CEEW THE COUNCIL | Centre for Energy Finance

Greening New Pastures for Green Investments

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Matching finance with demand for clean energy capital

Some things have not changed in a decade. When the Conference of the Parties for the UN Framework Convention on Climate Change (UNFCCC) met in Copenhagen in 2009, a half-hearted promise of USD 100 billion of climate finance was promised by 2020. Since then climate negotiators have failed to even agree on a definition of what would constitute climate finance or what sources of funds would make up for the promised sum. During the last half decade (2013-18), multilateral climate funds approved only USD 10.4 billion for mitigation activities; and a mere USD 4.4 billion in adaptation funding. Even including bilateral funds and private investment, climate financing by one count was USD 463 billion in 2016. As large as this number looks, it is woefully inadequate. India, alone, needs USD 2.5 trillion in climate financing by 2030. Yet, the refrain goes, there is a lot of capital waiting to be invested. More than USD 200 trillion (Convergence 2017) worth of assets are under management in the world's pension funds, insurance firms and sovereign wealth funds. Yet, the

greatest challenge of our times – confronting climate change, especially in the most vulnerable countries – does not find enough suitors. Mobilising finance for investment and innovation in low-carbon energy solutions remains a critical challenge and is the key constraint to a global energy transition.

So, a decade on from Copenhagen and nearly four years after the historic Paris Agreement, when the world gathers for the UN Secretary-General's Climate Summit in September 2019, we must ask ourselves: How should we match the potentially available finance with the unmet demand for capital?

> **Mobilising finance for investment and innovation in low-carbon energy solutions remains a critical challenge and is the key constraint to a global energy transition**

In 2018, global energy investment stabilised at more than USD 1.8 trillion (IEA 2019). Investments in the power sector exceeded oil and gas supply to become the largest energy investment sector. Investment in low-carbon energy, both in supply and demand side measures, amounted to a third of total investment at USD 620 billion (IEA 2019). Close to half of the total clean energy investment came from investments in renewable energy (BNEF 2019), with investments in electricity grids, energy efficiency, battery storage, etc. contributing the rest. The amount invested in renewable power capacity globally in 2018 (USD 289 billion) was three times as much as the investment in coal- and gas-fired power generation capacity (BNEF 2019). Despite the changing investor sentiment, the low-carbon investment required to meet the goals enshrined in the Paris Agreement would need to increase by 250 per cent by 2030 (IPCC 2018).

While the scale of investment growth required is mammoth, the current global financial system already houses many multiples of the multi-trillion-dollar capital sources needed for climate action. Estimates based on publicly available data suggest that there is nearly USD 250 trillion of commercial capital (Hewlett Foundation 2017) available globally in five primary capital pools: Asset Owners; Retail Bank Deposits; Development Finance Institutions (DFI) and Multilateral Development Banks (MDB); Private Equity; and Venture Capital. Combined with the growing global attention being directed towards mobilising public and private sources of finance to drive decarbonisation, most recently by the UN Secretary-General identifying finance as one the six priority action areas for the 2019 Climate Action Summit, the potential investor pool has raised the consciousness for enhanced private investment consistent with a pathway towards low greenhouse gas (GHG) emissions and climate-resilient development. The challenge now is to convert the consciousness into conscious action and investment. The clean energy transition will not happen on autopilot. Nor will a single shade of green, say multilateral or bilateral development assistance, suffice to meet the demand.

Who needs the money? Demand for capital in emerging economies

Despite these positive developments around rising low-carbon investment flows, and slowly improving investor confidence in clean energy investments, there is a strong link between the income levels of an economy and its energy investment. Nearly 90 per cent of energy investment in 2018 was concentrated in high- and upper-middle-income countries and regions (IEA 2019). High-income countries, with just over 15 per cent of the global population, accounted for more than 40 per cent of energy investment in 2018. In studied contrast, lower-middle and low-income countries accounted for less than 15 per cent of energy investment, despite housing well over 40 per cent of the world's population. In renewable energy investments (excluding large hydropower), of the total estimated global investment of USD 2.6 trillion from 2010-2019, only China, India, Brazil, Mexico and South Africa joined a group of developed countries, which had investments of more than USD 20 billion (UN Environment, Frankfurt School and BNEF 2019) over the entire decade (UN Environment, Frankfurt School and BNEF 2019). Further, the concentration of clean energy investment in a small group of nations is best captured by the total number of emerging markets recording investments in excess of USD 100 million in any one year. This number has stagnated at 27 countries annually, since 2010 (BNEF and Climatescope 2018).

