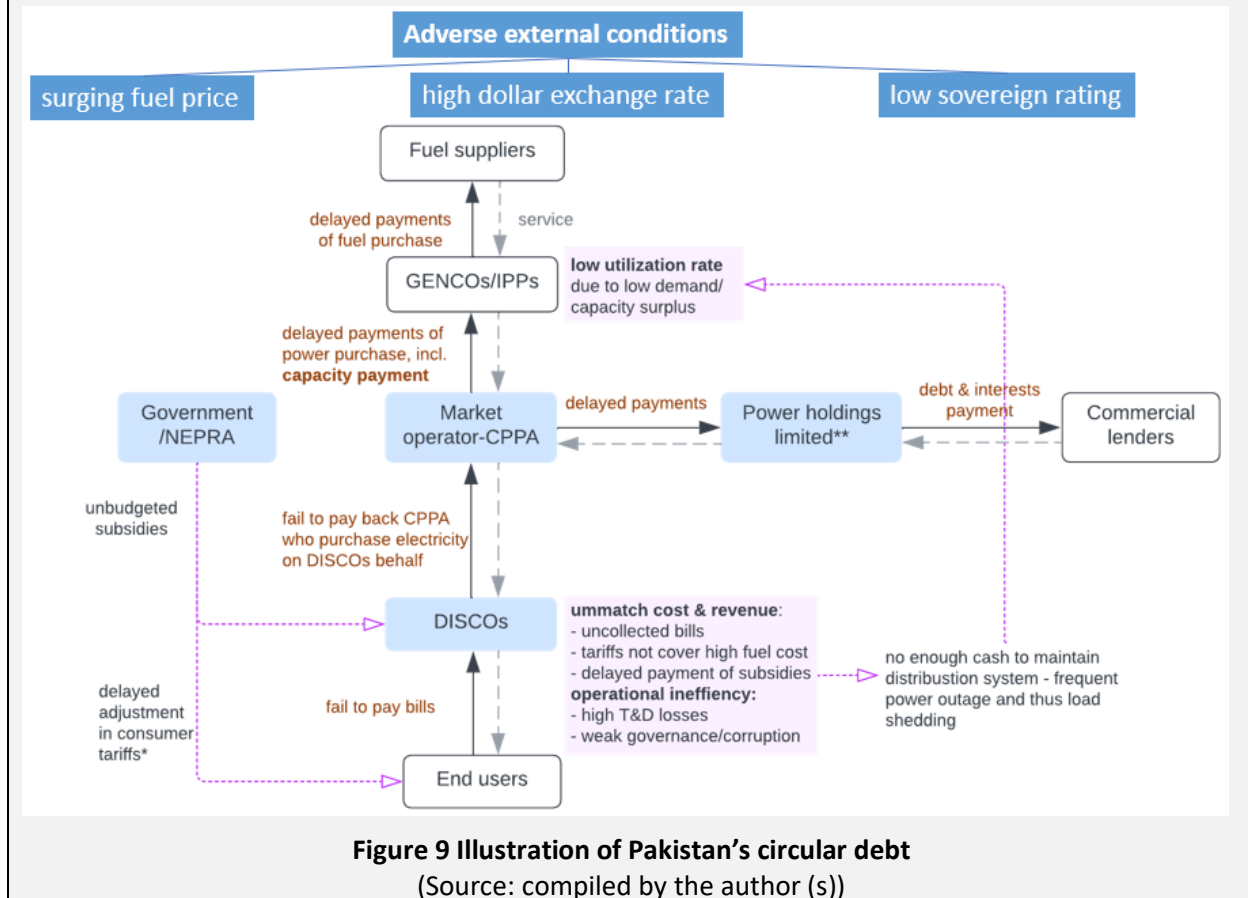
<sup>38</sup> Asian Development Bank (ADB), “Proposed Programmatic Approach and Policy- Based Loan for Subprogram 2 Islamic Republic of Pakistan: Energy Sector Reforms and Financial Sustainability - Circular Debt Impact on Power Sector Investment Supplementary Linked Document,” March 2021, <https://www.adb.org/projects/documents/pak-53165-002-rrp>.

<sup>39</sup> Amna Tauhidi and Usman W. Chohan, “The Conundrum of Circular Debt,” *SSRN Electronic Journal*, 2020, <https://doi.org/10.2139/ssrn.3513225>.

<sup>40</sup> Afia Malik, “Circular Debt— an Unfortunate Misnomer” (ISLAMABAD: PAKISTAN INSTITUTE OF DEVELOPMENT ECONOMICS, 2020), <https://www.pide.org.pk/pdf/Working%20Paper/WorkingPaper-2020-20.pdf>.



ultimately fall upon the government. **Figure 9** illustrates the flow and relevant impacts of circular debts.



**Figure 9 Illustration of Pakistan's circular debt**  
(Source: compiled by the author (s))

**Circular debt and payment issues are further exacerbated by Pakistan's high levels of inflation and currency depreciation.** Pakistan's consumer price inflation reached 31.5% in February 2023, the highest rate since June 1974, and is accompanied by a sharp depreciation of the Pakistani rupee against US dollars.<sup>41</sup> In addition to rising fuel prices on international markets, this impeded Pakistan's ability to pay for imported coal (and service its sovereign debt)<sup>42, 43</sup> and further pushed Pakistan's to shift towards utilizing domestic coal resources (i.e., Thar coal reserves).

<sup>41</sup> "Pakistan Inflation Rate - February 2023 Data - 1957-2022 Historical - March Forecast," accessed March 27, 2023, <https://tradingeconomics.com/pakistan/inflation-cpi>.

<sup>42</sup> Peshimam, "Exclusive."

<sup>43</sup> "Pak Forex Reserves Fall To Lowest Since 2019 Due To Increased Debt: Report," BW Businessworld, accessed March 27, 2023, <http://businessworld.inhttps://www.businessworld.in/article/Pak-Forex-Reserves-Fall-To-Lowest-Since-2019-Due-To-Increased-Debt-Report-/13-08-2022-441930>.



**Pakistan experienced a credit rating downgrade leading to higher borrowing cost**, driven by high inflation, escalating public debt, and budget deficits.<sup>44</sup> This could hinder the country's ability to make incremental investments in the energy sector, including investment in renewables as well as extra financing support for coal-fired power plant transition.

Despite such fiscal issues, **Pakistan continues to subsidize its coal sector to provide a price advantage for coal power generation**. According to local sources, the Pakistani government has been subsidizing the local Thar coal mining industry – although the exact amount or share is not publicly available. The International Monetary Fund (IMF) data further reveals indirect subsidies by identifying an estimated gap of USD 9-12 per gigajoule (GJ) between efficient and actual user prices for coal in Pakistan<sup>45 46</sup>, when the environmental externalities are considered as well. Underpricing provides cost advantages to coal-fired power plants, shielding them from the expenses associated with fuel and environmental impacts. Furthermore, the government enacted the tariff differential subsidy (TDS) scheme, under which DISCOs are compensated by the government for the difference between the consumer tariff and the cost-recovery tariff (paid to generators) determined by NEPRA.<sup>47</sup>

While subsidies are a protective measure against the costs of electricity generation for consumers, **subsidies hinder the transition to a greener power mix and contribute to the continued buildup of circular debt**. Despite the strain on Pakistan's public funds and the encouragement by IMF to phase out inefficient fossil fuel subsidies, there are no signals indicating that the government would eliminate subsidies for non-economical coal and other fossil fuel-based power system in the short term.<sup>48</sup>

### Social and environmental factors

**The phase-down of coal may have adverse repercussions on local employment and livelihoods if no just transition plan is in place**. According to Pakistan's Central Mines Labor Federation (PCMLF) estimates, more than 10,000 local workers are employed in coal mining in Pakistan<sup>49</sup>, and another 6,000 workers in CPEC coal projects<sup>50</sup>. They represent the most vulnerable group in a coal phase-down. Notably, the Thar coalfield is situated in rural and the most under-privileged area, and the primary objective of the CPEC projects in that region is to

---

<sup>44</sup> "Pakistan Credit Ratings," Fitch Ratings, n.d., <https://www.fitchratings.com/pakistan-94558490>.

<sup>45</sup> Efficient price includes both the supply and environmental costs of fuel use, according to IMF.

<sup>46</sup> Ian W. H. Parry Vernon Simon Black, Nate, "Still Not Getting Energy Prices Right: A Global and Country Update of Fossil Fuel Subsidies," IMF, September 2021, <https://www.imf.org/en/Publications/WP/Issues/2021/09/23/Still-Not-Getting-Energy-Prices-Right-A-Global-and-Country-Update-of-Fossil-Fuel-Subsidies-466004>.

<sup>47</sup> Ghulam Samad, Naseem Faraz, and Haroon S. Awan, "Tariff Differential Subsidy (TDS) Effects and Welfare Gains in Pakistan," *Indian Economic Review* 57, no. 2 (December 1, 2022): 373–92, <https://doi.org/10.1007/s41775-022-00150-z>.

<sup>48</sup> Gibran Naiyyar Peshimam and Asif Shahzad, "Pakistan's New Govt Decides Not to Roll Back Fuel, Power Subsidies," *Reuters*, April 15, 2022, sec. Asia Pacific, <https://www.reuters.com/world/asia-pacific/pakistans-new-govt-may-have-roll-back-fuel-power-subsidies-2022-04-14/>.

<sup>49</sup> Peoples Dispatch, "Coal Miners Become Casualties in Pakistan," *Peoples Dispatch* (blog), February 3, 2020, <https://peoplesdispatch.org/2020/02/03/coal-miners-become-casualties-in-pakistan/>.

<sup>50</sup> CPEC official website and author's estimate.



stimulate urbanization and foster economic development, thereby improving local welfare. Consequently, the transition away from coal may encounter local resistance unless a well-structured Just Transition mechanism is in place to address the potential socio-economic impacts on affected communities and to ensure alternative employment opportunities, skill development, and social support systems. However, currently, no Just Transition Mechanism is in place in Pakistan or ambitions to scale green jobs, e.g., AEDB's plans to establish an Institute of Renewable Energy Technologies to scale renewable training was abandoned.

