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Recent Developments in Climate Finance: Implications for Pakistan

This policy note is based on a report prepared by the International Growth Center (IGC) and the Consortium for Development Policy Research (CDPR). The Principal Investigators were William P. Mako (Lead specialist) and Ijaz Nabi (IGC Pakistan Country Director, CDPR Fellow and former World Bank Sector Economist) and Shanyuz Khan (CDPR RA).

About the project

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Impact

The Ministry of Finance (MoF) is interested in exploring and accessing international sources of finance tied to climate change initiatives. To date, Pakistan's access to international climate finance (CF) has been very limited. Furthermore, recent global trends show that the volume of concessionary finance has stagnated. The brief outlines Pakistan's climate targets and associated costs for meeting green targets. It also highlights available concessional CF options, and recommends policy action for Pakistan to attract more private investors in low-carbon investment, including nature-based bonds, work with potential investors to use cross-border carbon-trading provisions in the Paris Agreement to de-commission coal plants, encourage more domestic issuance of green bonds, and strengthen the framework for public-private partnerships.

In brief

The Government of Pakistan (GoP) has ambitious plans for reducing 2030 greenhouse gas (GHG) emissions 15-50% of baseline projected levels. These plans anticipate USD 101 billion of investment just for energy sector mitigation projects by 2040. In the GoP's view, only 15% reduction below baseline projected emissions should be financed 15% from domestic sources and 35% from international sources. International financing should be mostly on a concessional basis.

Despite Pakistan's relatively high emissions and relatively low GDP per capita, accessing concessional international climate finance (CF) will require meaningful changes to GoP policies. The volume of concessional finance is modest. Of the total CF of USD 632 billion in 2019-20, USD 63 billion was concessionary finance by multilaterals to East Asian economies and only USD 20 billion was provided by bilateral donors. Ultimately, the obstacle and clouds prospects for international support in overall volume of funds.

Of around USD 322 billion in recent worldwide annual funding for renewable energy (RE), the great majority was private equity and market-rate debt. With decreases in per-KWH costs to within the range for fossil fuel alternatives, RE is now expected to cover its costs and provide an adequate return on investment (ROI). By contrast, only 13% of recent CF was in the form of concessional debt or grant financing – focused on more challenging geographies (e.g., Sub-Saharan Africa) and sectors (e.g., agriculture, forestry or other land-use projects).

This suggests developing a strategy to target private external CF both for RE and for other climate change investments. Concessional CF may well be limited to non-remunerative climate mitigation projects (e.g., agricultural, or electricity transmission system upgrades to accommodate variable Renewable Energy (VRE)), adaptation projects, or components (e.g., safety nets for laid-off coal sector or fuel sector workers) of otherwise remunerative mitigation projects that cannot be expected to earn a profit.

Key recommendations

1. Convert Pakistan's 2021 Nationally Determined Contributions (NDCs) into a comprehensive document for climate investors. Show specifically what changes would be needed in Pakistan to reduce 2030 emissions to 50% below the baseline projection. Identify specific projects as well as the projected investment and emissions cut contribution for each. Group projects by suitability for non-concessional versus concessional CF.
2. Refine domestic guidelines for green bonds to minimize burdens on investors, while assuring that green bond sale proceeds contribute to climate mitigation or adaptation.
3. In order to attract private domestic or foreign investment for RE, continue to improve Pakistan's legal and institutional framework for public-private partnerships (PPPs).
4. Enhance Pakistan's competitiveness vis-à-vis other major claimants on private investment by improving its country risk rating, through improvements in macroeconomic and financial sector stability as well as rule-of-law indicators.
5. Reach out to multilateral/ bilateral development financial institutions (DFIs) to seek concessional CF for appropriate climate projects, e.g., agriculture, VRE-capable electricity transmission.
6. Work with conservation financiers to organize nature-based debt swaps, e.g., to accelerate the tree plantation/ reforestation programs.
7. Work with innovative multilateral/ bilateral DFIs to use cross-border mitigation investment and carbon-trading provisions in the 2015 Paris Agreement to finance the de-commissioning of some major coal plants.
8. Stress environmental/ climate change priorities in sectoral strategies to identify emissions reducing opportunities such as mitigating crop burning via investment in better planting technologies.

I. Context and Pakistan's Goals/ Plans

Climate finance (CF) is "local, national or transnational financing… that seeks to support mitigation and adaptation actions that will address climate change."[1] **The NDC summarizes Pakistan's targets for meeting greenhouse gas (GHG) reduction and the associated cost, assesses strategies to mitigate CF, and recommends policy action for accessing CF.**

Accounting for just 0.6% of global CO_2 emissions in 2018, an important GHG, Pakistan ranked 27th among the world's top CO_2 emitters, **but without new initiatives annual GHG emissions are projected to more than triple by 2030.**

Consistent with current Paris Agreement goals to limit temperature increases to 1.5 – 2.0 C, the Government of Pakistan (GoP) identified initiatives to reduce overall emissions by 50%: 15% from the country's own resources, and an additional 35% subject to international financial support. **Total costs to achieve this reduction by 2030 is projected at USD 101 billion just for energy transition (from fossil fuels to renewables) rising to USD 151 billion by 2040**[2]. The energy sector accounted for 41% of Pakistan's 2018 GHG emissions.

