THE NEED TO SWITCH TOWARDS GREENER FUTURE: LESSONS FROM CHINA

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Acknowledgements

We would like to express our sincere gratitude to the following speakers for their valuable contributions in making the high-level conference on 'The Need to Switch Towards a Greener Future: Lessons from China' a success:

Senator Rukhsana Zuberi, former Chairperson, Pakistan Engineering Council; Dr. Christoph Nedopil, Founding Director Green Finance and Development Centre (GFDC), Fudan University; Dr. Zhao Baige, Vice Chair of the 12th NPC Foreign Affairs Committee, Chair of Advisory Committee of RDI; Mr. Dong Shenliang, Deputy Chief Financial Officer, China Three Gorges South Asia Investment Limited (C-SAIL); Mr. Farid Ahmed, Group Chief Corporate and Investment Banking, Bank of Punjab; Mr. Muhammad Ayub, Deputy Managing Director (Former), National Transmission and Despatch Company (NTDC); Dr. Sajid Amin Javed, Deputy Executive Director (Research), SDPI; Mr. N.A. Zuberi, Senior Advisor China Three Gorges South Asia Investment Ltd. (C-SAIL); Dr. Hassan Daud Butt, Senior Advisor and Research Fellow, SDPI & Former CEO Khyber Pakhtunkhwa, Board of Investment and Trade (KP BoIT); Mr. Wang Huihua, General Manager, China Energy; Mr. Hamza Orakzai, Director of Strategic Planning and Regulatory Affairs, Special Technology Zones Authority; Mr. Sajeed Aslam, Regional Lead Public Affairs ACCA-APAC; Mr. Mujtaba Khan, Chief Executive Officer (CEO), Reon Energy; Mr. Osman Mohammad Maud, Chief Technology Officer (CTO), LONGi Central Asia Region; and Dr. Khalid Waleed, Lead Energy, SDPI.

Their insightful speeches and expert opinions were invaluable in shaping the conference's agenda and producing this policy paper. We extend our sincere thanks to each of them for their time, effort, and expertise.

With utmost appreciation, we extend our heartfelt thanks to Mr. Mustafa Hyder Sayed, the Executive Director of Pakistan China Institute (PCI), and his dedicated team for their valuable feedback and assistance in shaping and presenting this report. We are also immensely grateful to Dr. Vaqar Ahmed, the Joint Executive Director of SDPI, whose invaluable contributions made this report a reality. And last but not least, we express our sincere acknowledgment to the diligent support staff of SDPI and PCI who played a pivotal role in organizing the events.

Executive Summary

China is blazing a trail towards a more sustainable future, recognizing the dangers of climate change and the need for environmentally friendly development. Pioneering the way in the renewable energy sector, China has surged ahead as the world's largest investor in wind and solar power, accounting for a third of global investment in the field. Not only this, but the country has also implemented energy-saving policies and regulations, ensuring that buildings, industrial processes, and appliances meet energy-efficient standards. The implementation of such policies has significantly decreased the country's carbon emissions, making it a leading example for the rest of the world.

Despite the significant progress made, China's journey towards a greener future remains a challenge. The continued reliance on coal for electricity generation is a major hurdle, hampering efforts to reduce carbon emissions. Furthermore, air pollution remains a significant issue, particularly in urban areas, where it poses health risks to residents. Not to mention, opposition from the fossil fuel industry also threatens progress.

Nonetheless, China's experience provides valuable insights into how to achieve a sustainable future. Political will, effective policy design, and stakeholder engagement are crucial to navigating the challenges that arise in transitioning towards a more sustainable future. China's commitment to a greener future is an inspiration to other countries, and it serves as a shining example of what can be accomplished with a determined effort towards sustainability. Here are the three key takeaways from the conference titled "The need to switch towards greener future: Lessons from China".

1. Encourage sustainable investment in Pakistan's renewable energy and real estate sectors by introducing innovative financial incentives, such as reducing risk weights, enhancing concessionary facilities, and providing tax credits for green investments.
2. Create a secondary market for Renewable Energy (RE) credits in Pakistan to incentivize listed companies to invest in clean energy alternatives, ultimately contributing to a greener and more sustainable future.
3. Establish special zones that provide access to leading-edge machinery and top talent for research and development to replicate China's success in creating and sustaining systems for solar and wind power in Pakistan, leading to environmental benefits, job creation, and economic growth.

Introduction

The world is becoming increasingly aware of the catastrophic consequences of climate change, leading countries to take action towards a greener future. China, as one of the largest economies and most populous nations in the world, has taken a leading role in promoting sustainability. China's rapid economic growth over the past few decades has come at a significant cost to the environment. The country's heavy reliance on coal for energy production has contributed to severe air pollution problems, with air pollution contributing to over 1 million premature deaths per year. Additionally, China's rapid urbanisation and industrialization have led to significant water pollution and ecological degradation.