**While environmental protection has gained political and social significance, basic economic growth ambitions are prioritized in Pakistan.** Pakistan is the third most polluted country in the world when ranked by population-weighted PM<sub>2.5</sub> concentration according to the 2022 World Air Quality Report.<sup>51</sup> About 114,000 Pakistanis (9% of total deaths) die annually from the impact of air pollution.<sup>52</sup> Although Pakistan has been aware of this issue and has made some progress in releasing the Environmental Protection Act and climate mitigation pledges, these efforts have proven insufficient in controlling air quality, health impacts, and greenhouse gas emissions.<sup>53</sup> One of the contributing factors is Pakistan's lax emission standards compared to international benchmarks in the EU, China, and the US<sup>54</sup>. Additionally, local governments lack adequate monitoring measures to regulate emissions and mitigate their negative impact on local communities. Of particular concern is the increasing use of Thar coal, which is of low quality and contains high sulfur and lime contents. The coal mining and power generating sites in the Thar region cause land damage, water contamination, and the emergence of new diseases in nearby communities and villages. Despite these legitimate concerns, the lack of proactive advancement in implementing efficient regulations and robust market mechanisms (i.e., carbon pricing), has inadvertently facilitated a situation where coal plant operators can operate without adequately internalizing the environmental costs involved.

### Technological factors

**Coal power is seen instrumental for Pakistan's energy security and stability.** Coal power serves as a baseload in the energy sector in Pakistan. To phase down coal, it is important to provide an equally stable and consistent supply of electricity, which is not always the case with other sources of energy, such as wind and solar. Even though Pakistan has rich resources of wind and solar, their intermittent nature is widely seen as a concern for stable electricity supply.

**Transmission infrastructure is insufficient for renewable energy distribution.** The current aging transmission infrastructure is not capable of evacuating full capacity from existing

---

<sup>51</sup> "World's Most Polluted Countries in 2022 - PM<sub>2.5</sub> Ranking," IQAir, n.d., <https://www.iqair.com/world-most-polluted-countries>.

<sup>52</sup> World Bank, "Opportunities for a Clean and Green Pakistan," June 19, 2019, <https://doi.org/10.1596/32328>.

<sup>53</sup> Kaleem Anwar Mir et al., "Co-Benefits of Air Pollution Control and Climate Change Mitigation Strategies in Pakistan," *Environmental Science & Policy* 133 (July 1, 2022): 31–43, <https://doi.org/10.1016/j.envsci.2022.03.008>.

<sup>54</sup> "Air Quality, Health and Toxics Impacts of the Proposed Coal Mining and Power Cluster in Thar, Pakistan," Centre for Research on Energy and Clean Air, May 29, 2020, <https://energyandcleanair.org/publication/air-quality-health-and-toxics-impacts-of-the-proposed-coal-mining-and-power-cluster-in-thar-pakistan/>.



generation or transmitting energy from new sources like wind or solar. Even though Pakistan has enough installed capacity to meet demand, only 43% of the dependable capacity were utilized during FY2021-2022.<sup>55</sup> Generators are facing regular load curtailments due to overloading or unavailability of the grid.

### **Lack of local manufacturing reduces the benefits of switching to renewable technologies.**

Although Pakistan has witnessed advancements in its renewable power generation, the country's manufacturing capabilities in this field remain limited. Presently, over 90% of solar panels and 69% of wind turbines used in Pakistan are sourced from China, while the remaining portion is obtained from countries like the United States and Germany.<sup>56</sup> Even the ancillary technologies like frames, cables, circuits are mainly imported. This heavy reliance on imports has led to increased costs and extended lead times for renewable energy projects, while not bringing job benefits through local manufacturing in Pakistan.

### **Legal/Regulation**

**Pakistan's move towards a wholesale electricity market is yet to fully materialize, posing a potential hindrance to the competitiveness of renewable energies.** The Competitive Trading Bilateral Contract Market (CTBCM) design, which aims to transit Pakistan's electricity market from a single buyer mode to a wholesale one, has yet to take shape. The government views this as a way to achieve lower prices, promote the adoption of efficient, low-emission technologies, and move away from sovereign guarantees (currently provided for both coal and solar and wind projects).<sup>57</sup> However, most existing projects (both thermal and renewable) are bounded by long-term contracts, making CTBCM currently lack sufficient free suppliers on the playfield to leverage competitiveness for renewable energy.

**Young coal-fired power plants imply a long lifespan and debt repayment requirements.** China-funded coal plants in Pakistan, with an average age of under three years, have substantial outstanding capital obligations that extend over the next several decades. These obligations include debt repayments within the next seven years (typically limited to a 10-year repayment period) and future cashflows derived from revenue streams. The long-term power purchase agreements (PPAs) for coal plants, typically lasting 30 years and featuring 'Take or Pay' clauses, necessitate capacity payments irrespective of actual electricity demand or supply. This makes Pakistan coal plants highly profitable. The Return on Equity (ROE) ranges from 17% to 35% (see Annex II) and plant owners would be reluctant to accept any losses on such highly profitable assets. Meanwhile, the key clauses for implementing any acquisition or retirement are governed by contractual agreements. There are attached technical, financial, and commercial obligations that need to be sorted out before any activity is undertaken. If a power plant is intending to close early, it is expected to pay a substantial "termination fee" included as a

---

<sup>55</sup> "State of Industry Report 2022.Pdf."

<sup>56</sup> Renewable First, "Accelerating Chinese Investment in Renewable Energy Market of Pakistan," Brief for Policymakers –Webinar Series, 2023.

<sup>57</sup> ProPK Staff, "Implementation of CTBCM Model to Increase Accountability in the Power Sector," *ProPakistani* (blog), March 3, 2022, <https://propakistani.pk/2022/03/03/implementation-of-ctbcm-model-to-increase-accountability-in-the-power-sector/>.



contractual obligation in the PPA. Consequently, these coal projects have incurred significant legal debt burdens, requiring smart legal and political negotiations to change contractual terms.

**Coal projects under CPEC are protected by sovereign guarantees alongside an overall generous financial package (see Box 4),** which provide strong legal backing for the PPAs, making it difficult to renegotiate without the participation and consensus of all parties involved. This can be particularly challenging if the PPAs were signed for a long-term period, such as 30 years, as is often the case in the energy sector. Moreover, renegotiating power purchase agreements (PPAs) that are backed by sovereign guarantees can be perceived as a signal of instability or unpredictability in the regulatory landscape. This, in turn, can lead to uncertainty among investors and reduce their willingness to invest in future projects.

**International financiers, primarily China, play a decisive role in the phase-down of coal plants in Pakistan.** As discussed in Chapter 2, China is the main owner and investor in Pakistan's coal plants, providing substantial funding, technology, and personnel support. Their involvement can serve either as a powerful catalyst or a potential obstacle to Pakistan's efforts to phase down coal capacity. Coal projects under the umbrella of the China-Pakistan Economic Corridor (CPEC) are typically government-to-government initiatives based on intergovernmental cooperation. Thus, divesting from these substantial investments would require extensive renegotiations and strategic realignments.

#### **Box 4 Financing models for China-backed coal projects in Pakistan**

**China-backed coal power projects in Pakistan are typically structured as independent power producers (IPPs)<sup>58</sup> and are ensured power offtake through long-term power purchase agreements (PPAs) with sovereign guarantees and other preferential terms provided by the Pakistani government.** These coal IPP projects are developed through a Special Purpose Vehicle (SPV), which operates under either a Government-to-Government (G2G) model or a Foreign-Local-Partnerships joined by Chinese, Pakistani, and sometimes other international equity investors.<sup>59</sup> Chinese companies usually engage in Pakistan's coal power projects as contractors (responsible for engineering, procurement, and construction (EPC)), as well as investors (responsible for providing equity or/and debt finance).

The typical financing structure features one Chinese policy bank (either China Development Bank or the Export-Import Bank of China), one or two Chinese commercial banks to provide funding, and China Export & Credit Insurance (Sinosure) to provide risk guarantee. It is required by China that all the lending and investing activities from Chinese banks or state-owned enterprises for overseas projects should be secured by credit insurance from Sinosure to prevent non-payment risks<sup>60</sup>.

---

<sup>58</sup> "State of Industry Report 2022.Pdf."

<sup>59</sup> Olakunle Alao and Paul Cuffe, "Structuring Special Purpose Vehicles for Financing Renewable Generators on a Blockchain Marketplace," *IEEE Transactions on Industry Applications* 58, no. 2 (March 2022): 1478–89, <https://doi.org/10.1109/TIA.2021.3135252>.

<sup>60</sup> Hanea Isaad, "Evaluating the Emissions Impact and Economic Feasibility of Coal Power Plants under the China Pakistan Economic Corridor in Pakistan," n.d.



Debt repayment period is usually limited to 10 years<sup>61</sup>, reducing the risk of non-payment to a shorter period. While increasing the financial attractiveness to both investors and Chinese policy banks<sup>62</sup>, this also makes the corresponding capacity payments onerous as they are designed to cover the coal plants' fixed costs including debt repayments and interests.

The repayments of the Chinese debt are ideally covered in the electricity tariffs in Pakistan<sup>63</sup>.

To attract Chinese and other financiers and project developers, the Pakistan government offers special terms for them to mitigate financial risks, including:

- Pay tariffs to coal power IPPs which include a high return on equity, ranging from 17% to 35%.<sup>64</sup> See Annex II for details.
- Permit project developers to claim reimbursement from China Export and Credit Insurance Corporation (Sinosure) payments<sup>65</sup>.
- Provide sovereign guarantees for coal-fired power plants financing to ensure project sponsors receive payment on time<sup>66</sup>.
- Provide a mechanism for the indexation/adjustment of certain tariff components based on the Rupee/Dollar exchange rate, fuel price variations, and inflation to ensure a stable and predictable revenue stream for IPPs.