The GoP contemplates major – but indeterminate – increases in renewable energy (RE). RE accounted for just 5% of electricity generation in 2019[3]. NDC 2021 proposes 60% RE by 2030[4]. The 2019 Alternative and Renewable Energy (ARE) Policy, however, "mandates 30% solar, biogasse, and wind by 2030. A consistent and credible projection of RE will be useful.

Hydropower, solar and wind will be critical for the energy transition, and both have enormous and underutilized potential. Pakistan has an estimated hydropower potential of around 60,000 MW, out of which approximately 14% is currently exploited[5]. It is estimated that 42% of total installed capacity in 2030 will be hydropower in the base case scenario[6].

[1] "Introduction to Climate Finance," United Nations Framework Convention on Climate Change (UNFCCC), accessed June 20, 2022, https://unfccc.int/topics/climate-finance/the-big-picture/introduction-to-climate-finance.
[2] Government of Pakistan. Pakistan: Updated Nationally Determined Contributions 2021 ("NDC"), 10.
[3] NDC, 27.
[4] Ibid, 17 and 27.
[5] Ibid, 27.
[6] Ibid, 28.

Cost is an obstacle to realizing solar and wind potential. If Pakistan's solar power potential (mainly in Balochistan) "is utilized, all of Pakistan's current energy needs can be met with solar power alone"[7]. In addition, Pakistan "has a significant untapped potential for wind power generation, mainly in the coastal areas of Sindh and Balochistan."[8] **Pakistan could come "close to 100% net carbon but at a highly unaffordable cost,** as transitioning to the proposed energy mix will require investments to the grid, changes to operational procedures, and proper planning of Variable Renewable Energy (VRE) expansion with storage facilities."[9]

In addition to measures to mitigate the rise in temperatures, the GoP has identified a need for investments of USD 7-14 billion for adaptation, to make Pakistan more resilient against the effects of climate change.[10]

Potential CF financiers might appreciate a more fully developed presentation of energy sector plans[11] including the plans for coal[12] more detail (e.g., specific projects) on the required estimated investment of USD 80 billion by 2040 in hydropower and more credible estimates of burning costs of Thar coal mines would be useful. Other discussions in NDC 2021 **are less developed, but contain some items of interest.** (E.g.:)

- Agriculture is the second biggest emitter (37%) of GHGs and government contemplates a "complete ban on open burning of rice stubble, solid waste, and other hazardous materials"[13] and "disposal of crop residue in an environmentally friendly manner."
- Transportation (9%): The GoP's goal is for electric vehicles (EVs) to comprise 30% of vehicle sales (passenger vehicles and heavy trucks) by 2030 and 90% by 2040[14]. A more complete transition to EVs would likely reduce fuel sector employment, requiring sector planning and perhaps transitional safety nets[15].
- Industry (5%) accounts for 73% of coal consumption (which has tripled since 2016), "of which the cement sector contributes 65% of national coal consumption."[16] "Cement is incredibly dirty to produce. More specific measures may be warranted to cut cement industry GHGs."[17]
- Land Use, Land Use Change, and Forestry (5%) initiatives feature the Ten Billion Tree Tsunami Program (TBTTP), which is expected to "sequester 148.76 $MtCO_2$ emissions over the next ten years. The estimated project cost of about US USD 800 million is being met nationally from indigenous sources. It is not clear, however, the extent to which carbon sinks can generate carbon reduction revenue (see Section II.D).
- Waste disposal (4%) initiatives seem to focus on turning animal waste into methane for use as a fuel for rural households and urban transportation. Methane accounts for almost 90% of this sector's GHG emissions. Such fuel projects might earn a profit and be expected to earn carbon credits, but that start-up might be challenging.

[7] Ibid, 23.
[8] Ibid, 24.
[9] Ibid, 28.
[10] Ibid, 44.
[11] Perhaps, however, other GoP documents provide a more complete and analytical perspective.
[12] "From 2020 onwards, a moratorium is in place on new imported coal based power plants and through imported coal, (and) plans for two new coal-fired power plants have been shelved in favor of hydro electricity projects." NDC 2021, 23.
[13] "Two-thirds of fossil fuel subsidies ... "
[14] As of 2018, Pakistan's fuel sales accounted for almost 1.23 … local consumption.
[15] "These could include, for instance, 'reducing the overexploitation of subsidized electricity ... '"
[16] E.g., it is expected that the TBTTP will sequester 148.76 $MtCO_2$-e …
[17] …

NDC 2021 provides little visibility on how Pakistan would achieve its overall GHG reduction goals by 2030. Selectively cuts are mentioned.[18] But these would come nowhere near the GoP's overall goal of reducing annual GHG emissions by (240 – 800 $MtCO_2$-e) by 2030. Hence, the government states that concessional international CF will be "key."[19]

Thus far, Pakistan has enjoyed very limited access to international climate finance. This includes 1 project from the Adaptation Fund, 3 from the Green Climate Fund (totaling USD 122 million), and 19 projects approved by the Global Environment Fund. "Pakistan has thus far not accessed Climate Investment Funds (CIFs), major bilateral climate funds, or facilities," except for one project. In addition, Pakistan has received support to explore options for carbon pricing and may be exploring a "debt-for-nature" swap.[20] Pakistan has also had 18 energy projects approved by the Clean Development Mechanism (CDM), for which it receives carbon credit income.