> **The interplay of developing countries with the global energy landscape has shifted dramatically in the last fifteen years, as their energy consumption has nearly doubled**

Although developed countries were the first to embrace renewables, the sharpest increases in electricity demand, by far, are taking place in developing countries. The interplay of developing countries with the global energy landscape has shifted dramatically in the last fifteen years, as their energy consumption has nearly doubled (Center on Global Energy Policy, Columbia 2019). Developing economies now use a majority of the world's energy to support local consumption, and they are looking to even significantly larger levels of energy use going forward to power further economic and social development. There are currently over six billion energy consumers in the developing world whose demand is projected to grow another 30 per cent over the next 15 years, up from 7000 million tonnes of oil equivalent (Mtoe) in 2015 to 9100 Mtoe in 2030 (Benoit 2019). Powered in large part by rapidly expanding economies, specifically industrial growth and rising standards of living, the energy options available to developing countries and the choices they make are issues of global concern.

Several developing economies have announced policy shifts in favour of renewable energy. In recent years, renewable energy capacity addition in some countries surpassed the addition of new fossil fuel-based generation plants. Despite such progress, coal contributes 26 times more to the total primary energy supply (TPES) in non-OECD countries than renewable energy sources (solar, wind, geothermal, etc.) (IEA 2016). Such shares and trajectories are clearly inconsistent with the common goals agreed to and enshrined in the Paris Agreement. With rapidly growing energy demand and shrinking carbon space, the share of renewable energy in final energy consumption needs to be ramped up at a rapid pace, in countries around the world without exception.

But an energy transition at scale will not be driven by policy commitments alone. The cost-competitiveness of renewable energy tariffs is a major determinant of capacity addition. Analysis by the Council on Energy, Environment and Water (CEEW) of the determinants of renewable energy tariffs, disaggregating the impact of equipment-related factors and financing costs (costs of debt and equity), finds that financing costs account for the largest component – between 50 and 65 per cent – of present day renewable energy tariffs in India (Chawla, Aggarwal, and Dutt 2019), and even higher shares in other developing countries where the risk premium is higher.

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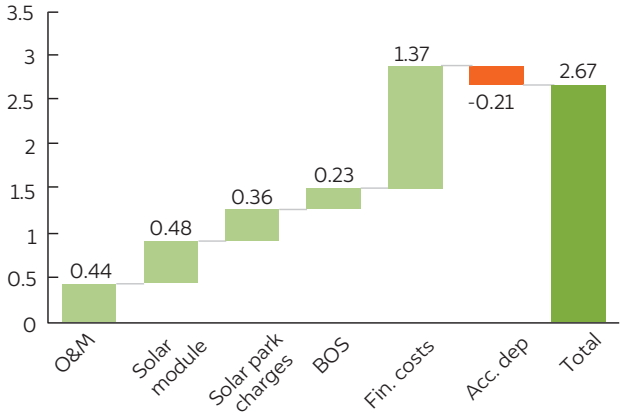
Figure 1: Anatomy of a solar tariff



Source: CEEW analysis

Historically, equipment-related factors have been the major drivers of tariff reduction. But with a high share of the tariff being the cost of capital (Figure 1), even big drops in equipment costs would not make much difference in lowering renewable energy tariffs. Instead, CEEW analysis suggests, that changes in financing costs could drive future declines in both solar and wind tariffs. Clean energy sectors could enjoy lower costs of financing if suitable policy and market-led interventions could de-risk investments and increase competition between various sources of capital.

One of the key barriers to increasing new sources of capital that enter emerging markets is the divide between capital-rich developed countries, which hold a bulk of the global supply of capital and dominate the international conversation on mobilising private capital, and developing countries with a huge demand for capital to build the infrastructure that could meet their growing energy demand. Developing countries present a huge, and largely untapped, potential for investments in renewable energy and associated assets. However, a high perception of risk precludes international private capital from flowing into these economies at scale. The demand for energy and the demand for finance converge in emerging economies. As yet, there has been very limited effort to build a robust bridge between the two.

Who fears risks? Why capital is not flowing

When it comes to renewable energy investments, China is the clear leader, accounting for 31 per cent of global renewable energy investment. But other regions have also seen steep expansions. For instance, renewable energy capacity in the Middle East and Africa increased from 3 gigawatt (GW) to 45 GW between 2010 and 2019. In 2018, developing economies invested more in renewables than developed countries, skewed due to the large investments being made in renewables in China and India. Barring investments in the two Asian giants, investments in other developing economies stood at a record USD 47.5 billion, higher than previous years but a small share of the total of USD 272.9 billion invested in 2018.