However, in the last decade, China has recognized the urgent need to shift towards a greener future. The IEA forecasts that by 2024, China will contribute 40% towards the world's renewable energy capacity growth.[1] Additionally, China has set a target to peak carbon emissions before 2030 and achieve carbon neutrality by 2060, which would require significant shifts in its energy, transportation, and industrial sectors.[2] The Chinese government has implemented several policies and initiatives aimed at reducing carbon emissions and promoting sustainability. One of the most significant initiatives is the National Emissions Trading Scheme, which launched in 2021.[3] The scheme aims to reduce carbon emissions by setting a cap on emissions and allowing companies to buy and sell emission allowances. The scheme covers over 2,000 companies in the power sector, which account for around 40% of China's carbon emissions.[4] Moreover, China has implemented the Renewable Energy Law[5], which has helped to drive the adoption of renewable energy sources. The law requires power grid companies to prioritise purchasing electricity generated from renewable energy sources and offers financial incentives for renewable energy producers. Furthermore, China has

[1] International Energy Agency, "China," accessed February 26, 2023, https://www.iea.org/countries/china.
[2] International Energy Agency, "An Energy Sector Roadmap to Carbon Neutrality in China\, https://www.iea.org/reports/an-energy-sector-roadmap-to-carbon-neutrality-in-china.
[3] Ma Tianjie, "The first year of China's national carbon market reviewed," China Dialogue, January 6, 2022, https://chinadialogue.net/en/climate/the-first-year-of-chinas-national-carbon-market-reviewed/
[4] Ibid
[5] International Energy Agency, "Renewable Energy Law of the People's Republic of China," accessed February 26, 2023, https://www.iea.org/policies/3080-renewable-energy-law-of-the-peoples-republic-of-china.

invested heavily in research and development of clean energy technologies, making it a global leader in the production and adoption of solar and wind power.

China's transition towards a greener future has encountered significant challenges, despite making some progress. The country's heavy reliance on coal for energy production is one of the major challenges. Currently, coal accounts for around 60% of China's energy mix, even though it has made substantial progress in adopting renewable energy sources.[6] Moreover, the country's economic growth has resulted in significant environmental degradation, with many of its cities experiencing severe air and water pollution problems.

According to the World Health Organization (WHO), China's air pollution levels have been consistently above their recommended levels.[7] In addition, implementing green policies and initiatives at the local level can be challenging due to varying priorities and interests. Although the Chinese government has set ambitious targets for reducing carbon emissions and promoting sustainability, a lack of transparency and accountability in policy implementation can hinder progress. Despite these challenges, China has made progress in adopting renewable energy sources. The National Energy Administration of China has projected that by 2023, China's total installed capacity for wind, solar, and hydropower would reach 430GW, 490GW, and 423GW, respectively.[8]

Like China, Pakistan is facing significant environmental challenges, including air and water pollution, deforestation, and desertification. However, the country has also recognized the urgent need to shift towards a greener future. Pakistan has set a target to generate 60% of its energy from renewable sources by 2030,[9] and has made significant investments in wind and solar power. Additionally, the country has launched several initiatives aimed at promoting

[6] International Energy Agency, "China has a clear pathway to build a more sustainable, secure and inclusive energy future," accessed February 26, 2023, https://www.iea.org/news/china-has-a-clear-pathway-to-build-a-more-sustainable-secure-and-inclusive-energy-future.
[7] David Stanway, "China must raise air quality standards as smog persists: task force," Reuters, April 23, 2022, https://www.reuters.com/world/china/china-must-raise-air-quality-standards-smog-persists-task-force-2022-04-23/.
[8] Emiliano Bellini, "China aims to add 160 GW of wind, solar in 2023," pv magazine, January 3, 2023, https://www.pv-magazine.com/2023/01/03/china-aims-to-add-160-gw-of-wind-solar-in-2023/.
[9] "Pakistan aims for 60% clean energy by 2030," The Express Tribune, November 11, 2021, https://tribune.com.pk/story/2366224/pakistan-aims-for-60-clean-energy-by-2030.

sustainable agriculture and reducing greenhouse gas emissions.

Despite these efforts, Pakistan faces significant challenges in transitioning towards a greener future, including inadequate infrastructure, lack of funding, and limited public awareness and education. By learning from China's experience in promoting sustainability, Pakistan can better navigate these challenges and work towards a more sustainable and greener future.

Objectives

This policy paper aims to:

1. Assess the current status and potential of green finance for renewable energy projects under CPEC and to explore innovative ways for mobilising green finance for such projects in Pakistan
2. Evaluate the prospects of manufacturing solar PVs in Pakistan under special economic zones, and government's polices to encourage solar power projects through various policies.
3. Identify the key lessons learnt from China's experience and make recommendations for policy and regulatory frameworks based on China's journey towards expanding renewable energy including best practices and solutions.

Understanding Project Finance

Project finance is a unique form of financing that is specifically tailored to fund individual projects. This type of financing differs from traditional corporate finance, which is based on the creditworthiness of the borrower. In project finance, the viability of the project is the main factor that determines whether or not financing is provided.[10] To achieve this, a complex financing structure is usually employed, which involves multiple parties, each with a specific role to play in mitigating risks and allocating them to the party best equipped to handle them.