### 3.4 Drivers for accelerated green energy transition in Pakistan

#### Political factors

##### **Enabling international coal transition momentums could provide pivotal support.**

Internationally, initiatives have been developed to support the phase-down of coal-fired power plants both technically and financially. Many of them have focused on developing countries and could serve as valuable tools for leveraging change. Notably, the Energy Transition Mechanism (ETM) of the Asian Development Bank (ADB), the Accelerating Coal Transition Investment Program (ACT), and a pioneering multilateral financial commitment Just Energy Transition Partnership (JETP) stand out. Among them, ADB has already been conducting pre-feasibility analysis on Pakistan for a potential ETM, expanding its scope to include not only coal-fired power plants but also those reliant on diesel and furnace oil<sup>67</sup>. Insider information reveals that

---

<sup>61</sup> Simon Nicholas, "China and Pakistan's 'No More Coal Power' Pledges Don't Hold up to Scrutiny," 2022, <https://ieefa.org/resources/ieefa-china-and-pakistans-no-more-coal-power-pledges-dont-hold-scrutiny>.

<sup>62</sup> Rishikesh Ram Bhandary and Kelly Sims Gallagher, "What Drives Pakistan's Coal-Fired Power Plant Construction Boom? Understanding the China-Pakistan Economic Corridor's Energy Portfolio," *World Development Perspectives* 25 (March 1, 2022): 100396, <https://doi.org/10.1016/j.wdp.2022.100396>.

<sup>63</sup> "Pakistan to Seek Debt Restructuring of CPEC Power Projects," *The Express Tribune*, May 1, 2021, <https://tribune.com.pk/story/2297655/pakistan-to-seek-debt-restructuring-of-cpec-power-projects>.

<sup>64</sup> Bhandary and Gallagher.

<sup>65</sup> Bhandary and Gallagher.

<sup>66</sup> Nedopil et al., "Potential for Early Coal Retirement," 2022, [https://greenfdc.org/wp-content/uploads/2022/07/Nedopil-et-al-2022\\_Potential-for-early-coal-retirement.pdf](https://greenfdc.org/wp-content/uploads/2022/07/Nedopil-et-al-2022_Potential-for-early-coal-retirement.pdf).

<sup>67</sup> "ADB Announces \$0.3m for Pakistan to Phase out Coal Plants," *The Express Tribune*, November 5, 2021, <https://tribune.com.pk/story/2327982/adb-announces-03m-for-pakistan-to-phase-out-coal-plants>.



initially, coal plants, especially those located in Thar, were excluded in ETM's study. After several rounds of negotiations emphasizing the importance of including the detrimental impact brought by coal power plants into the selection criteria, several Thar coal plants have been included in the ETM shortlist for potential early retirement.

**Pakistan has announced clear renewable energy development targets.** Pakistan's latest renewable energy policy ARE 2019 shifted to a more proactive approach in terms of incorporating renewable energy projects by setting up a clear goal of at least 20% of generation capacity sourced from non-hydro technologies by 2025, and 30% by 2030.

**China, Pakistan's primary partner in the energy sector and coal assets, is promising to build a "green Belt and Road Initiative".** In 2021, China pledged to refrain from building new coal plants abroad, prioritizing renewable energy investments, and aligning with global green finance standards, especially within the Belt and Road Initiative (BRI). In light of this shift, it would be promising that CPEC is entering a greener phase. According to GFDC's latest report on BRI series, China's energy related engagement in the first half of 2023 were the greenest in any 6-month period since the BRI's inception in 2013.<sup>68</sup>

### Economic factors

**The shift in global and local financial resources accelerated the divestment from coal.** Despite the recent announcements by the incumbent government regarding the expansion of coal power capacity from 2.5 GW to 10 GW<sup>69</sup>, obtaining funding for non-committed coal projects in Pakistan seems challenging. The primary lenders, Chinese entities, are aligning with China's commitment to shift away from coal. Additionally, HBL, the largest commercial bank in Pakistan and a key participant in CPEC projects has implemented a "no new coal" policy in 2020, intending to eliminate its coal-related exposure by 2030<sup>70</sup>. Other local banks have also followed suit.

**Financial challenges/default impact the financial health of existing coal IPPs driven by challenging economic conditions and circular debt issues in Pakistan.** Chinese companies invested in coal projects are facing a backlog of payments with outstanding amounts at around US\$1.5 billion (by March 2023)<sup>71</sup>, resulting in serious financial problems on debt repayment and operational barriers for the Chinese-funded Independent Power Producers (IPPs). This situation, on the one hand, has led to domestic political pressure on the Chinese government to ensure the viability and profitability of its overseas investments while also drawing international attention to its responsibility in addressing bad debt. On the other hand, Chinese state-owned companies are facing mounting pressure to align with green and sustainable

---

<sup>68</sup> Nedopil, Christoph (July 2023): "China Belt and Road Initiative (BRI) Investment Report 2023 H1 – the first ten years", Green Finance & Development Center, FISF Fudan University, Shanghai; doi: 10.13140/RG.2.2.13892.19841

<sup>69</sup> Peshimam, "Exclusive."

<sup>70</sup> "HBL Launches Its First Impact and Sustainability Report," HBL, June 2022, <https://www.hbl.com/news-and-media/hbl-launches-its-first-impact-and-sustainability-report>.

<sup>71</sup> "China Is Concerned Over Pending \$1.5 Billion Payments," ProPakistani (blog), March 15, 2023, <https://propakistani.pk/2023/03/15/china-is-concerned-over-pending-1-5-billion-payments/>.



practices. These companies may need to liquidate their coal assets to generate funds for investment in other projects. Selling off coal assets and redirecting funds towards alternative ventures might align with their long-term strategic goals. In this case, innovative financing practices such as refinancing (debt restructuring) for early coal phase-down could provide Chinese investors capital and reduce brown asset exposure.

**The government has made some progress through subsidy and taxation reforms to change the state of fossil fuel subsidies**, despite the achievements having been mixed to date. For example, the government implemented subsidy reform and taxation reform between 2015-2020, aiming to reduce spending on fossil fuel subsidies.<sup>72</sup> Also, in these two years, GOP has increased fuel prices as well as electricity tariffs several times per IMF demand – which deems that the country’s untargeted subsidies over the years are constantly adding burdens to its fiscal condition.<sup>73</sup> While the government's consideration towards the reduction of fossil fuel subsidies, including coal, may not yet translate into a consistent commitment towards transformational change, it is a positive signal for the energy transition.

For renewable expansion, **evolving preferential policies foster greater uptake of renewable energy sources and promote local assembly and manufacturing**. First, the "Solar Fast Track Program 2022"<sup>74</sup> aims to rapidly add 10 GW of solar energy to the grid and introduces a framework that distinguishes these solar PV projects from other IPP initiatives awaiting overdue payments. These projects enjoy a priority payment mechanism, ensuring their exemption from payment delays experienced by other projects due to collection issues faced by the DISCOs. This mechanism offers additional liquidity and reliability, providing important reassurance to investors. Moreover, the government extends a sovereign guarantee for payment, further strengthening the financial security associated with these projects.

Additionally, to counter the increasing cost of imported solar panels (more than 100% increase since May 2022)<sup>75</sup>, **the government is reportedly devising long-term plans in exempting solar equipment from all taxes to achieve a target of 10,000 MWp from solar plants**. The under-review policy drafted by the Ministry of Industries and Production proposes a 10-year policy framework with exemptions from duties and taxes on imports of inputs used in manufacturing solar panels and allied equipment (previously only exempt imports of complete solar power systems).<sup>76</sup> The policy also proposes bank financing and low-interest loans for setting up local manufacturing and installation plants for solar panels and supporting its exports through adequate incentives in the shape of Research & Development support.

---

<sup>72</sup> “Background Note on Fossil Fuel Subsidy Reform,” International Institute for Sustainable Development, August 2023, <https://www.iisd.org/publications/brief/background-note-fossil-fuel-subsidy-reform>.

<sup>73</sup> “Fuel Prices Raised Again to Unlock IMF Funding,” The Express Tribune, June 15, 2022, <https://tribune.com.pk/story/2361724/fuel-prices-raised-again-to-unlock-imf-funding>.

<sup>74</sup> [Framework Guidelines Fast Track Solar PV Initiatives 2022.pdf \(aedb.org\)](#)

<sup>75</sup> “Solar Panels Price in Pakistan,” Paksolar Renewable Energy (Pvt) Ltd, July 28, 2022, <https://www.paksolarservices.com/solar-panel-in-pakistan.html>.

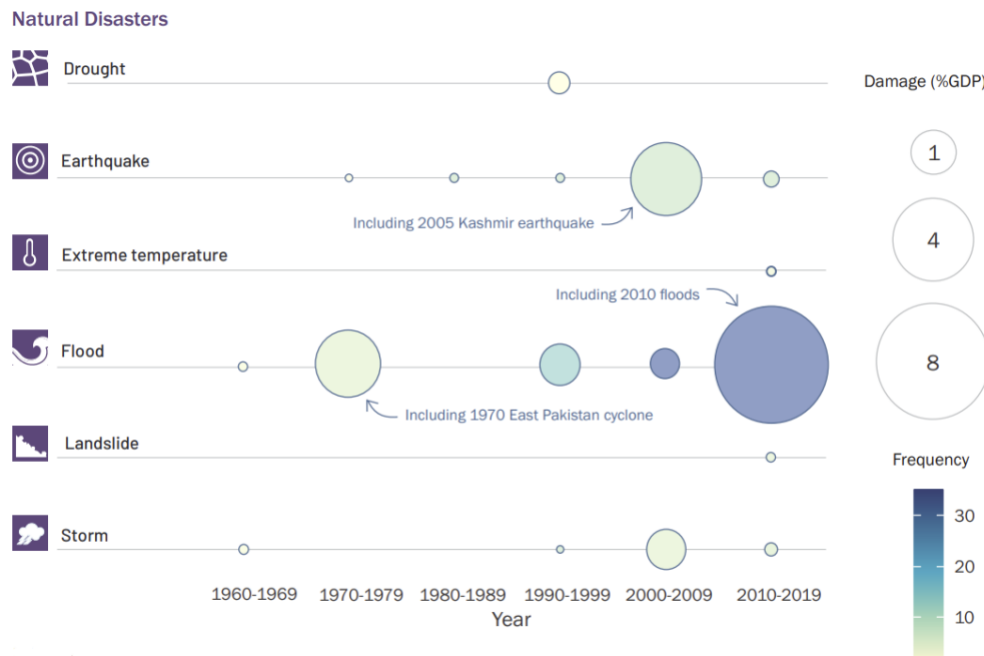
<sup>76</sup> Mushtaq Ghumman, “Govt May Exempt Solar Equipment from All Taxes,” Brecorder, 06:15:17+05:00, <https://www.brecorder.com/news/40222770>.