Investment decisions in clean energy, like any other infrastructure sector, are contingent upon investors' perceptions of risk-adjusted returns. Various kinds of risks could adversely impact the risk-return trade-off for investors and act as deterrents for investments. The estimation of returns is further affected by the investors' perception of risk. Investors may, and often do, overestimate the risk of new technology, or the risk of new geographies –– especially in the case of developing economies. This poses a twin challenge for renewable energy markets in emerging economies: renewable energy projects face both an availability and an affordability constraint. Several investors, especially those with limited risk appetites such as institutional investors, do not even consider investing in most developing economies. Capital that is willing to move into these markets is often priced at prohibitively high rates thanks to the combination of real and perceived risks. These risks can broadly be categorised into project-specific and non-project specific risks. Project risks are specific to the sector, in this case clean energy investments. Whereas non-project risks include broader macroeconomic and country-level risks. The main risks plaguing investments under each category are outlined below.

> Twin challenge for renewable energy markets in emerging economies: renewable energy projects face both an availability and an affordability constraint. Several investors, especially those with limited risk appetites such as institutional investors, do not even consider investing in most developing economies

Project-specific risks

- **Technology risk** is associated with a lack of proven track record with a particular technology. Factors that contribute towards this risk include lack of performance data over the lifetime of equipment and a lack of standardisation or certification of equipment.
- **Offtake risk** refers to non-compliance with the terms of the contracts by counterparties such as delays in payment, renegotiation or cancellation of these contracts. Poor financial health of offtakers (power distribution companies in many cases) heightens this risk, which is exacerbated by the general standard of contractual enforcement in the country under consideration. It is, in turn, closely linked to the non-project risk of rule of law and the financial health of state-regulated counterparties.
- **Construction and regulatory risks** are associated with the timely availability of land for setting up infrastructure projects and complementary infrastructure such as for transmission and evacuation of power, as well as timeliness and ease of securing clearances and permissions.
- **Integration risks** refer to the technical challenges posed by variable sources of power such as solar and wind energy. This is the risk associated with grid balancing and managing grid stability at high shares of renewable energy in final energy production and consumption. This risk is further exacerbated in developing economies that have a technologically less-advanced grid system, and lower capacity for integrated technical planning for renewables integration and dispatch management.

Non-project specific risks

These risks are not peculiar to investment in the clean energy sector specifically, but stem from the general investment climate associated with a particular country. Some of these risks include:

- **Foreign exchange risk,** which refers to risks of lower returns as a result of fluctuations in emerging market currencies. The lack of well-developed currency derivatives markets limits options for mitigation of these risks in emerging market currencies and acts as a deterrent to investment flows. This is especially problematic in case capital

is deployed in local currency. In the case of hard currency investments this risk falls on the borrower.

- **Political risk,** refers to the risk associated with political instability, insurgency and terrorism, corruption and risks of nationalisation. This risk often also referred to as country risk.
- **Rule of law** is the risk associated with the strength and timeliness of existing mechanisms for contractual enforcement and creditor protection.
- **Demand risk** refers to the risk posed by dampened growth in energy demand, and specifically in this context electricity demand, as compared to projections and national planning forecasts. This is a non-project risk as individual projects with contracts with counterparties remain largely unaffected. This is a challenge for the clean energy sector and its growth overall. Electricity demand growth is often closely linked with GDP growth. However, in some markets a growing economy might sit uncomfortably alongside the poor financial health of electricity distribution companies (discoms). When discoms lower the demand for how much electricity they can buy from generators, it impacts the system overall (resulting in brownouts and blackouts).
- **Lack of deep financial markets,** which determines the extent to which local currency capital is available for financing infrastructure projects.

In addition, considerations such as an *unfavourable tax regime*, characterised by high rates of taxation (corporate tax rates, capital gains taxes etc.), could affect returns on investments in emerging economies. While the risk profile of each country is unique, emerging markets around the world have a combination of these risks, varying in intensity and scale. These risks limit the flow of capital-rich to capital-poor regions.

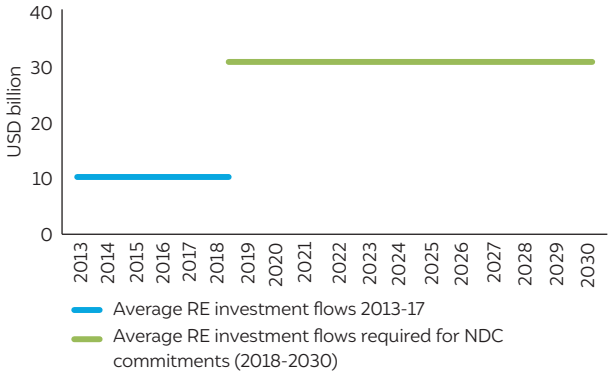
The good, bad and ugly? Evolving landscape across emerging economies

Many of the challenges and risks are common across developing countries. But there are also considerable disparities in the status of development of clean energy markets in developing economies. While policy and regulatory measures coupled with favourable market developments have achieved considerable success in de-risking clean energy sectors in markets such as India, a number of emerging economies are still characterised by fledgling markets. There is considerable scope for applying learnings from economies with more advanced energy transitions to support those in the incipient stages.