One of the key features that sets project finance apart is the use of a special purpose vehicle (SPV) or project company. This legal entity is created solely for the purpose of executing the project, and it is responsible for its construction, operation, and maintenance. The project

[10] Andrew Fight, "Overview of project finance," in Essential Capital Markets, ed. Andrew Fight (Butterworth-Heinemann, 2005), 1-44, https://doi.org/10.1016/B978-075065905-5.50001-5.

company is the borrower of the funds, and the assets and revenue streams generated by the project are used as collateral for the loans. Unlike in traditional corporate finance, the repayment of the debt is tied to the cash flows generated by the project, rather than the creditworthiness of the project company or sponsor.[11] This limited recourse approach means that lenders have little recourse to the sponsors or shareholders, and the success of the project is crucial for the repayment of the debt.

The financing participants in project finance are numerous and varied, and they typically include the project company, lenders, government agencies, insurers, construction companies, and operators etc.[12] Each of these parties has a specific role to play in the financing structure, and their participation helps to align incentives and share risks. By pooling resources and expertise, project finance enables the completion of large-scale infrastructure projects that would be difficult to finance through traditional corporate finance methods. This approach to financing has proved successful in a wide range of projects, from large-scale energy and transportation projects to social infrastructure projects like hospitals and schools.

Parties involved	Role in Solar and wind power project financing
1. Project Company (Special Purpose Vehicle)	1. Responsible for construction, operation, and maintenance of the solar or wind power facility; borrower of the funds
2. Lenders	2. Provide financing secured by the assets and revenue streams of the solar or wind power facility; loan is typically structured as a non-recourse project finance bond
3. Government Agencies	3. Provide grants or low-cost loans, tax credits, or other incentives to incentivize the development of solar and wind energy projects

[11] Blackridge Research, "What is Project Finance and How Project Financing Works," Blackridge Research Blog, accessed February 26, 2023, https://www.blackridgeresearch.com/blog/what-is-project-finance-and-how-project-financing-works.
[12] Global Trade Funding, "Features of Project Finance," accessed February 26, 2023, https://globaltradefunding.com/project-finance/features-of-project-finance/.

4. Equipment Suppliers	4. Provide vendor financing for the equipment required to generate solar or wind power; reducing upfront costs and providing additional incentives for successful project completion

Current state of affairs – Green financing for renewable energy projects

Assessing Pakistan's renewable energy potential

Pakistan has significant potential for renewable energy generation, particularly through wind and solar power. However, despite the introduction of the Alternate and Renewable Energy Policy 2019[13], the implementation of renewable energy projects has been slow, and the country still heavily relies on fossil fuels for electricity generation. The policy lacks clarity and consistency in implementation, which has hindered progress in the sector. The recent introduction of a competitive bidding structure to increase private sector participation in renewable energy projects is a positive development.[14] However, the effectiveness of this structure in reducing tariffs for end consumers and attracting private sector investment is uncertain, as no project has been established under this structure yet. The government needs to take more proactive measures to incentivize private sector investment in renewable energy projects. There are significant challenges to the adoption of renewable energy in Pakistan, including inadequate transmission and distribution infrastructure, regulatory barriers, and limited access to financing. While the government has taken steps to address these challenges, a more supportive policy environment is necessary to encourage investment in renewable energy projects. Overall, the slow implementation of renewable energy projects and the challenges to adoption highlight the need for further action and support from the government and other stakeholders to achieve a more sustainable energy future in Pakistan.

[13] Alternative Energy Development Board (AEDB), "Draft Alternative and Renewable Energy Policy 2019," Version 2, July 21, 2019, accessed February 26, 2023, https://www.aedb.org/images/Draft_ARE_Policy_2019_-_Version_2_July_21_2019.pdf.

[14] This Point was raised by Mr. Farid Ahmed, Group Chief Corporate and Investment Banking, Bank of Punjab CSAIL during the conference titled 'The Need to switch towards Greener Future: Lessons from China' held on February 22, 2023 in Islamabad.

Financing and other constraints of RE projects in Pakistan

The banking sector's focus on the traditional energy sector is posing a major obstacle to the growth of renewable energy in Pakistan. The ballooning circular debt in the power sector, which now stands at a staggering PKR 2.5 trillion[15], is making it tough for local and international investors to back on-grid projects. To make matters worse, the State Bank of Pakistan has recently lifted concessionary limits for renewable energy projects, and the current interest rates have further undermined the profitability of off-grid and captive projects. Meanwhile, the volatility of the exchange rate and import restrictions are complicating the import of critical machinery and equipment needed for RE projects. This, coupled with high project costs, land disputes, and a lack of supportive policies, is causing further delays in the implementation of renewable energy projects. It's clear that a collaborative effort from the government and other stakeholders is needed to overcome these obstacles and create an environment that encourages investment in sustainable energy.