In laying claim to concessional international CF, the government places high hopes on international agreements in line with United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement[21].

In addition, market and non-market-based approaches are being explored to diversify funding sources for commissioning capital intensive projects. These include Green Bonds, Natures Performance Bonds, Carbon Pricing Instruments, and Blue Carbon.

The Water and Power Development Authority (WAPDA) raised USD 500 million, at a 7.25% market yield, in May 2021 in Pakistan's first Green Bond issue.[22] The recently issued SECP guidelines recognizes the International Capital Market Association (ICMA) principles for green investment, but require streamlining to make them investor friendly.[23]

The GoP is also exploring conservation finance, a subset of CF. The TBTTP is a major conservation initiative. "Building on an earlier experience with the Government of Italy, Pakistan is engaged with several bilateral and other development partners to channel outstanding payments into conservation and climate-related investments via [the National Bank of Pakistan]."[24]

Given the current concentration of GHG emissions in certain sectors, notably including coal-fired electricity generation and cement, carbon pricing applications could be helpful. "A range of activities have commenced including capacity building on carbon pricing/ trading, national consultation on carbon pricing, and scoping of pricing instruments in [the] Pakistani context. The aim is to explore options for the introduction of domestic CPIs to manage the cohort of large-scale emitting installations, representing around 27% of domestic emissions, as well as an opportunity for similar or related instruments for the transport sector."[25]

[18] Ibid.
[19] "Based on an earlier experience with the Government of Italy, development partners to channel outstanding payments into conservation via National Bank of Pakistan." Ibid, 76-77.
[20] Ibid, 44.
[21] Press 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.
[22] Securities & Exchange Commission of Pakistan, Guidelines – Issuance of Green Bonds, 2021, https://www.secp.gov.pk/document/green-bonds-guidelines/ (downloaded 27 March 2022).
[23] NDC, 71.
[24] Ibid.
[25] Ibid.

II. Recent Developments in Climate Finance

International agreements provide general support for GoP claims on concessional CF, as seen in the 1992 UNFCCC,[26] and the 2005 Kyoto Protocol and the 2015 Paris Agreement.[27] **A Financial Mechanism was envisioned to facilitate the flow of funds from richer to the poorer countries**[28] consisting of funds and flexible mechanisms.

However, according to the UN's most recent review, the Financial Mechanism's contributions to CF are marginal. Recent grants from the funds may represent only about 4% of total CF grants and 0.3% of total CF flows worldwide,[29] while contributions from Kyoto's flexible mechanisms have dwindled. **Recent developments in main streams of the financial mechanism are summarized below:**

A. CF Flows and Green Bonds

1. CF Flows

Total CF for 2019-2020 averaged an estimated USD 632 billion per year. Of this amount, 93% went for mitigation and just 7% for adaptation.

Over three-quarters of this CF originated from domestic sources. This suggests "the continuing need to strengthen national policies and domestic regulatory frameworks to encourage domestic investments and address risks."[30]

Just over half (USD 321 billion per year) of recent CF has come from public institutions. In East Asia, most of the CF came from national development finance institutions (DFIs). "Many multilateral DFIs are committing that up to 50% of their financing will be climate-related by 2025."[31] Almost all known CF by SOEs in 2019-2020 was directed toward the energy sector.[32] **As for the other half of recent CF from private investors (USD 310 billion per year), 79% came from corporations or commercial financial institutions.** The CF from commercial financial institutions went 75% toward renewable energy (RE), with another 20% for transport (mainly EV) and 5% for other.

Recent CF is mostly for project finance, while concessional debt or grant financing is rare and focused on challenged countries or non-remunerative sectors. I.e., agriculture, forestry, or other land-use (AFOLU) projects.

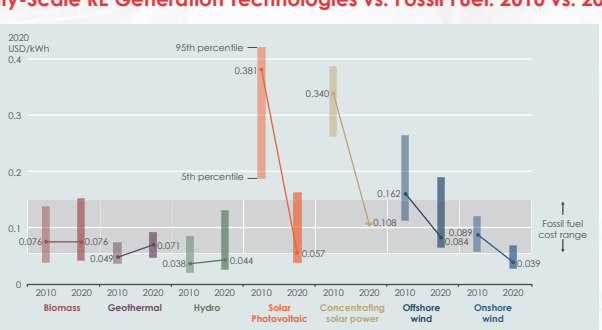
Concessional CF by Asian Development Bank (ADB), UN Green Climate Fund (GCF), World Bank Group (WBG), European Union (EU), UK and German aid agencies, and Japan International Cooperation Agency (JICA), can be critical to de-risk, leverage, and mobilize additional CF. Multilateral and bilateral DFIs have identified priority areas for concessional CF.

Of the USD 554 billion CF for mitigation, 60% (USD 334 billion) was for the energy sector. Of this energy total, 97% was for RE, including 88% for solar or wind power.

Domination of electricity sector CF by the private sector (67%) reflects substantial improvements in the economics of RE. By 2020, the cost per kilowatt-hour (KWH) for biomass, geothermal, hydro, solar, and wind power were all within the per-KWH range for fossil fuel alternatives. This makes RE technologies "particularly attractive for private investors, irrespective of public support."