Furthermore, in June 2022, **the State Bank of Pakistan (SBP) announced a two-year extension of a subsidy scheme** that aims to provide financing with low interest rate for renewable power projects.<sup>77</sup> The scheme was launched in 2009 and underwent several revisions in 2016 and the subsequent years, which include broadening the scope of support and increasing the maximum loan amount etc.<sup>78</sup> Currently, the scheme is not practically available due to economic crisis.

### Social and environmental factors

**Pakistan’s society is increasingly worried about climate change.** In recent years, Pakistan has seen more frequent occurrences of disastrous floods and heatwaves (see **Figure 10**). In 2022, Pakistan experienced a once-in-a-millennium heatwave, followed by the most intense monsoon rains ever recorded. Consequently, the national poverty rate is projected to increase by 3.7 to 4.0 percentage points, pushing an additional 8.4 and 9.1 million people into poverty and more easily affected by extreme weathers.<sup>79</sup> Analysis shows that around 15-20% of Pakistan population has recognized and suffered the climate-related disasters and has become climate migrants.<sup>80</sup>



<sup>77</sup> Recorder Report, “SBP Extends Financing Scheme for Renewable Energy Projects,” Brecorder, June 19, 2022, <https://www.brecorder.com/news/40181005>.

<sup>78</sup> State Bank of Pakistan, “SBP Financing Scheme for Renewable Energy,” accessed December 21, 2022, <https://www.sbp.org.pk/Incen-others/Rene.asp>.

<sup>79</sup> “Pakistan Climate & Development Report,” World Bank, November 2022, <https://www.worldbank.org/en/news/press-release/2022/11/10/pakistan-urgently-needs-significant-investments-in-climate-resilience-to-secure-its-economy-and-reduce-poverty>.

<sup>80</sup> “Climate Change Triggers Widespread Pakistan Migration,” August 2019, <https://www.aa.com.tr/en/environment/climate-change-triggers-widespread-pakistan-migration/1667231>.



**Figure 10 Total Occurrence and Average Economic Damage (percentage of GDP) from Natural Disasters in Pakistan between 1990 and 2019**

(Source: World Bank - Pakistan Climate & Development Report)

Meanwhile, **people have been aware of the detrimental impact on local air quality, water reserve, farming land, and human health brought by coal power generation**, which has raised concerns and protests around the country, including Thar<sup>81</sup>, Karachi<sup>82</sup>, etc. The formation of the Anti-Coal Alliance announced during COP24 in 2018 by Pakistani activists marked an organized effort to oppose the use of coal power in Pakistan.<sup>83</sup> Their collective voice and activism could play a role in bringing attention to the issue and urging the government to shift away from coal-based power generation.

**Certain areas that are currently powered by coal have the potential to overlap with regions rich in renewable energy resources, creating transitional job opportunities.** A study conducted by the World Bank has identified these ideal zones for solar and wind power generation based on financial considerations.<sup>84</sup> The summarized results (see **Table 1**) indicate that implementing solar and wind projects adjacent to the existing grid, rather than constructing extensive transmission lines, offers greater cost-effectiveness and faster implementation. For example, in Sindh Province, coal plants near the port region could explore the possibility of displacement through wind energy, while the coal plant in Punjab could potentially be substituted with solar power utilizing the existing grid infrastructure. Furthermore, the employment potential of renewable energy surpasses that of coal power when the same amount of investment is made. Research conducted by the United Nations Industrial Development Organization and the Global Green Growth Institute demonstrates that a USD 1 million investment in fossil fuels generates 22 jobs in Indonesia and 33 jobs in South Africa. In contrast, investing the same amount in clean energy could create 103 and 66 jobs, respectively.<sup>85</sup>

**Table 1 Zoning for financial attractiveness of solar and wind power<sup>86</sup>**

|   | <b>Solar</b>  | <b>Wind</b>  |
|---|---|--|
| <b>Without grid connection (long-term planning)</b> | Favorable all over the country, especially in the southern areas of Balochistan, Sindh, and southern Punjab. Northern areas have the potential for solar power deployment at a cost that is comparatively | Concentrated in western Balochistan and a corridor in Sindh. |

<sup>81</sup> “Resisting Coal in Pakistan’s Thar Desert,” September 2019, <https://theecologist.org/2019/sep/30/resisting-coal-pakistans-thar-desert>.

<sup>82</sup> Dawn com | Agencies | Sana Ali, “Pakistanis Answer Call to March against Climate Change in Vast Global Protest,” DAWN.COM, September 2019, <https://www.dawn.com/news/1506308>.

<sup>83</sup> “Pakistani Activists Announce Launch of Anti-Coal Alliance,” *Daily Times* (blog), December 6, 2018, <https://dailytimes.com.pk/330716/pakistani-activists-announce-launch-of-anti-coal-alliance/>.

<sup>84</sup> World Bank, “Variable Renewable Energy Locational Study,” 2022, <https://aedb.org/images/VRE-Locational-Study.pdf>.

<sup>85</sup> UNIDO, “Global green growth: Clean energy industrial investments and expanding job opportunities,” 2015. [https://www.unido.org/sites/default/files/2015-05/GLOBAL\\_GREEN\\_GROWTH\\_REPORT\\_vol1\\_final\\_0.pdf](https://www.unido.org/sites/default/files/2015-05/GLOBAL_GREEN_GROWTH_REPORT_vol1_final_0.pdf)

<sup>86</sup> Compiled by author based on analysis of the World Bank.



---

|   |   |   |
|---|---|---|
|   | higher, but still competitive on the international level.   |   |
| <b>With grid connection (short-term planning)</b> | The most suitable areas are located in <b>western Punjab and northeastern Balochistan, near the Afghan border</b> , where good solar resources come together with existing grid infrastructure. | <b>Corridor in Sindh</b> in the central south of Pakistan that is close to the existing grid. |

---

### Technological factors

**Potential to leverage existing power substations and distributed solar, especially rooftop solar, to quickly expand renewable power.** A World Bank study in 2022 showed that Pakistan can get up to 20% of its total power capacity from variable renewable energy by focusing on existing substations. Rooftop solar can also be delivered quickly and at a relatively low cost while avoiding the need for additional transmission and distribution infrastructure. As highlighted by the recent installation of 20 MW of rooftop solar on over 30 hospitals in Sindh under a World Bank-financed project, rooftop solar can be delivered quickly (in 6-12 months) and at a relatively low cost (as low as \$530 per installed kilowatt of capacity), while avoiding the need for additional transmission and distribution infrastructure.<sup>87</sup> This provides an opportunity for RE to scale up quickly with the right policy incentives. This is also reflected in the Solar Fast Track Guidelines, which emphasizes utilizing available sub-station transmission capacity and substituting existing thermal power projects (most likely gas and oil according to IGCEP 2022-31) through solar projects.

**Pakistan is developing regional grids to enhance the utilization of local renewable resources**, i.e., NEPRA has granted Licenses to the Sindh Government and the Khyber Pakhtunkhwa Government in 2019 and 2021 respectively<sup>88</sup>, Punjab Government is also working on establishing its own transmission company. Although the overall progress is slow, the potentially extending grid system at the local level will make it more feasible and reasonable to incorporate provincially scattered renewables into the grid.

### Legal/Regulation

**The green financing landscape and regulation are evolving in Pakistan.** In 2017, the State Bank of Pakistan introduced Green Banking Guidelines with the objective of encouraging the commercial banking sector to prioritize green finance. This was followed by the issuance of Pakistan's first green bond by the Water and Power Development Authority in May 2021.<sup>89</sup> Subsequently, in September 2021, the Securities Exchange Commission of Pakistan (SECP)

---

<sup>87</sup> Oliver Knight, "Expanding Solar and Wind in Pakistan Requires Decisive Action," World Bank Blogs, May 2022, <https://blogs.worldbank.org/endpovertyinsouthasia/expanding-solar-and-wind-pakistan-requires-decisive-action>.

<sup>88</sup> Ibid.

<sup>89</sup> Web Desk, "Pakistan's WAPDA Raises USD 500m in Country's First Green Bond Issuance," Business Recorder, 28 May 2021, <https://www.brecorder.com/news/40095710>.



approved national guidelines for green bonds.<sup>90</sup> These initial advancements in the green finance market will play a pivotal role in facilitating broader initiatives.

Given the limited fiscal capacity of Pakistan's public sector and the lack of incentives for the private sector, the emergence of supportive green finance regulations is crucial. These regulations will help streamline and maximize the utilization of local private finance in targeted green sectors, with renewable energy serving as a foundational pillar.