The deployment of renewable energy projects in Pakistan has been impeded by a combination of factors.[16] Firstly, a lack of baseline data has resulted in the difficulty in accurately measuring the energy potential of the country and identifying areas where renewable energy projects could be implemented. Secondly, the perception of renewable energy being expensive has dissuaded investment in the technology. Thirdly, resistance to change and a focus on grid-based power alone has limited the potential for renewable energy in the country. Fourthly, inconsistent policies and a lack of a level playing field for renewable energy investors have hindered the deployment of renewable energy projects. Finally, a low engineering base has resulted in a shortage of skilled workers, making it challenging to design and implement renewable energy projects. The resolution of these factors is essential to accelerate the deployment of renewable energy projects in Pakistan and achieve the country's clean energy goals.

[15] "Impressed by plan to contain Rs952b circular debt," The Express Tribune, September 14, 2021, accessed February 26, 2023, https://tribune.com.pk/story/2398936/imf-unimpressed-by-plan-to-contain-rs952b-circular-debt.

[16] This point was raised by N.A. Zuberi, Senior Advisor, CSAIL during the conference titled 'The Need to switch towards Greener Future: Lessons from China' held on February 22, 2023 in Islamabad.

State of readiness of commercial banks in financing renewable energy projects

The power sector in Pakistan plays a vital role in the country's economic growth, but it also poses significant environmental challenges. The fact that a few commercial banks have primarily financed the sector highlights the critical role these banks play in Pakistan's energy landscape.[17] The involvement of these banks in financing power projects under CPEC and co-financing with international DFIs is a positive development, as it signals greater collaboration and investment in the sector. [18]

Pakistani banks have also tried to tap foreign sources of funding. The accreditation of one bank i.e., JS Bank with the Green Climate Fund[19] is a step towards greening the power sector, but it's clear that more needs to be done to encourage sustainable financing. The ongoing applications for accreditation of two more banks indicate that the banking sector in Pakistan is recognizing the importance of sustainable financing and the need to prioritize environmental considerations. It is hoped that the accreditation will address currency and concessional financing issues.

However, the lack of effective implementation and monitoring of internal green banking policies is a significant issue that needs to be addressed. It is essential to ensure that the policies are not merely symbolic but are implemented in practice to promote environmentally sustainable financing practices. The establishment of a dedicated green banking office is a crucial step in the right direction. Such an office can help guide and direct the industry towards sustainable practices and ensure that environmental considerations are taken into account during the financing of power projects.

[17] This Point was raised by Mr. Farid Ahmed, Group Chief Corporate and Investment Banking, Bank of Punjab CSAIL during the conference titled 'The Need to switch towards Greener Future: Lessons from China' held on February 22, 2023 in Islamabad.
[18] Ibid
[19] JS Bank, "JS Bank becomes Pakistan's first financial institution to be accredited by the Green Climate Fund, world's largest climate fund," JS Bank, accessed February 26, 2023, https://jsbl.com/js-bank-becomes-pakistans-first-financial-institution-to-be-accredited-by-the-green-climate-fund-worlds-largest-climate-fund/.

Innovative financing instruments to scale renewable energy production

Following are some of the innovative financing instruments to scale renewable energy production in Pakistan.

Financing Method	Definition	Rationale for using these vehicles for Solar and Wind Power Projects in Pakistan	Challenges for using these vehicles in Solar and Wind Power Projects in Pakistan
Green Bonds	Fixed-income securities that are issued to finance environmentally friendly projects such as renewable energy, sustainable agriculture, and low-carbon transport.[20]	Can attract international investors and provide a new source of financing for solar and wind power projects in Pakistan.	Limited awareness and understanding of green bonds among investors and issuers; lack of an effective regulatory framework for green bonds in Pakistan.
Carbon Credits	Tradable permits that allow companies to emit a certain amount of greenhouse gases. By purchasing carbon credits, companies can offset their carbon emissions and	Can help Pakistan meet its emissions reduction targets under the Paris Agreement and attract investment in solar and wind power projects.	Limited capacity to monitor and verify emissions reductions; lack of transparency and regulation in the carbon market.

[20] International Finance Corporation (IFC), "What You Need to Know About IFC's Green Bonds," World Bank, December 8, 2021, accessed February 26, 2023, https://www.worldbank.org/en/news/feature/2021/12/08/what-you-need-to-know-about-ifc-s-green-bonds.

	contribute to the development of sustainable projects.[21]		
Impact Investing	Investing in companies, organizations, or projects with the aim of generating positive social and environmental impact, as well as financial returns.[22]	Can address social and environmental challenges in Pakistan, such as energy poverty and climate change, and promote the development of solar and wind power projects.	Limited awareness and understanding of impact investing among investors and social entrepreneurs; difficulty in measuring and verifying impact in a complex and diverse context like Pakistan.
Green Banks	Public or quasi-public institutions that provide financing for sustainable projects. Green banks can leverage public funds to attract private investment and provide low-cost financing for green initiatives.[23]	Can provide low-cost financing for solar and wind power projects and leverage public funds to attract private investment in Pakistan.	Lack of political will and funding commitments for green banks; potential for political interference and mismanagement in public institutions.