[26] United Nations Framework Convention on Climate Change (UNFCCC), 1992, https://unfccc.int/resource/docs/convkp/conveng.pdf.
[27] "Introduction to Climate Finance," United Nations Framework Convention on Climate Change (UNFCCC), accessed June 20, 2022, https://unfccc.int/topics/climate-finance/the-big-picture/introduction-to-climate-finance.
[28] United Nations Framework Convention on Climate Change, 19 September 2011, https://unfccc.int/resource/docs/2011/cop17/eng/07.pdf.
[29] Author's estimates based on Global Environment Facility (GEF), https://www.thegef.org/ (Accessed June 20, 2022); Green Climate Fund, https://www.greenclimate.fund/; "Global Environment Facility," Wikimedia Foundation, June 19, 2022, 3:59; "Green Climate Fund," Wikimedia Foundation, June 19, 2022, 3:59.
[30] Climate Policy Initiative (CPI), Global Landscape of Climate Finance 2021, 11.
[31] Ibid.
[32] Ibid.

Global Levelized Cost of Electricity from Newly Commissioned Utility-Scale RE Generation Technologies vs. Fossil Fuel: 2010 vs. 2020



Source: Climate Policy Initiative, Global Landscape of Climate Finance 2021 ("CPI"), December, 2021, 19.

Electricity transmission and distribution were a likely exception to private dominance of CF for electricity. Developed and developing countries both tend to require substantial upgrades to transmission/ distribution. The natural monopoly nature of electricity transmission/ distribution, however, tends to militate against private equity investment and control. Thus, recently, SOEs and national DFIs accounted for almost 50% of the CF in electricity transmission/ distribution, followed by multilateral DFIs.[33]

Transportation CF, the fastest-growing mitigation sector, is dominated by privately financed household (business acquisition of EVs. EVs and battery-charging stations have recently accounted for almost half of investment in climate-mitigating transportation. Only 10% of these investments have been financed via government subsidies. The rest have been financed privately, including 58% by household or business payments and 27% by auto-loans from commercial banks. By contrast, investment in rail or public transport has been financed 65% by public entities, including a mix of governments and bilateral/multilateral DFIs.

Subsidies for EV purchases pose an issue for governments. This includes questions as to whether to provide subsidies, how much, for how long, and for what types of EVs. Subsidies become fiscally draining as the market expands. Thus, many countries (China, UK, Austria) are reducing or eliminating subsidies to encourage EV purchases.[34]

While incomplete, recent bilateral/ multilateral DFI CF funding for AFOLU mitigation has averaged USD 10 billion. This includes USD 3.4 billion for forestry projects and USD 2.3 for agriculture (e.g., sustainable crops, agro-forestry, and livestock production).

2. Green Bonds[35]

Worldwide, green bond issuance has grown rapidly, increasing perhaps 13x from its 2013 level to about USD 250 billion in 2020.

Green bonds are mainly issued by governments/ financial institutions and used for energy or buildings mitigation projects. Thus, mitigation projects in less developed countries may not be able to access the lower interest rates that might otherwise result from tax-advantaged green bonds issued in more developed countries.

Questions have been raised about the green credentials of certain bonds, either the projects financed or the issuer. Accusations of "green washing" are not uncommon (Spain's Repsol to oil and gas production,[36] China's "clean coal"[37] the Three Gorges Dam projects).

Desires for reasonable assurance among bond investors and tax authorities that green bond proceeds are actually going for climate projects has encouraged the development of standards for the definition of green bonds and the use of green bond proceeds.

B. Conservation Finance

Current estimates of the overall volume of conservation finance range from USD 124 to USD 143 billion annually, with 80-86% coming from the public sector.[38] Main funders include multilateral and bilateral financial institutions; the current volume of private funding is estimated at USD 18 billion per year. Another USD 2-3 billion come from NGOs and philanthropies (representing[39]) and a "rare **increase in the number of major institutional players and asset managers entering the market,** demonstrating a growing interest in conservation finance." **Almost half the investments are in sustainable agriculture and protection of the ocean and coastal zones.**[40]

Belize's USD 365 million "Blue Bond" deal shows the way to other such debt swaps. The Box 1 is "one of the biggest-ever debt restructurings meant to aid the environment in an agreement that remedies the nation's latest default."

Box 1: Belize's USD 364 Million "Blue Bond", November 2021

Based in Arlington VA, The Nature Conservancy (TNC) issued USD 364 million, most of which will be used to buy back GoB's total debt burden will free up USD 553 million of capital in more marine protection. "Tripling Belize's budget for ocean conservation …" As part of the deal, Belize has agreed to protect 30% of its ocean area by 2030.

The buy-back involves a GoB bond due 2034, which was trading at about 59 cents, in March 2021. Covid shutdowns led to a June default. Current market pricing of that bond, Belize's total debt burden, will decrease to about 40 cents in ocean protection.