#### **4. Recommendations to accelerate Pakistan's green energy transition**

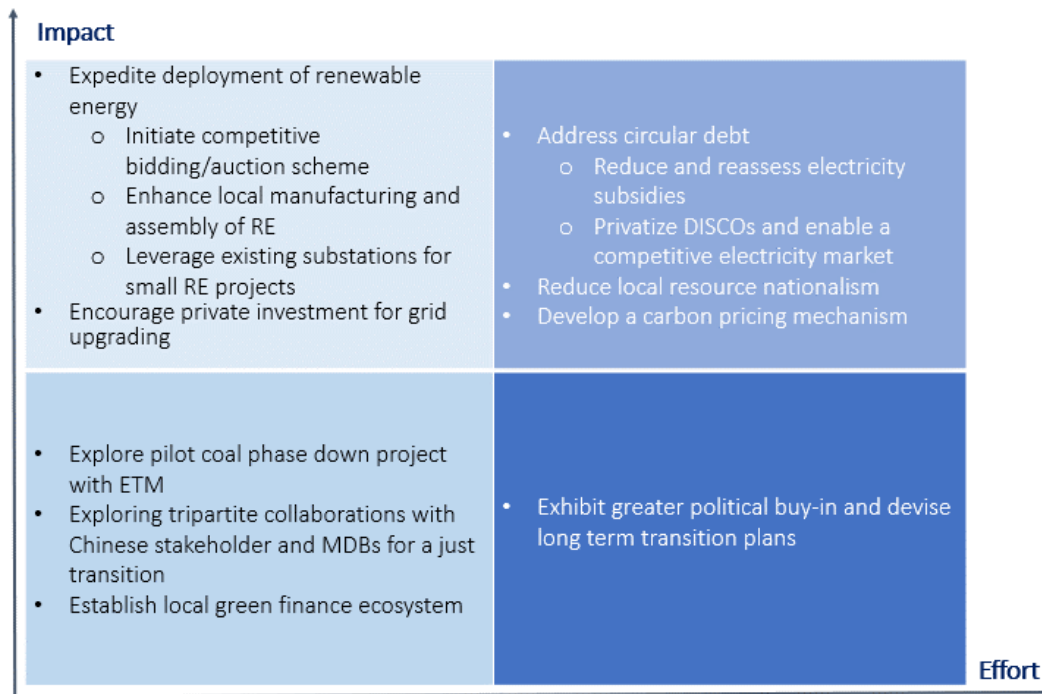
In navigating the complex landscape of the coal phase down in Pakistan, it is essential to strike a balance between addressing immediate energy needs and pursuing sustainable long-term green and climate-friendly energy solutions.

Although it will be challenging to reduce current coal reliance in Pakistan in the short term, there is a possibility to reduce and terminate reliance on coal in the medium and long-term. Alternatively, if Pakistan continues the expansion of coal, it risks missing out on cheaper energy generation options while not reducing greenhouse gas emissions. Therefore, it is imperative to prioritize the addition of sufficient capacity for a non-fossil fuel-based generation to facilitate the eventual transition away from inefficient and costly conventional generation methods and initiate the practical discussion on the phase-down of coal.

Based on the above analysis of Pakistan's political economy, the following recommendations are proposed to accelerate Pakistan's green energy transition:

---

<sup>90</sup> Securities & Exchange Commission of Pakistan, Guidelines – Issuance of Green Bonds," 2021. <https://www.secp.gov.pk/document/green-bonds-guidelines/?wpdmdl=42537&refresh=62407a452ca7b1648392773>



**Figure 11 Heat map for recommendations to accelerate Pakistan's green energy transition**  
(Source: compiled by the author (s))

***In the short term (over the next 2-5 years)***, Pakistan could facilitate green energy transition through fully leveraging existing accelerators. This includes:

**Recommendation 1. Expedite the deployment of renewable energy to diversify power mix, restrain the additional coal-fired power plants, and pave the way for coal power to assume a diminished role.** The integration of mature renewable energy sources in the power portfolio will effectively mitigate the ongoing dependence on coal and significantly curtail the imperative for future coal-fired power generation. To expedite this process, policymakers must prioritize the implementation of already planned reforms and enabling measures, while capitalizing on readily available low-hanging fruit opportunities.

**Priority 1. Initiate the competitive bidding scheme.** The successful execution of a long-debated and carefully crafted competitive bidding system will play a pivotal role in driving the expansion of renewable energy sources. Timely implementation of this system by the AEDB is crucial to instill assurance and optimism among potential investors in the industry. It is also important to incorporate well-defined policies and attractive fiscal incentives into the auction framework. Moreover, maintaining transparency and demonstrating consideration for local developers will be essential in generating substantial interest from domestic investors in this undertaking.

**Priority 2. Enhance local manufacturing and assembly ability of renewable technology.** Despite manufacture of some of the specialized equipment are unlikely to be cost effective in Pakistan without strong policy support, local manufacturing can be levered for standardized equipment, including support structures for solar PV and towers for wind



energy.<sup>91</sup> This will reduce Pakistan’s reliance on imported parts of renewable energy technologies and avoid international price fluctuations. Additionally, scaling-up local assembly of solar panels is also an option, which is a relatively easy-learning skill for local workers. Overall, this can be achieved by:

- **Establishing a capacity building scheme to quickly scale-up targeted capacity building** by cooperating with research institutions, and industry associations and fostering joint venture partners with Chinese entities that lead the renewable technology industry and are familiar with Pakistan’s local conditions;
- **Providing effective policy support to increase competitiveness in the local manufacturing sector.** This can be achieved through accelerating the launch of the 10-year policy incentives for boosting local renewable manufacture (mentioned in “Political factors” of the Enablers section). In addition to affordable and accessible financing options and tax exemptions, the government could provide special provisions for industrial lands in China–Pakistan Economic Corridor (CPEC) for investors to set up solar or wind manufacturing facilities. This could easily be integrated into the specialized economic zones (SEZs) initiative under the CPEC that is already under development.

**Priority 3. Accelerate renewable installations through existing substations** (require less cost for transmission connection and therefore more economically viable).<sup>92</sup> According to World Bank study (introduced in “Technological factors” in the previous chapter), there is ample substation capacity to reach the interim target of 20 percent renewable capacity by 2025. These substation projects will be mostly small in size and thus more feasible for local developers. For large-scale solar and wind parks, substantial public and private sector investment will be needed for the infrastructure, which could be brought on by seeking cooperation with Chinese companies.

**Recommendation 2. Encourage private sector investment in upgrading grid infrastructure to catalyze energy transition.** An upgraded and expanded electric grid will be the backbone of the energy transition. Pakistan should ensure that the transmission investments required to integrate renewable sources into the grid are realized and carefully coordinated with generation-expansion plans. By addressing grid system issues and ensuring successful transmission, the full capacity of existing generation facilities can be leveraged. This, in turn, provides an opportunity to retire excess coal plants and optimize the power generation mix. Simultaneously, grid system reconfiguration and modernization offer the potential to ensure compatibility with the evolving renewable energy landscape. Renewable dominated Mini and micro-grids (MGs) that provide a favorable option for electrification of rural areas (which are

---

<sup>91</sup> “Variable Renewable Energy Competitive Bidding Study,” World Bank, April 2022, <https://openknowledge.worldbank.org/entities/publication/da13d56c-731a-5864-b5b2-73086ebd44ea>.

<sup>92</sup> “Variable Renewable Energy Locational Study.”



home to more than 65% of the country's population<sup>93</sup>) can also facilitate a greater uptake of renewable energy, with potential support from subsidized financing.

**Recommendation 3. Leverage the Energy Transition Mechanism (ETM) to explore a piloting project for the flexibilization of the operation coal units and its potential phase down.** The country's total installed capacity currently exceeds peak demand, creating an opportunity to consider retiring underutilized coal plants in areas where overcapacity exists. Such retirements can be carried out without compromising energy security. For instance, the Sahiwal coal power project, is under ETM discussions for potential early retirement, primarily due to a lack of demand and its adverse effects on local farming. Starting operation in 2017 (currently the earliest China-backed one put into operation), the Sahiwal plant could explore a more flexible status and reduce its operation hours when renewable power takes a more prominent role in the short-term and start considering retirement in 2027 when the debt has been paid back. A more detailed project-level analysis would be needed to develop a roadmap and proper financial models. The pilot stands to establish good precedents that can enhance the prospects of adopting similar approaches for other fossil fuel assets.

**Recommendation 4. Exploring tripartite collaborations with Chinese stakeholder and Multilateral Development Banks for concessional and innovative financing tools that could provide more opportunities for a just transition.** Innovative financial instruments, including: i) Refinancing tools: ratepayer-backed securitization, asset-backed securitization, which can help restructure debt and provide financial relief; ii) Carbon financing tools: carbon avoidance bonus, which can generate revenue from selling carbon credits based on early coal retirement ; iii) Debt swaps: debt-for-green energy swaps, debt-for-climate-swaps, etc., which could alleviate Pakistan's debt burdens in exchange for climate mitigation activities such as repurposing coal plants to renewables (with energy storage). These mechanisms, if well designed, can be an attractive opportunity to buyout and retire the existing coal plants early and generate revenues for the new owners, while also providing just transition mechanisms for affected workers and communities. Given Chinese stakeholders important role in Pakistan's power sector, their participants in these transition options through tripartite cooperation will be necessary. **Box 5** shares some potential action points for Chinese stakeholders.

#### **Box 5 Recommendations for Chinese Stakeholders**

Chinese state-owned enterprises and investors, as key facilitators of Pakistan's coal projects, wield substantial influence and are susceptible to the repercussions arising from the outcomes of these coal IPPs. As these coal IPPs face defaults and competitiveness challenges, China needs to take measures to address their investments, manage future stranding risks, and seize new investment opportunities in renewable energy within the framework of the China-Pakistan Economic Corridor (CPEC). In this regard, China could consider the following actions:

---

<sup>93</sup> Yongrong Xin et al., "Analyzing Pakistan's Renewable Energy Potential: A Review of the Country's Energy Policy, Its Challenges, and Recommendations," *Sustainability* 14 (December 2, 2022): 16123, <https://doi.org/10.3390/su142316123>.