[21] Alternative Energy Development Board (AEDB), "Clean Development Mechanism (CDM)," AEDB, accessed February 26, 2023, https://www.aedb.org/ae-technologies/carbon-credit/81-cdm.
[22] Global Impact Investing Network (GIIN), "Need to Know," GIIN, accessed February 26, 2023, https://thegiin.org/impact-investing/need-to-know/.
[23] Natural Resources Defense Council (NRDC), "How Green Banks Are Financing the Fight Against Climate Change," NRDC, accessed February 26, 2023, https://www.nrdc.org/stories/how-green-banks-are-financing-fight-against-climate-change.

Green Trusts	Investment vehicles that are specifically designed to finance sustainable projects.[24]	Can mobilize private capital for solar and wind power projects and promote sustainable development in Pakistan.	Limited availability of green trusts and investment opportunities in Pakistan; lack of transparency and regulation in investment processes.

Evaluate the prospects of manufacturing solar PVs in Pakistan under special economic zones including the analysis of key factors such as market demand, technological capabilities, and policy environment

Prospects of Solar PVs in Pakistan

Nestled between 24- and 37-degrees North latitude and 62–75 degrees East longitude, Pakistan boasts one of the most plentiful solar radiation resources worldwide.[25] With sunshine aplenty, the southern and southwestern regions of Pakistan receive particularly high levels of irradiation, providing a prime opportunity to tap into solar energy. To unleash this potential, the Alternative Energy Development Board (AEDB) partnered with the World Bank through its Energy Sector Management Assistance Program (ESMAP) to unveil a comprehensive solar resource map of Pakistan.[26] Through the installation of nine solar data stations, areas with the highest solar energy potential were identified, paving the way for a clean energy future. This promising initiative highlights Pakistan's commitment to reducing its carbon footprint and reliance on non-renewable energy sources.

Thanks to technological advancements in Solar PV technology, the cost of solar energy has plummeted in recent years, making it one of the most affordable sources of energy

[24] Saba Akbar, Syed Salman Ali Shah, and Muhammad Salman Bashir, "Emerging Solar Potential of Pakistan: A Comparative Analysis of Different Solar Potential Coordinates of Pakistan," Journal of Energy and Natural Resources Management 4, no. 1 (2017): 1-9, https://www.omicsonline.org/open-access/different-solar-potential-coordinates-of-pakistan.php?aid=95530.
[25] Ibid
[26] World Bank Group, "World Bank Launches Improved Solar Maps for Pakistan," World Bank, March 6, 2017, accessed February 26, 2023, https://www.worldbank.org/en/news/press-release/2017/03/06/world-bank-launches-improved-solar-maps-for-pakistan.

worldwide.[27] Furthermore, it has the potential to account for a larger portion of Pakistan's energy mix, bolstering the share of clean and indigenous power generation sources while simultaneously providing low-cost electricity. As proof of this, the reduction in solar power tariffs in Pakistan over time, as well as the Indicative Generation Capacity Expansion Plan's emphasis on expanding Solar PV energy generation, underscore its significance. Solar PV energy generation is the most cost-effective choice, underscoring its long-term viability as a dependable and sustainable source of energy to support Pakistan's energy security.

Pakistan's 2022 fast track solar initiative is a significant milestone in the country's journey towards sustainable energy production.[28] The government has set three ambitious objectives to reduce reliance on expensive imported fossil fuels and to promote clean energy alternatives.[29] Firstly, the initiative aims to replace fossil fuels with solar PV. Secondly, solar PV generation will be established on 11 VK feeders, and thirdly, public buildings will be solarized. To achieve these goals, Pakistan intends to establish substitution capacity via a competitive bidding process. The target is to install an additional 10,000 MW of solar generation capacity. The first step towards achieving this target is the launch of the first RFP for a 600 MW IPP in Muzaffargarh, with commercial bids now being accepted.[30] The implementation of this initiative is a significant step forward for Pakistan's energy sector and will lead to a cleaner and more sustainable future for the country. By reducing reliance on fossil fuels, Pakistan will reduce its carbon footprint and promote environmental sustainability.

Pakistan's ability to safely incorporate 10,000 MW into its power system is hindered by a major bottleneck: the distribution mechanism. Without risking a grid collapse, this mammoth amount of energy cannot be seamlessly integrated into the existing infrastructure.[31]

The Pakistan Government through its "Solar Panel and Allied Equipment Manufacturing Policy 2023" is promoting local manufacturing of Solar PV panels and Allied Equipment by