Transaction structure highlights:

- On behalf of TNC, Credit Suisse Group AG issued USD 364 million in bonds to investors.
- TNC lends the resulting bond proceeds to GoB.
- GoB uses that USD 364 million to buy the TNC bond at 0.55 of face value.
- The resulting reduction in GoB's total debt burden is expected to finance ocean protection.
- TNC will use debt service payments from the GoB.
- TNC's "blue bond" investors will be guaranteed by the U.S. International Development Finance Corporation.

Source, Bloomberg, 5 November 2021

[33] Ibid.
[34] Colin McKerracher, "The U.S. Zigs While the Rest of the World Zags on EV Subsidies," Bloomberg Green, March 8, 2022.
[35] …
[36] Andrew Whiley, "An Oil & Gas Bond We Knew Would Come Eventually: Repsol: Good on GBPs, Not So Sure on Green Credentials," Climate Bonds Initiative, May 23, 2017.
[37] Yusuke Matsuzaki, "Environmental Bonds Stained by 'Green Washing'," Nikkei Asia, March 3, 2018.
[38] CPIC, 12.
[39] …
[40] Based on a survey of institutions for Conservation Finance 2021, An Unfolding Opportunity …

C. Coal Generation De-commissioning

The phase-out of coal-fired generation will need to accelerate, even just to achieve announced emission cut pledges. During 2011-2020, worldwide retirements of coal-fired plants averaged about 24,000 MW per year, mainly in advanced economies. To achieve announced pledge (APS) however, the annual rate of coal plant retirements will need to roughly double overall (to almost 50,000 MW per year during 2030-2030) with developing countries doubling to almost 11,000 MW per year.

Despite being "an even more crucial component of climate action," early retirement of coal plants is a much trickier challenge for public policy. Given the dependence of a number of countries and regions on coal, the closure or repurposing of existing coal power plants could have serious economic and social consequences. It requires planning for the impacts on affected workers and communities, and on the repurposing and reclamation of affected land.[41]

D. Clean Development Mechanism (CDM)

The CDM has strong logical appeal. It has allowed richer countries to fund GHG-reducing projects in poorer countries, and then claim the emission savings as part of their own efforts to meet international emissions targets. While it is generally cheaper to undertake mitigation projects inside poorer countries, the resulting emission reductions benefit the global atmosphere and climate. Thus, "the CDM allows industrialized countries to buy CERs and to invest in emission reductions where it is cheapest globally."[42]

The CDM has, however, faced significant implementation challenges; these include proving additionality, and mitigating the risk of fraud and avoiding perverse incentives that result in emission increase, those related to CDM governance and managing conflicts[43] lower participation by developing countries, managing complexities of hydropower projects, forestry projects and carbon sinks, and high transaction costs.

CDM registration proceeded slowly, peaked in 2013, and collapsed thereafter, with almost all CERs going to just a few countries. By 14 September 2012, 4,626 projects had been registered by the CDM EB and the board had issued 1 billion CERs: 60% to China; 15% to India; 9% South Korea, 7% Brazil, 2% Mexico, and 5% other. Pakistan registered just 18 (0.4%) projects for 1,800,000 CERs (0.2%).

By 2010, the World Bank anticipated that CDM revenues could exceed concessional aid flows. CDM's could raise USD 15-24 billion in direct carbon revenues for developing countries, "depending on the price of carbon," By contrast, "official development assistance for mitigation was about USD 19 billion over 2002-07".[44]

However, CER sales revenue, are not predictable because carbon prices can be highly volatile. Furthermore, future CERs from registered CDM projects can be traded on a forward basis at a discount, which can vary widely. **Despite the CDM's past travails, the 2015 Paris Agreement extended authorization for a mechanism to allow the cross-border trading of carbon credits from mitigation projects.**

E. Carbon Trading

The worldwide carbon market is hot. Global trading volume increased an average of almost 25% in 2019 and 2020, followed by a 164% increase to Euro 760 billion (USD 851 billion) in 2021. Explanations include expectations of tighter carbon caps resulting in increased demand for permits; likely increased coal usage due to higher natural gas prices and the Ukraine conflict; and the Paris Agreement on using out-of-area GHG cuts to count toward emission caps.

[41] International Energy Agency, World Energy Outlook 2021, 58.
[42] Michael Grubb, "The Economics of the Kyoto Protocol," World Economics, July-September 2003.
[43] Jean-Marc Burniaux, Jean Chateau, Romain Dellin, Romain Duval, and Stephanie Jamet, "The Economics of Climate Change Mitigation: How to Build the Necessary Global Action in a Cost-Effective Manner," OECD Economics Department Working Paper 701, June 2009, 40; Michael Gillenwater, "What is Additonality? Part 1: A Long Standing Problem," Greenhouse Gas Management Institute Discussion Paper 1, January 2012.
[44] World Bank, World Development Report 2010: Development and Climate Change, 2010.

III. Implications for Pakistan

Recent CF developments have major implications for Pakistan, as discussed below. Despite Pakistan's emissions/income profile, a global scarcity means that concessional CF is likely to be limited to non-remunerative mitigation projects, adaptation projects, or side costs (e.g., safety nets for laid-off fuel sector workers) for remunerative RE projects. Hence, **achievement of its CO_2-e reduction targets will require Pakistan to attract substantial quantities of private CF, especially for RE-based mitigation projects.** Hence, it will be important for Pakistan to improve its framework for public-private partnerships, encourage more domestic issuance of green bonds, reduce investor perceptions of country risk, pursue nature-based bonds, including for the TBTTP and agricultural projects, and work with potential investors to use cross-border carbon-trading provisions in the Paris Agreement to de-commission coal plants, as discussed below.