#### For Chinese policymakers:

- Begin considering and engaging the phase-down of overseas coal to align with climate pledges, particularly in countries where clear coal exit policies have been announced (i.e., Vietnam) and where the coal power industry heavily depends on China (i.e., Pakistan).
- Adhere strictly to the "no new coal policy" overseas, including suspending projects that have pending financing or not entering the construction phase, to prevent further carbon lock-in and reduce the risks of stranded assets.
- Collaborate on coal transition policy: Chinese stakeholders can actively collaborate with Pakistani counterparts in shaping policies related to the coal phase-down process. Encourages coal plant acquisitions by different entities.
- Leverage China's leading role in developing transition finance: Incorporate early coal retirement into broader transition finance scope; Use transition finance tools such as Sustainability-Linked Bonds (SLBs) to lower borrowing costs for coal transition; Create and diversify innovative financing tools to support coal-to-renewable transition; Establish coal transition fund to redirect refinancing cash flows to convert coal generating capacity into new clean energy facilities.
- Embrace a greener phase of cooperation within the China-Pakistan Economic Corridor (CPEC): As China continues to promote greener engagement in initiatives like the Belt and Road Initiative (BRI) and CPEC, there is significant potential for China and Pakistan to embark on a greener phase of cooperation, given the vast renewable energy market and untapped potential in Pakistan. This can facilitate the diffusion of cleaner energy technologies throughout the developing world.

#### For Chinese investors and financiers:

- Chinese owners of Pakistan coal IPPs could be open to renegotiating PPAs (PPA restructure/extension for coal-to-renewable displacement) and explore innovative coal transition financing mechanisms (i.e., refinance and reinvest in repurposing coal to renewable power generation that partially utilizes existing facilities) to avoid stranded asset risk, reduce debt burden, and redirect funds into renewables that have more sustainable returns.
- Chinese policy banks such as China Development Bank (CDB) and Export-Import Bank of China (CHEXIM) and commercial banks such as the Industrial and Commercial Bank of China and Bank of China, who have financed most of the coal capacity, could mitigate their financial losses by raising new financing to facilitate coal decommissioning and repurposing to renewable energy, and explore tripartite collaboration with other MDBs to leverage more concessional and private finance.
- Chinese insurance banks, i.e., Sinosure, which is exposed to the credit default risk of Pakistan's coal IPPs, could collaborate with development finance institutions such as





AIIB to design new credit guarantees and credit enhancement program for potential coal-to-renewable transition.

- Provide support for capacity building and knowledge sharing: Chinese companies can offer capacity-building programs and knowledge-sharing initiatives to support Pakistan's energy sector. This can include workshops and seminars on coal-to-renewable transition, policy implementation, and renewable technologies.

**Recommendation 5. Establish local green finance ecosystem to support greater uptake of renewable energy and transition away from emission-intensified power sources.** Tools like green bonds for renewable investments and transition bonds for decommissioning high carbon-emitting assets could be further leveraged in Pakistan for green energy transition. Pakistan's nascent rise of Green Banking indicates a higher margin for improvement on this front. To support these efforts, it is essential to gradually build up a domestic green finance market, strengthen the Green Banking Guidelines of the State Bank of Pakistan, enabling them to effectively guide private banks towards prioritizing lending for renewable projects. In the meanwhile, restarting of the SBP renewable financing scheme would be one of the most significant enablers for renewable development in the country.

***In the longer term (over the next 7-10 years),*** Pakistan needs to foster reforms at scale to address barriers and deeply rooted problems embedded in its energy sector, formulate market mechanisms and price dynamics, and remove local level resource nationalism in the power sector that crowds out coal usage, as well as pave the way for further expansion of renewables.

**Recommendation 6. Drive necessary reforms in the power sector to reverse the course of circular debt and restore a healthy energy economics.** Circular debt looms large as the pervasive challenge within Pakistan's energy sector. To rectify this issue, measures must transcend simply lowering generation costs through reduced fuel imports and instead focus on tackling root causes and instigating deep changes in the entrenched power structure. Two preliminary changes can help:

**In the shorter period, Pakistan should take steps to reduce and reassess electricity subsidies.** The Tariff Differential Subsidy (TDS), which accounted for over a quarter of the entire power sector subsidy in 2023<sup>94</sup>, has historically been provided to DISCOs to compensate for their operational losses. However, this broad-based subsidy does not effectively incentivize loss-making state-owned DISCOs to improve their performance. To alleviate the burden of circular debt and mitigate financial hardships in the country, it is crucial to consider eliminating TDS and replacing it with performance-based or targeted subsidies. This shift will facilitate the improvement of DISCOs' financial standing. If the government intends to provide relief to low-income consumers, a more effective

---

<sup>94</sup> Khalid Hasnain, "Rs151 Billion 'Subsidy' to Shield Power Users from Line Losses," DAWN.COM, June 2023, <https://www.dawn.com/news/1759490>.



approach would be to directly subsidize consumers instead of channeling the subsidies through DISCOs.

**In the longer term, it is imperative to catalyze the long-discussed privatization of DISCOs and enable a competitive electricity market.** The government needs to accelerate the pace for structural reforms to improve accountability, enhance efficiency, and form healthy competitions in the electricity sector, starting with privatization/provincialization of DISCOs. This requires the central government to play a key role in harmonizing conflict of interests and nurturing broad political consensus. Central government should promptly engage in collaboration with local governments and the relevant DISCOs, supported by the establishment of a dedicated task force for supervision and coordination. In conjunction with the privatization process, a competitive market structure (both competitive bidding and trading) should be in place to bring about competitiveness and shift away from a cost-plus model (with ensured margins) for all the generation and distribution companies, which can then provide the necessary impetus for the to minimize both technical losses (i.e., high transmission and distribution losses for DISCOs), and non-technical losses (i.e., inefficiencies in management, corruption, and low recovery rate for DISCOs), reducing power sector distortions in the long term.

**Recommendation 7. Repurpose coal subsidies, diversify economics, and improve transparency and accountability for coal rich provinces to move away from resource nationalism.** First is repurposing existing coal subsidies to utilize freed-up fiscal resources to remove barriers to renewable investment and value chain improvements. Reducing the regulatory incentives favoring coal investments, and in particular, removing implicit and explicit coal subsidies, could effectively discourage additional private coal investments and potentially redirect financial flows towards renewables.

Second is economic diversification. The federal government should encourage local economies to diversify beyond coal by promoting the development of alternative energies, i.e., renewables. In coal-rich provinces such as Sindh, it is usually the case that the region also has rich renewable resources. This can also be a pillar industry baked into future revenues with reduced stranded risks as renewables are becoming cost-competitive at a fast pace. Provincial government should provide support, incentives, and resources for the growth of renewable energy and technology sectors. Creating and supporting small-scale livelihood opportunities in surrounding communities and nurturing new economic pathways for coal mining regions through new investments and support for incubators, accelerators, and early-stage ventures.

Third is through higher transparency and Accountability: Advocate for greater transparency in the coal industry, particularly regarding the allocation of resources, revenue distribution, and environmental impacts. Implement mechanisms for accountability to ensure that revenues from the coal industry are managed and reinvested for the benefit of local communities and sustainable development.

**Recommendation 8. Develop carbon pricing mechanism to rationalize implicit cost for coal power generation.** Introducing a carbon pricing system, such as a carbon tax or emissions trading, would impose additional financial costs on coal plants, discouraging further



investments in coal assets and diminishing their priority in the merit order. This will subject to further support from experienced countries and organizations.

**Recommendation 9. Demonstrate stronger political buy-in and devise long-term transition plans to effectively leverage public and private financing support.** By showcasing a firm dedication to a green-energy future and the goal to wean away from coal, Pakistan can send positive signals for public and private investors in the international community, instilling confidence and credibility for their participation in Pakistan’s green transition. To achieve this, a long-term energy transition plan should be developed based on the existing energy expansion plan (IGCEP 2022-31) and by converting Pakistan's Nationally Determined Contributions (NDCs) 2021 into a clear trajectory with specific timeline. This will reduce uncertainty and facilitate better decision-making for potential investors. The plan could consider a potential phase-out of coal between 2030-2035. At that stage, it is expected that the majority of existing coal power projects will have completed loan repayments; the cost of energy storage, carbon capture and storage (CCS) etc. will become more economically viable, and financing mechanisms are likely to be more mature, thereby enabling greater flexibility and choice in the utilization of coal power. Additionally, a long-term planning framework will assist policymakers in identifying the reskilling needs for vulnerable groups who are presently reliant on the coal-based economy, enabling a managed transition that minimizes social disruption and an equitable process for all stakeholders involved.





## Annex

### Annex I Decarbonization Policy Overview

| Policy   | Month-Year of issuance    | Issuing body/authority  | Targets  |
|--|---------------------------|---|--|
| <b>Policy for Development of Renewable Energy for Power Generation (RE 2006)</b> | 2006<br>(Expired in 2018) | Government of Pakistan, Alternate Energy Development Board (AEDB) | Relief of customs duty or sale tax for machinery import for RE projects. No income tax on RE projects' earnings is charged. Easy repatriation of equity and dividends. Raising local and foreign finance is allowed.   |
| <b>National Climate Change Policy 2012</b>                                       | 2012                      | Ministry of Climate Change, Government of Pakistan                | Encourage the development and promotion of hydropower generation. Plan the necessary expansion of nuclear power. Mandate all new coal-fired power plants to perform at a high-efficiency level. Promote and provide incentives for increasing low-carbon fossil fuels.   |
| <b>National Power Policy 2013</b>  | 2013                      | The Ministry of Water and Power of the Government of Pakistan     | Manage inefficiency, power theft, and high cost of generation problems. Decrease transmission and distribution losses from ~23-25% to ~16% by 2017. Introduce competitive bidding to lower the cost of electricity. Phase out subsidies. Rationalize tariffs, Shift to low-cost fuels (i.e., local coal and hydro projects). Privatize GENCOs. |
| <b>Feed-in Tariff</b>  | January 2015              | NEPRA   | Promote solar and wind. The scheme provided remuneration levels for solar projects for 25 years for projects up to 10MW.   |
| <b>Net metering</b>  | September 2015            | NEPRA   | Allows any grid consumer to sell electricity back to the grid up to 1 MW, backed by a supporting tariff scheme.  |
| <b>Power Generation Policy 2015</b>  | 2015                      | Government of Pakistan  | The development of hydropower projects is the top priority. Offers profitable business opportunities and the Government urges local and international investors to participate in the development of power projects.   |
| <b>Pakistan's Nationally Determined contributions</b>                            | 2016                      | Government of Pakistan  | Decreasing emissions by 5% on 2012 levels by 2030.   |