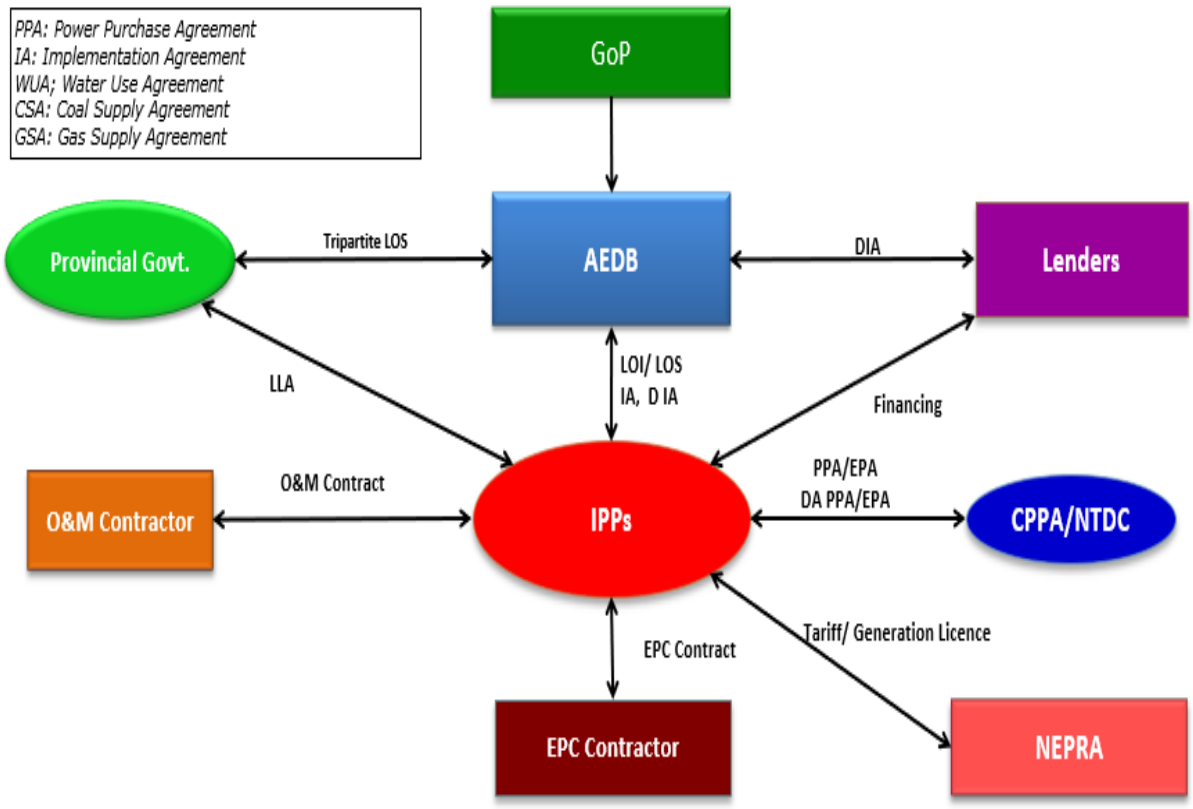
[27] David Rotman, "Explaining the Dropping Solar Cost," MIT Technology Review, November 20, 2018, accessed February 26, 2023, https://news.mit.edu/2018/explaining-dropping-solar-cost-1120
[28] Business Recorder, "Solar power: no need to fast track," Business Recorder, August 31, 2021, accessed February 26, 2023, https://www.brecorder.com/news/40217498/solar-power-no-need-to-fast-track.
[29] Ibid
[30] Ibid
[31] This point was raised by Ali Majid, CEO Longi Solar, during the conference titled 'The Need to switch towards Greener Future: Lessons from China' held on February 22, 2023 in Islamabad

proposing a policy with several interventions. These include a 10-year policy framework to encourage investment, exemption from duties and taxes on imported inputs, and exemption from duties and taxes on imported plant, machinery, and equipment for new and BMRE plants used in manufacturing solar panels and allied equipment.

Furthermore, in a bid to foster solar investments, the Pakistani government has instituted renewable energy policies that present enticing incentives to potential investors. At the forefront of these efforts is the Alternative Energy Development Board (AEDB), a specialized entity that offers private sector investors a one-stop-shop for facilitating and expediting renewable energy projects. To streamline the process and avoid tedious negotiations, the AEDB has designed a uniform security package that includes an Implementation Agreement, Energy Purchase Agreement, and Land lease Agreement. In a show of unwavering support, the Pakistani government has pledged to underwrite the power purchaser's payment obligations, thus bolstering investor confidence.[32] These progressive measures demonstrate the administration's unwavering commitment to the promotion of sustainable and eco-friendly energy sources, pointing to a bright and promising future for Pakistan's energy landscape.

Solar PV technologies offer a bright solution for various on-grid applications, illuminating the way towards a more sustainable future. Whether for commercial power projects, net metering, solar thermal-electric, captive power generation, or commercial lighting, solar PV panels can be deployed to reduce dependence on grid power and achieve cost savings. By capturing the power of the sun, solar PV technologies empower businesses and individuals to generate their own electricity, while also contributing to a cleaner environment. With increasing global adoption and government support, solar PV technologies are lighting up the path towards a brighter, more sustainable future. The development of CPEC SEZs in Pakistan could provide Chinese companies with a platform to set up their production facilities in Pakistan and export solar PVs to other countries in the region.