A. Prospects for Concessional CF

Pakistan's prospects for attracting concessional CF for mitigation appear mixed. On the one hand, Pakistan emits enough GHG to be a problem, and is relatively poor. But the great majority of Pakistan's planned mitigation spending is for RE, for which non-concessional market-based financing has become the norm.

Of 41 "middle-tier emitters," Pakistan ranks at the bottom in terms of GDP. This group ranges from South Korea (ranked 7th in 2018, at 631 $MtCO_2$) to Turkmenistan (48th in 2018, at 72 $MtCO_2$). Logic suggests that the larger top-tier emitters should draw the largest share (e.g., 62%, or more) of mitigation-oriented CF, while the bottom-tier emitters may not pose enough climate risk to warrant any of the world's scarce supply of mitigation CF – neither concessional nor market-based. Thus, the poorest of the world's middle-tier emitters (e.g., Pakistan, Uzbekistan, Bangladesh, Nigeria, Iran) may be able to attract the bulk of concessional mitigation-oriented CF based on their threat to the climate and their relative poverty.

Prospects for concessional mitigation CF are clouded, however, by the "bankability" of the RE energy projects emphasized by GoP. Per-KWH costs for hydro, wind, solar, or biomass power have decreased to the cost-range for fossil fuels.[45] Thus, it should be possible for new RE projects to achieve full cost-recovery and provide an adequate risk-adjusted return for equity to investors and lenders.

B. Public-Private Partnerships

Moreover, Pakistan has extensive and successful experience with private participation in infrastructure (PPI), especially in the electricity sector. Since 1990, 118 PPI projects involving USD 33.2 billion of investment have reached financial closure in Pakistan. The great majority of activity – 102 projects for USD 29 billion of investment – have been in the electricity sector. Investment in these electricity projects have averaged USD 284 million. Only one project, representing 0.5% of country investment, has been cancelled. Some of Pakistan's electricity PPI projects involved divestiture (i.e., privatization) or development of electricity transmission/ distribution.

Pakistan's 76 electricity generation PPPs have emphasized fossil fuels. RE projects (i.e., 47 biomass, hydro, nuclear, solar, waste, or wind projects) account for only 34% of capacity and 48% of investment (Exhibit 25). The rest comes from 29 coal, diesel, natural gas, or oil-fueled electricity generation PPPs. Of the 8 coal-fired plants, 5 have achieved financial closure since 2015.

Thus, to hedge against the unavailability of concessional CF for RE, the GoP may wish to improve Pakistan's attractiveness to potential RE investors. This could involve improvements in both Pakistan's framework for PPP projects and country risk profile.

Pakistan scores well in its PPP framework, but improvements seem possible. Pakistan's overall PPP rating exceeds the average for South Asia and is about on par with the average for high-income countries. Larger emitters – such as China, the US, South Korea, Australia, or the U.K. – may seem more attractive to RE investors, however, both because of their emission magnitudes and some advantages in their PPP frameworks.

[45] See Exhibit 11 in the main report.

The GoP may wish to exchange information with countries that seem to excel in particular aspects of PPPs. E.g.:

- Project preparation – Australia, UK, or Slovakia;
- Procurement (including selection of PPP equity sponsors) – Slovakia or China;
- Contract management – Australia or China; and
- Treatment of unsolicited proposals – the US, Korea, or Australia.

C. Green Bonds

The GoP may wish to review and perhaps reduce the requirements it places on green bond sponsors and their regulators. As noted earlier, disclosures required by the SECP Green Bond Guidelines – which seemingly must be reviewed and approved by the SECP – go beyond those of the ICMA. Consistent with its overall approach to securities regulation, the SECP may wish to bring green bond disclosures into line with ICMA requirements and ensure simply that required disclosures are included in each green bond prospectus, leaving it then to potential investors to make their own assessments about a bond's "greenness."

D. Country Risk

To raise Pakistan's attractiveness to potential foreign PPP sponsors, GoP could work to improve Pakistan's country risk rating, especially regarding "rule of law." A host country's country risk rating can affect the overall credit rating for a PPP project company, and hence the cost of its debt and therefore the rate at which it can profitably sell an "infrastructure service" (e.g., electricity) within the host country. "In emerging markets especially, the operating environment can result in a lower rating profile by one to two notches, depending on the level of challenge posed by that environment.' Thus, for example, a higher risk country environment could reduce a corporation's credit rating from BBB (investment grade) to BB+ (below investment grade." Rating agencies assess multiple factors. For example, Fitch assesses economic factors that might cause a sovereign default, financial factors that might presage a banking or capital market crisis, and governance factors. Half of Fitch's governance sub-assessment "reflects a 'rule of law' sub-sub-assessment, which measures perceptions of the extent to which economic agents can have confidence in contract enforcement, property rights, and physical security."[46] For rule of law, Pakistan currently ranks at about the 25th percentile from the bottom well below the averages for South Asia and other regions or the country ratings for such key competitors for mitigation CF as India and China.