|   |               |  |  |
|---|---------------|--|--|
| <b>Alternative and Renewable Energy Policy 2019</b>                 | August 2020   | Government of Pakistan                             | To boost the share of electricity generated from renewable sources (excluding hydro) from around 5% at present to: <ul style="list-style-type: none"> <li>• at least 20% by 2025 and</li> <li>• 30% by 2030</li> </ul> Known as the 20X25 and 30X30 targets.   |
| <b>Coal moratorium</b>  | December 2020 | Pakistan PM Imran Khan                             | Pakistan will no longer approve any new imported coal-based power plants; Two imported coal projects, Muzaffargarh and Rahim Yar Khan, amounting to 2600 MW were shelved, which have recently been replaced with 3700 MW of new Hydro projects.  |
| <b>National Electricity Policy 2021</b>                             | 2021          | Government of Pakistan                             | Sustainable development of the power market (increased competition)<br>Efficient generation mix with <u>a high share of indigenous clean energy resources</u><br><u>Privatization of state-owned enterprises (especially the DISCOs)</u><br>Reforms in the generation, transmission, and distribution of electricity<br>Broader in scope than 2015 one but less specific about the incentives and protections offered. |
| <b>Pakistan's Updated Nationally Determined Contributions (NDC)</b> | October 2021  | Government of Pakistan                             | Renewable energy: by 2030, 60% of all energy produced in the country will be generated from renewable energy resources (including hydro)<br>Coal: coal moratorium (see above)<br>The updated NDC also indicates that an additional estimated US\$ 13 billion will be required to replace the production of the coal power plants with solar.   |
| <b>Updated National Climate Change Policy 2021</b>                  | October 2021  | Ministry of Climate Change, Government of Pakistan | Policy incentives proposed to ensure a low-carbon transition.  |
| <b>Fast Track Solar PV Initiatives 2022</b>                         | October 2022  | Government of Pakistan                             | Target: produce 10,000 megawatts (MW) of electricity through solar energy projects through i) substitution of expensive imported fossil fuels with solar PV ii) Solar PV generation on 11 VK feeders, and iii) solarization of public buildings  |



## Annex II Coal Projects Overview

| Name of the project                             | Capacity (MW) | Technology     | Coal type and origin | Financing (US\$) million |        | Return of equity | Tariff (US\$) | Plant owner  | Operating year | Latest Status                     |
|---|---------------|----------------|----------------------|--------------------------|--------|------------------|---------------|--|----------------|-----------------------------------|
|   |               |                |                      | Debt                     | Equity |                  |               |  |                |                                   |
| <b>1. Sahiwal Coal-fired Power Plant</b>        | 1320          | Super-critical | Import               | 1,420.69                 | 361.63 | 27.20%           | -             | Huaneng Shandong Power Co Ltd, Shandong Ruyi Group | 2017           | Operating                         |
| <b>2. Port Qasim Coal Power Project Karachi</b> | 1320          | Super-critical | Import               | 1,555                    | 427.44 | 27.20%           | .07859        | Port Qasim Electric Power Company                  | 2018           | Operating                         |
| <b>3. China Hub Coal Power Project</b>          | 1320          | Super-critical | Import               | 1,361.69                 | 406.74 | 27.20%           | .07859        | China Power Hub Generation Company                 | 2019           | Operating                         |
| <b>4. Engro Thar Coal Power Project</b>         | 660           | Sub-critical   | Thar                 | 373.3                    | -      | 30.65%           | .0542         | Thar Power Company                                 | 2019           | Operating                         |
| <b>5. Thar TEL Coal Power Project</b>           | 330           | Sub-critical   | Thar                 | 373.3                    | 130    | 30.65%           | .0542         | Hub Power Company (Hubco) (60%)                    | 2022           | Operating                         |
| <b>6. Thal Nova Thar Coal Power Project</b>     | 330           | Sub-critical   | Thar                 | 373.3                    | -      | 30.65%           | .0542         | Hub Power Company (Hubco) (37%)                    | 2022           | Operating (commissioned Dec 2022) |
| <b>7. SSRL (Shanghai electric) Thar</b>         | 1320          | Sub-critical   | Thar                 | 1,434                    | 478    | 34.49%           | .0568         | Global Mining China (GMC) (55%)                    | 2023           | Operating                         |
| <b>8. Coal-Fired Power Project at Gwadar</b>    | 300           | Super-critical | Import               | 433.88                   | 108.47 | 17%              | .084935       | China Communications Construction Company (75.5%)  | 2023           | Under construction                |



## References

- Afia Malik. "Circular Debt— an Unfortunate Misnomer." ISLAMABAD: PAKISTAN INSTITUTE OF DEVELOPMENT ECONOMICS, 2020.  
<https://www.pide.org.pk/pdf/Working%20Paper/WorkingPaper-2020-20.pdf>.
- Alao, Olakunle, and Paul Cuffe. "Structuring Special Purpose Vehicles for Financing Renewable Generators on a Blockchain Marketplace." *IEEE Transactions on Industry Applications* 58, no. 2 (March 2022): 1478–89. <https://doi.org/10.1109/TIA.2021.3135252>.
- Ali, Dawn com | Agencies | Sana. "Pakistanis Answer Call to March against Climate Change in Vast Global Protest." DAWN.COM, September 2019. <https://www.dawn.com/news/1506308>.
- Asian Development Bank (ADB). "Proposed Programmatic Approach and Policy- Based Loan for Subprogram 2 Islamic Republic of Pakistan: Energy Sector Reforms and Financial Sustainability - Circular Debt Impact on Power Sector Investment Supplementary Linked Document," March 2021. <https://www.adb.org/projects/documents/pak-53165-002-rrp>.
- BBC News. "COP27: Sharp Rise in Fossil Fuel Industry Delegates at Climate Summit." November 10, 2022, sec. Science & Environment. <https://www.bbc.com/news/science-environment-63571610>.
- Bhandary, Rishikesh Ram, and Kelly Sims Gallagher. "What Drives Pakistan's Coal-Fired Power Plant Construction Boom? Understanding the China-Pakistan Economic Corridor's Energy Portfolio." *World Development Perspectives* 25 (March 1, 2022): 100396.  
<https://doi.org/10.1016/j.wdp.2022.100396>.
- Bureau, BW Online. "Pak Forex Reserves Fall To Lowest Since 2019 Due To Increased Debt: Report." BW Businessworld. Accessed March 27, 2023.  
<http://businessworld.inhttps://www.businessworld.in/article/Pak-Forex-Reserves-Fall-To-Lowest-Since-2019-Due-To-Increased-Debt-Report-/13-08-2022-441930>.
- Centre for Research on Energy and Clean Air. "Air Quality, Health and Toxics Impacts of the Proposed Coal Mining and Power Cluster in Thar, Pakistan," May 29, 2020.  
<https://energyandcleanair.org/publication/air-quality-health-and-toxics-impacts-of-the-proposed-coal-mining-and-power-cluster-in-thar-pakistan/>.
- "Climate Change Triggers Widespread Pakistan Migration," August 2019.  
<https://www.aa.com.tr/en/environment/climate-change-triggers-widespread-pakistan-migration/1667231>.
- Daily Times. "Pakistani Activists Announce Launch of Anti-Coal Alliance," December 6, 2018.  
<https://dailytimes.com.pk/330716/pakistani-activists-announce-launch-of-anti-coal-alliance/>.
- DAWN. "Rural Electrification and Poverty Decline," 2021.  
<https://www.dawn.com/news/1660159>.
- Dawn.com. "7 Facts about Pakistan's Energy Crisis – and How You Can Help End It." DAWN.COM, 2016. <http://www.dawn.com/news/1275116>.





Dispatch, Peoples. "Coal Miners Become Casualties in Pakistan." *Peoples Dispatch* (blog), February 3, 2020. <https://peoplesdispatch.org/2020/02/03/coal-miners-become-casualties-in-pakistan/>.

Dou, Shiquan, Deyi Xu, Yongguang Zhu, and Rodney Keenan. "Critical Mineral Sustainable Supply: Challenges and Governance." *Futures* 146 (February 1, 2023): 103101. <https://doi.org/10.1016/j.futures.2023.103101>.

Ferris, Nick. "Why Not All Coal Phase-Outs Are Created Equal." *Energy Monitor* (blog), January 12, 2022. <https://www.energymonitor.ai/policy/market-design/why-not-all-coal-phase-outs-are-created-equal/>.

Fitch Ratings. "Pakistan Credit Ratings," n.d. <https://www.fitchratings.com/pakistan-94558490>.

Ghafoor, Abdul, Tanzeel ur Rehman, Anjum Munir, Manzoor Ahmad, and Muhammad Iqbal. "Current Status and Overview of Renewable Energy Potential in Pakistan for Continuous Energy Sustainability." *Renewable and Sustainable Energy Reviews* 60 (July 1, 2016): 1332–42. <https://doi.org/10.1016/j.rser.2016.03.020>.

Ghumman, Mushtaq. "Govt May Exempt Solar Equipment from All Taxes." Brecorder, 06:15:17+05:00. <https://www.brecorder.com/news/40222770>.

Global Development Policy Center. "Growing Momentum for Coal Phase-Down in the Global South: Lessons from Pakistan," February 2022. <https://www.bu.edu/gdp/2022/02/15/growing-momentum-for-coal-phase-down-in-the-global-south-lessons-from-pakistan/>.

Habib, Sheeba, Kanwar Muhammad Javed Iqbal, Sarah Amir, Dr Naseer, Nadia Akhtar, Wajih Ur Rehman, and Muhammad Khan. "Renewable Energy Potential in Pakistan and Barriers to Its Development for Overcoming Power Crisis." *Journal of Contemporary Issues in Business and Government* 27 (February 15, 2021): 6836–46. <https://doi.org/10.47750/cibg.2021.27.02.653>.

Hanea Isaad. "Gwadar Coal Power Plant: One Step Forward, Two Steps Back," March 2023. <https://thediomat.com/2023/03/gwadar-coal-power-plant-one-step-forward-two-steps-back/>.