[32] This point was raised by N.A Zuberi, Senior Advisor, CSAIL during the conference titled 'The Need to switch towards Greener Future: Lessons from China' held on February 22, 2023 in Islamabad

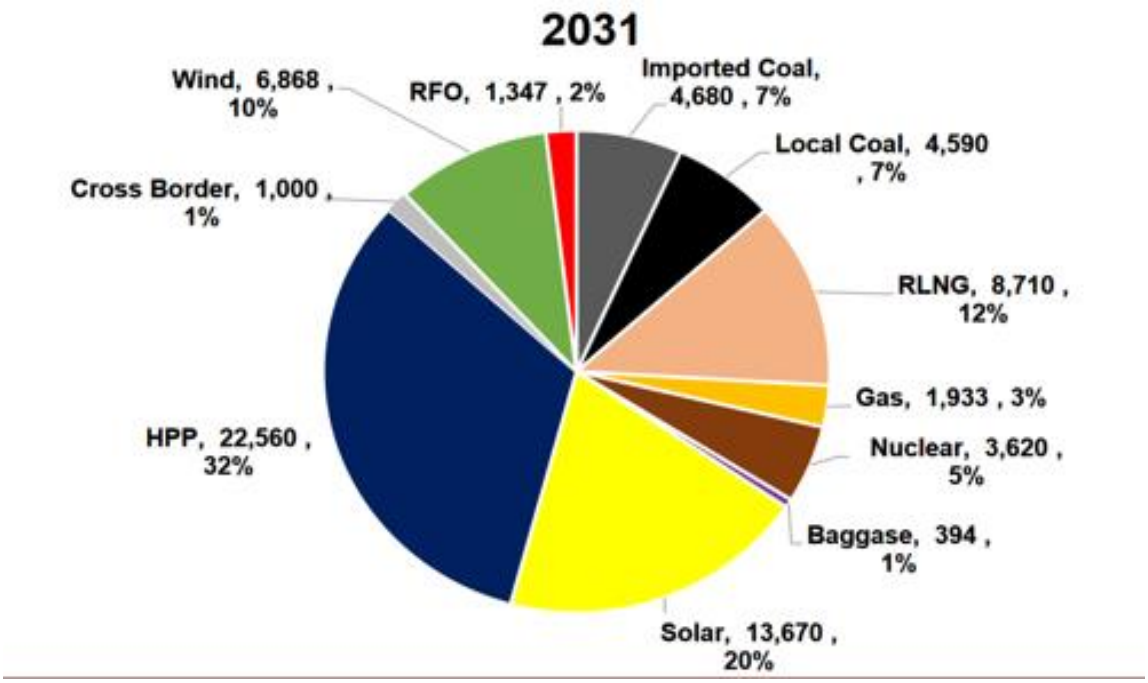


(**IPP Model for Solar Power Development in Pakistan**)

(Source: China Three Gorges, Pakistan)

NEPRA's approval of the Indicative Generation Capacity Expansion Plan (2022-31) on February 01, 2023 marks a new milestone in the renewable energy sector. The plan paints a bright picture for the future, with an ambitious target of 13,670 MW of solar projects slated to be completed by 2031. This move highlights a clear commitment to sustainable and clean energy, paving the way for a greener tomorrow.[33]

[33] This point was raised by N.A Zuberi, Senior Advisor, CSAIL during the conference titled 'The Need to switch towards Greener Future: Lessons from China' held on February 22, 2023 in Islamabad



Source: China Three Gorges, Pakistan

Lessons learned from China

(1) China's success in solar power generation and manufacturing is largely attributed to its government's long-term planning and investment in the industry. In 2015, China became the world's largest producer of solar energy, surpassing Germany, and has continued to dominate the global solar market since then.[34] This achievement is a result of China's ambitious targets for renewable energy and the policy and financial support provided by its government. One of the key policies implemented by the Chinese government is the feed-in tariff (FIT) program, which guarantees a fixed price for electricity generated from renewable sources, including solar energy.[35] This policy has

[34] Trace Software International, "China is Leading the Solar Energy Revolution," Trace Software International, accessed February 26, 2023, https://www.trace-software.com/china-is-leading-the-solar-energy-revolution/.
[35] Lehman, Lee & Xu, "China gets FIT: China Implements Solar Feed-in Tariff Program," Lehman, Lee & Xu, accessed February 26, 2023, https://www.lehmanlaw.com/resource-centre/faqs/foreign-exchange/china-gets-fit-china-implements-solar-feed-in-tariff-program.html.

encouraged private investment in the industry, resulting in increased competition and technological advancements, leading to a reduction in the cost of solar panels. Chinese government has also invested in the development of solar power plants and the construction of large-scale solar farms. The Top Runner Program, for instance, aims to promote the development of high-efficiency solar cells and modules, as well as encourage the construction of large-scale solar power plants.[36]

(2) One key driver of China's success in the solar panel industry is its ability to achieve economies of scale.[37] By scaling up production, Chinese manufacturers can reduce their costs per unit, which in turn allows them to offer more competitive prices to buyers.

(3) Another factor contributing to China's leadership in solar panel manufacturing is its focus on improving the efficiency of its production processes. Efficiency gains can result in higher production volumes and lower costs, both of which are key factors in maintaining competitiveness in the global market. In 2020, the average efficiency of a solar panel produced in China was around 19%, which is on par with the global average and higher than the efficiency of panels produced in some other countries.