E. Conservation Finance

Nature conservation projects, such as the TBTTP, could potentially be financed via a debt swap. Thus, for example, a debt swap for the USD 500 million of GoP bonds due April 2051 could potentially fund 5.74 billion trees over the next twenty-eight years.

[46] William P. Mako, The Bankable SOE: Commercial Financing for State-Owned Enterprises, Asian Development Bank, September 2021, 17-19. Cites Fitch, Corporate Rating Criteria, 2020, 3.

Box 2: Hypothetical Debt-for-Nature Swap

Between 1 July 2019 and 31 March 2021, 814,671,000 trees were planted at a total cost of PKR 14,670,654,000,[1] – i.e., PKR 18 per tree, or USD 0.0976 per tree at the 1 April 2022 exchange rate.[2]

Assume 2 billion trees have been planted, leaving an additional 8 billion to be planted.

In April 2021, the GoP issued USD 500 million of 30-year bonds, due in April 2051, with an annual coupon of 8.875%.[3] Thus, annual interest payments total USD 44.375 million. Current bids for these April 2071 bonds are at 0.69459 of Face Value.[4]

Pakistan now has a B- Standard & Poor's rating,[5] as did the Government of Belize (GoB) in November 2021,[6] when it borrowed USD 364 million from The Nature Conservancy (TNC) for 19 years at a rate of 6.1%. Repayment by the GoB to TNC was guaranteed by the U.S. Development Finance Corporation (DFC).

Allowing for an increase in interest rates since then and longer maturity, assume that the GoP borrows USD 375 million in April 2023 at 6.5% annual interest (i.e., USD 24,375,000 a year) for 28 years, until April 2051. Assume then that the GoP uses the USD 375 million in bond proceeds to redeem the outstanding April 2051 GoP bond at 0.7 of Face Value.

If the GoP amortizes the new bond over 28 years, it would save USD 14,955,105 per year (= USD 44,375,000 old bond interest – USD 29,419,895 amortization of new bond).

If, instead, the GoP plans to roll over the new bond in April 2051, in which case it would not need to amortize bond principal, it would save USD 20,000,000 per year (= USD 44,375,000 old bond interest - USD 24,375,000 new bond interest).

Over 28 years, at the current cost/tree, these debt service savings could finance the planting of 4.29 billion or 5.74 billion trees.

[1] Government of Pakistan, Finance Division, Pakistan Economic Survey 2020-21, 322-323.
[2] https://www.xe.com/currencyconverter/convert/?Amount=1&From=USD&To=PKR, accessed 1 April 2022.
[3] Pakistan Economic Survey, 196.
[4] https://bondevalue.com/webapp/home , accessed 1 April 2022.
[5] http://www.worldgovernmentbonds.com/ , accessed 1 April 2022.
[6] https://www.theglobaleconomy.com/Belize/credit_rating/ , accessed 1 April 2022

F. De-commissioning of Coal-Fired Generation

Improved arrangements for cross-border mitigation/ carbon-trading, under the Paris Accord, seem an ideal way to finance the de-commissioning of heavily polluting coal-fired electricity generation. Old Kyoto-era questions about additionality and ongoing contributions should quickly fade away. Who would de-commission a new coal-fired plant without some sort of concessional financing? As for the ongoing emission reductions, it should be simple enough to measure annual emissions from a plant that is currently operating and – reasonably enough – to assume that these annual savings would continue for however many years remains in the expected life of the plant or the term of a PPP contract. Given reasonable assumptions about expected investor returns, plant utilization and emissions, de-commissioning costs, and the future value of carbon credits, it should be possible to borrow enough from multilateral DFIs to:

(i) buy out the investors for a large coal-fired plant and pay de-commissioning costs.

(ii) rely on the revenue from future carbon credits to amortize this DFI borrowing.

Box 3: Hypothetical Coal-Generation De-commissioning

Assumptions	Thus
(i) A 1,320 MW coal-fired electricity generation plant achieved financial close in 2020; **(ii)** This is a B-O-T PPP, with a 25-year term; **(iii)** The equity sponsor invested USD 478 million, on which it expects a 15% return from the time the plant begins operating; **(iv)** Banks have loaned a combined USD 1,434 million at annual interest of 5%, with principal payable at the end of the PPP contract term; **(v)** After 1 year of construction, the plant began operating in April 2021, and is expected to operate for 24 years until April 2045; **(vi)** Utilization will average 50% of capacity;[1] **(vii)** The plant will emit 0.99 metric tons of CO^2 per MWH;[2] **(viii)** Under the Paris Agreement, the price of carbon credits for mitigation projects in developing under will be USD 68 per ton of Co^2; **(ix)** The cost to de-commission a coal-fired plant, net of scrap value, is USD 134,000 per MW;[4] **(x)** The goal is to achieve financial close in April 2023 to finance the de-commissioning of this plant.	**(i)** The plant was expected to operate 24 years, from April 2021 until April 2035; **(ii)** Over this period, to achieve a 15% equity return, the equity investor expected annual net income of USD 73,946,314. In April 2023, the Present Value of the remaining 22 years of expected net income will equal USD 468,292,073; **(iii)** Debt of USD 1,434,000 will remain outstanding in April 2023; **(iv)** It will cost USD 176,880,000 (= USD 134,000/MW x 1,320 MWs) to de-commission this plant; **(v)** Total amount needed in April 2023 to pay off investors and fund de-commissioning is USD 1,902,293,314 (= 468,292,703 + 1,434,000 + 176,880,000); **(vi)** Shutting down the plant will reduce CO^2 emissions by 5,723,784 tons per year; **(vii)** The resulting 22 years of 5,723,784 Paris Agreement Emission Credits (PAEC) can be sold each year on the EU-ETS.