Hasnain, Khalid. "Rs151 Billion 'Subsidy' to Shield Power Users from Line Losses." DAWN.COM, June 2023. <https://www.dawn.com/news/1759490>.

HBL. "HBL Launches Its First Impact And Sustainability Report," June 2022. <https://www.hbl.com/news-and-media/hbl-launches-its-first-impact-and-sustainability-report>.

International Institute for Sustainable Development. "Background Note on Fossil Fuel Subsidy Reform." Accessed April 2, 2023. <https://www.iisd.org/publications/brief/background-note-fossil-fuel-subsidy-reform>.

IQAir. "World's Most Polluted Countries in 2022 - PM2.5 Ranking," n.d. <https://www.iqair.com/world-most-polluted-countries>.

Isaad, Hanea. "Evaluating the Emissions Impact and Economic Feasibility of Coal Power Plants under the China Pakistan Economic Corridor in Pakistan," n.d.

Jakob, Michael, Christian Flachslund, Jan Christoph Steckel, and Johannes Urpelainen. "Actors, Objectives, Context: A Framework of the Political Economy of Energy and Climate Policy



Applied to India, Indonesia, and Vietnam.” *Energy Research & Social Science* 70 (December 1, 2020): 101775. <https://doi.org/10.1016/j.erss.2020.101775>.

“Massive Gas Deficit in Upcoming Winter: Centre Endeavours to Convince Federating Units on WACOG,” September 2020. <https://www.thenews.com.pk/print/711804-massive-gas-deficit-in-upcoming-winter-centre-endeavours-to-convince-federating-units-on-wacog>.

Mir, Kaleem Anwar, Pallav Purohit, Sylvain Cail, and Seungdo Kim. “Co-Benefits of Air Pollution Control and Climate Change Mitigation Strategies in Pakistan.” *Environmental Science & Policy* 133 (July 1, 2022): 31–43. <https://doi.org/10.1016/j.envsci.2022.03.008>.

National Transmission and Despatch Company (NTDC). “Indicative Generation Capacity Expansion Plan (IGCEP) 2022-31,” September 2022. <https://nepra.org.pk/licensing/Licences/IGCEP/IGCEP%202022-31%20.pdf>.

Nedopil, Christoph. “The Potential for Early Coal Plant Retirement,” n.d., 8.

Nedopil et al. “Potential for Early Coal Retirement,” 2022. [https://greenfdc.org/wp-content/uploads/2022/07/Nedopil-et-al-2022\\_Potential-for-early-coal-retirement.pdf](https://greenfdc.org/wp-content/uploads/2022/07/Nedopil-et-al-2022_Potential-for-early-coal-retirement.pdf).

NEPRA. “Determination of the Authority in the Matter of Thar Coal Upfront Tariff,” July 2014. <https://nepra.org.pk/tariff/Tariff/Upfront/COAL%20UpFront%20Tariff.PDF>.

“Notification in Respect of NEPRA, Upfront Tariff for the Project of Imported Local/ Coal,” September 2013. <https://nepra.org.pk/tariff/Tariff/Upfront/Notification%20upfront%20Tariff%20imported-local%20coal.PDF>.

Oliver Knight. “Expanding Solar and Wind in Pakistan Requires Decisive Action.” World Bank Blogs, May 2022. <https://blogs.worldbank.org/endpovertyinsouthasia/expanding-solar-and-wind-pakistan-requires-decisive-action>.

“Pakistan Inflation Rate - February 2023 Data - 1957-2022 Historical - March Forecast.” Accessed March 27, 2023. <https://tradingeconomics.com/pakistan/inflation-cpi>.

“Pakistan Nationally Determined Contributions 2021,” October 2021. <https://unfccc.int/sites/default/files/NDC/2022-06/Pakistan%20Updated%20NDC%202021.pdf>.

Paksolar Renewable Energy (Pvt) Ltd. “Solar Panels Price in Pakistan,” July 28, 2022. <https://www.paksolarservices.com/solar-panel-in-pakistan.html>.

Peshimam, Gibran Naiyyar. “Exclusive: Pakistan Plans to Quadruple Domestic Coal-Fired Power, Move Away from Gas.” *Reuters*, February 14, 2023, sec. Energy. <https://www.reuters.com/business/energy/pakistan-plans-quadruple-domestic-coal-fired-power-move-away-gas-2023-02-13/>.

Peshimam, Gibran Naiyyar, and Asif Shahzad. “Pakistan’s New Govt Decides Not to Roll Back Fuel, Power Subsidies.” *Reuters*, April 15, 2022, sec. Asia Pacific. <https://www.reuters.com/world/asia-pacific/pakistans-new-govt-may-have-roll-back-fuel-power-subsidies-2022-04-14/>.

ProPakistani. “China Is Concerned Over Pending \$1.5 Billion Payments,” March 15, 2023. <https://propakistani.pk/2023/03/15/china-is-concerned-over-pending-1-5-billion-payments/>.



Qudrat-Ullah, Hassan. "A Review and Analysis of Renewable Energy Policies and CO2 Emissions of Pakistan." *Energy* 238 (January 2022): 121849.

<https://doi.org/10.1016/j.energy.2021.121849>.

Report, Recorder. "SBP Extends Financing Scheme for Renewable Energy Projects." Brecorder, June 19, 2022. <https://www.brecorder.com/news/40181005>.

"Resisting Coal in Pakistan's Thar Desert," September 2019.

<https://theecologist.org/2019/sep/30/resisting-coal-pakistans-thar-desert>.

Samad, Ghulam, Naseem Faraz, and Haroon S. Awan. "Tariff Differential Subsidy (TDS) Effects and Welfare Gains in Pakistan." *Indian Economic Review* 57, no. 2 (December 1, 2022): 373–92.

<https://doi.org/10.1007/s41775-022-00150-z>.

Simon Nicholas. "China and Pakistan's 'No More Coal Power' Pledges Don't Hold up to Scrutiny," 2022. <https://ieefa.org/resources/ieefa-china-and-pakistans-no-more-coal-power-pledges-dont-hold-scrutiny>.

"Sindh Engro Coal Mining Company (SECMC)," n.d. <https://www.secmc.com.pk/>.

Staff, ProPK. "Implementation of CTBCM Model to Increase Accountability in the Power Sector." *ProPakistani* (blog), March 3, 2022.

<https://propakistani.pk/2022/03/03/implementation-of-ctbcm-model-to-increase-accountability-in-the-power-sector/>.

State Bank of Pakistan. "SBP Financing Scheme for Renewable Energy." Accessed December 21, 2022. <https://www.sbp.org.pk/Incen-others/Rene.asp>.

"State of Industry Report 2022.Pdf." Accessed December 14, 2022.

<https://www.nepra.org.pk/publications/State%20of%20Industry%20Reports/State%20of%20Industry%20Report%202022.pdf>.

Tauhidi, Amna, and Usman W. Chohan. "The Conundrum of Circular Debt." *SSRN Electronic Journal*, 2020. <https://doi.org/10.2139/ssrn.3513225>.

The Express Tribune. "ADB Announces \$0.3m for Pakistan to Phase out Coal Plants," November 5, 2021. <https://tribune.com.pk/story/2327982/adb-announces-03m-for-pakistan-to-phase-out-coal-plants>.

The Express Tribune. "Circular Debt Soars Past Rs4,177bn," December 14, 2022.

<https://tribune.com.pk/story/2391025/circular-debt-soars-past-rs4177bn>.

The Express Tribune. "Fuel Prices Raised Again to Unlock IMF Funding," June 15, 2022.

<https://tribune.com.pk/story/2361724/fuel-prices-raised-again-to-unlock-imf-funding>.

The Express Tribune. "Lobbies at Work to Turn Energy Mix in Their Favour," April 24, 2018.

<https://tribune.com.pk/story/1693962/lobbies-work-turn-energy-mix-favour>.

The Express Tribune. "Pakistan to Seek Debt Restructuring of CPEC Power Projects," May 1, 2021. <https://tribune.com.pk/story/2297655/pakistan-to-seek-debt-restructuring-of-cpec-power-projects>.

The International News. "Revised power tariff: All 47 IPPs sign Master Agreements," March 2021. <https://www.thenews.com.pk/print/784220-revised-power-tariff-all-47-ipp-sign-master-agreements>.



The International News. "Sindh Undertakes Coal-Gasification Project." Accessed June 12, 2023.  
<https://www.thenews.com.pk/print/966777-sindh-undertakes-coal-gasification-project>.

"Variable Renewable Energy Locational Study." Accessed December 19, 2022.  
<https://aedb.org/images/VRE-Locational-Study.pdf>.

Vernon, Ian W. H. Parry, Simon Black, Nate. "Still Not Getting Energy Prices Right: A Global and Country Update of Fossil Fuel Subsidies." IMF, September 2021.  
<https://www.imf.org/en/Publications/WP/Issues/2021/09/23/Still-Not-Getting-Energy-Prices-Right-A-Global-and-Country-Update-of-Fossil-Fuel-Subsidies-466004>.

World Bank. "Opportunities for a Clean and Green Pakistan," June 19, 2019.  
<https://doi.org/10.1596/32328>.

World Bank. "Pakistan Climate & Development Report," November 2022.  
<https://www.worldbank.org/en/news/press-release/2022/11/10/pakistan-urgently-needs-significant-investments-in-climate-resilience-to-secure-its-economy-and-reduce-poverty>.

World Bank. "Variable Renewable Energy Competitive Bidding Study," April 2022.  
<https://openknowledge.worldbank.org/entities/publication/da13d56c-731a-5864-b5b2-73086ebd44ea>.

Xin, Yongrong, Muhammad Dost, Hamza Akram, and Waqas Ahmad Watto. "Analyzing Pakistan's Renewable Energy Potential: A Review of the Country's Energy Policy, Its Challenges, and Recommendations." *Sustainability* 14 (December 2, 2022): 16123.  
<https://doi.org/10.3390/su142316123>.