(4) China's commitment to solar energy has been unwavering, with heavy investment in research and development resulting in significant advancements in the technology of solar panels. By prioritizing the development of more efficient and cost-effective solar panels, Chinese manufacturers have managed to stay ahead of the competition in the global market. Through innovative breakthroughs such as thin-film solar cells, China has continued to push the boundaries of what is possible with solar energy technology, with a relentless focus on finding new ways to harness the power of the sun. As a result, China has become a major player in the renewable energy sector and a leading example of how investment in sustainable technology can drive both economic growth and environmental sustainability.

(5) China's approach to innovation in the solar industry can be described as a magnificent example of collaborative efforts between its research institutions, universities, and private sector. By uniting the strengths of each sector, China has successfully

[36] Ronald Brakels, "China's Top Runner Program: Will It Make Solar Cheaper for the Rest of the World?" SolarQuotes, November 18, 2020, accessed February 26, 2023, https://www.solarquotes.com.au/blog/chinas-top-runner-program/.

[37] Goswami, Nandini. “China's Solar Value Chain.” ORF, Observer Research Foundation, 5 Oct. 2021, https://www.orfonline.org/expert-speak/chinas-solar-value-chain/.

introduced new technologies to the world, including the innovative concept of floating solar farms. This strategy has not only paved the way for the development of sustainable energy, but it has also played a significant role in reducing the cost of solar power generation, making it more affordable and accessible for people around the globe. China's commitment to renewable energy is a testament to its visionary leadership and underscores the power of collaboration in achieving sustainable development.

(6) China's rise as a solar power superpower has been fuelled not just by its technical prowess, but also by the foresight of its policymakers. Through a suite of policies aimed at promoting solar energy, China has fostered an environment where the industry can flourish. Feed-in tariffs have provided a reliable source of revenue for solar companies, while tax incentives have encouraged investment and R&D. Government procurement programs have helped to create a domestic market for solar power, and have made it easier for Chinese manufacturers to scale up production. By supporting the growth of the solar industry, China has not only reduced its carbon footprint, but has also created a new source of economic strength and technological leadership. As other countries follow in China's footsteps, it is clear that solar power will play a crucial role in shaping the energy landscape of the future.

Policy Recommendations

(1) Investors looking to invest in Pakistan's renewable energy sector should explore captive, off-grid, or wheeling renewable energy projects. These types of projects offer unique benefits to investors, including their ability to operate independently from Pakistan's circular debt problem. This means that investors can rest assured that their investment will not be affected by any financial instability in the national grid system. With the increasing demand for clean energy and the government's push towards renewable energy development, investing in these types of projects can generate significant interest from investors and have a positive impact on both the environment and the economy of Pakistan.

(2) SBP can take a step forward by introducing innovative financial incentives that promote sustainable real estate investments. By reducing the risk weights on real estate exposures, investors can benefit from lower capital requirements and reduced cost of borrowing, encouraging them to invest in the sector. Additionally, by

enhancing the limits of existing concessionary real estate facilities, the central bank can provide a much-needed boost to the real estate market, spurring economic growth and creating employment opportunities. These incentives can pave the way for a more sustainable and prosperous future for Pakistan's real estate sector.

(3) SECP and PSX should consider the introduction of Renewable Energy (RE) credits, as already implemented in the United States. The creation of a secondary market for these credits would incentivize listed companies to adopt and invest in clean energy alternatives. With minimum requirements in place for listed companies, they would be encouraged to pursue RE credits as a way to offset their carbon footprint and contribute to a sustainable future. This step would ultimately pave the way towards a greener and more sustainable future for Pakistan, while also creating opportunities for renewable energy investments and economic growth.

(4) The Federal Board of Revenue (FBR) could potentially revolutionize the renewable energy sector in Pakistan by introducing financial incentives for individuals and organizations to invest in renewable energy products. By providing tax credits for investments in green bonds and renewable energy financing, the FBR would encourage more people to take part in the country's transition to clean energy, which would ultimately help combat climate change and increase energy independence. This would also lead to more job opportunities in the renewable energy industry and further stimulate economic growth.

(5) China has demonstrated remarkable success in creating and sustaining systems through the implementation of accountability mechanisms and a daily improvement mindset. For instance, they currently manufacture 84% of the world's solar panels. To replicate this, one possible approach is to establish special zones that offer access to leading-edge machinery and top talent for research and development. By focusing on the entire value chain of solar and wind power, Pakistan can produce and deploy these technologies locally, leading to environmental benefits, job creation, and economic growth.

Conclusion

As we conclude, we must recognize that transitioning towards a greener future is a critical issue that demands a collaborative effort from all sectors of society, including policymakers, businesses, and individuals alike. China's success in promoting green technologies and reducing carbon emissions offers a plethora of valuable insights that other nations can draw inspiration from. By investing in sustainable technologies and prioritizing environmental protection, China has made significant progress towards a cleaner and more sustainable future. Nonetheless, China still faces obstacles such as finding a balance between economic growth and environmental conservation and dealing with air and water pollution. We must learn from China's experience and take bold steps towards a greener future marked by sustainable development and environmental stewardship, for the benefit of ourselves and future generations.

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