If the GoP can borrow USD 1.9 billion from a consortium of multilateral lenders (e.g., the European Investment Bank, Asian Development Bank, and World Bank) at 5% annual interest, annual interest payments and amortization of principal (over a 22-year period) would equal USD 144,343,966. Thus, assuming that PAEC's remain at 40% of the value of EUAs, any EUA price in excess of Euro 63.05 would suffice to pay off the USD 1.9 billion debt. Except for a short drop at the beginning of Russia's invasion of Ukraine, EUA prices have remained above Euro 63.05 since 5 November 2021.

Source: Author's estimates based on the following:

[1] U.S. Energy Information Administration, "Annual U.S. Coal-Fired Electricity Generation Will Increase," 10/18/21.
[2] U.S. Environmental Protection Agency, "Greenhouse Bas Reporting Program: Power Plants," September 2019.
[3] https://tradingeconomics.com/commodity/carbon, and author's assumptions based on past CRE/EUA ratio.
[4] Daniel Rami, Decommissioning U.S. Power Plants, Resources for the Future, October 2017, 3.

Any such borrowing would need to be accompanied by additional risk mitigation measures. For example, a consortium of multilateral/ bilateral risk guarantee agencies could guarantee against a demise of the Paris Agreement mechanism for cross-border mitigation/ carbon credits or carbon trading markets. In addition, there would likely need to be some hedging of carbon credit prices – e.g., perhaps by selling call options and buying put options on EUA spot prices.

G. Explore CF for funding prevention of crop stubble burning.

Globally, agriculture contributes 13 percent of GHGs but a much higher 42 percent in Pakistan. Burning of crop stubble contributes a small share of this. However, addressing crop stubble burning has the twin benefits of reducing global carbon emissions as well as improving immediate local health outcomes. This creates an opportunity for securing concessionary finance for prevention of crop burning. (The principals of a potential debt swap /roll over are given in Box 4 below - the financials can be worked out).

For three weeks straddling October and November, Punjab farmers (in Pakistan and India) resort to stubble burning of the harvested rice crop to prepare the fields for wheat sowing. As a consequence of crop burning (but also low-grade fuel, industrial emissions and dust particles), many Punjab cities experience a sharp deterioration in air quality. In winter, biomass burning contributed to 17 per cent PM10 and 26 per cent PM2.5. Lahore, with a population of more than 10 million people, now ranks among the most polluted cities in the world while Pakistan came third in the list of the most polluted countries in 2021.[47] Studies show that nearly half of Delhi's air pollution in this season is due to crop burning.

Exposure to such dangerously high levels of pollution has significant health and non-health impacts. The University of Chicago Air Quality Life Index shows that meeting WHO air quality standard improves the average life expectancy of a Pakistani by 2.7 years and of a Lahori by 5.3 years. Studies in other countries show large benefits in improvement in birth weights, infant mortality and reduction in school absence. In India, 42,000 premature deaths were attributed to crop residual burning. The released sooty black carbon reduces agriculture yields and blackens Himalaya glaciers, accelerating their melting and thus significantly contributes to climate change.

The policy note on the health impact of air pollution lays out the risks and costs of air pollution for low-income households.

Box 4: CF for reducing air pollution associated with crop stubble burning

One known technology for eliminating stubble burning is the "happy seeder", which can plant wheat without removing the stubble but it is expensive and uses a lot of fuel. However, the cost is mitigated by the reduced labor and fertilizer expense. Even so, small farmers can't afford it so a subsidy will likely be required. It is estimated that Indian Punjab needs 15,000 such seeders (costing about Indian Rs 1.5 lakh each). The larger Pakistan Punjab will need more. Assuming 25,000 seeders will be needed at the price of USD 4000 each, the total cost is USD 100 million. Extending the program to the rice growing areas of Sind with similar rice-wheat cycle would increase the capital cost to USD 150-USD 200 million. The annual fuel cost for operating the seeder would also need to be factored in. Another approach would be to pay farmers a premium price for rice if they don't burn stubble. The price could be structured as in the better cotton initiative in which case the price premium would be paid by buyers of rice in the importing country. Satellite imagery could be used to certify zones by stubble burning practice.

Once the cost is known, TNC could be approached, as in the case of the Belize ocean initiative and the hypothetical Pakistan tree planation scheme (discussed in Box 1 and 2) for a similar debt swap arrangement that will yield enough surplus to fund the crop stubble burning abatement program. To secure even more attractive terms, concessionary CF could be approached by emphasizing the twin benefits of curtailing crop stubble burning: the global benefit by reducing CO2 emissions and the immediate local benefit of improving health outcomes especially for the low-income households since they spend a disproportionately large share of income on health costs associated with poor quality air.

[47] IQAir. World Air Quality Report 2021

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