In order to analyse the prevalent risks, CEEW researchers analysed the barriers to capital flows in India (Aggarwal and Dutt 2018), Indonesia (Dutt, Chawla, and Kuldeep 2019), and South Africa (Aggarwal and Chawla 2019a). We demonstrate the impact of these varying risks on scaling renewable energy capacity, flow of capital, and the development of deep, well-functioning clean energy markets in these emerging economies. All the three countries are major drivers of global energy demand, and would need large pools of private capital at competitive prices in order to move away from a fossil fuel-based energy system.

Investment flows in India have averaged around USD 10.3 billion over a five-year period ending 2018 (UN Environment, Frankfurt School and BNEF 2019). While this level of investment flows stands only second to China in terms of emerging economy clean energy investments, meeting India's clean energy commitments to the UNFCCC would require a tripling of investment flows (CEEW and IEA 2019). The rapid increase in market activity in the last half-decade has both contributed to the steep price decline (especially in solar photovoltaic costs) and also benefited from the global cost decline in renewable energy technologies. Commissioning of new photovoltaic capacity in India stood at 11 GW in 2018, up from 10.3 GW in 2017 (BNEF 2019). But lower capital costs helped to prevent the total dollar investment required from increasing.

Figure 2: RE investment flows in India



Source: Average investment flows for 2013-18: BNEF, Global Trends In Renewable Energy Investment 2018
Average RE investment flows for NDC commitments (2018-2030): IFC

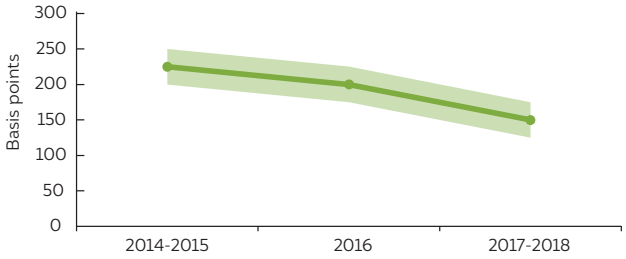
India's continued policy commitment to clean energy (175 GW by 2022 and 40 per cent non-fossil power generation capacity by 2030) has been able to successfully keep industry sentiment bullish. To some extent, this has resulted in an overall reduction in risk perceptions pertaining to India's clean energy sector. However, even as the terms and features of the capital available (debt and equity) are improving, the huge shortfall between average investments and the investment required is indicative of the persisting gap in capital demand and supply.

> **Accessible, reliable, and comprehensible data is necessary (but not sufficient) for creating deep markets and attracting investment**

Risk perceptions are further exacerbated by information asymmetry about progress made in clean energy. Accessible, reliable, and comprehensible data is necessary (but not sufficient) for creating deep markets and attracting investment. CEEW and the International Energy Agency (IEA), in their joint annual Clean Energy Investment Trends analysis, use project-level data to quantify the strides made by the sector and to lower the risk perception of investors. This has resulted in improved terms of financing. Equally, CEEW and IEA provide evidence on the adverse impact of regulatory uncertainty on the sector.

The improvement in risk perceptions pertaining to India's solar and wind sector is manifested in changes in metrics pertaining to debt financing and capital structure (CEEW and IEA 2019). This is particularly evident for the solar sector, which benefited considerably from the big push for solar from 2014. At the time, solar generation was at a nascent stage compared to the relatively more mature wind sector in India.

Figure 4: Interest rate spreads for solar PV and wind have declined



Source: CEEW & IEA, Clean Energy Investment Trends: Evolving Risk Perceptions for India's Grid-Connected Renewable Energy Projects, 2019

The capital structure of wind projects has remained stable with debt-to-equity ratios averaging 75:25. But the share of debt has risen for solar PV, with more 75:25 structures in recent years and even instances of higher debt ratios (80:20) (Figure 3).

Interest rate spreads over bank benchmark lending rates also fell between 75 to 125 basis points for both wind and solar PV between 2014 and 2018 (Figure 4) and loan tenures increased during the period between 2014 and 2018 as lenders became more comfortable in extending longer term loans (Figure 5).

Given the sharp declines in renewable energy tariffs in India, and intense market competition, renewable energy developers have felt the pressure on their profit margins. Equity investors with access to favourable sources of finance have had more success in winning project capacity at competitive auctions. These

Figure 3: Shares of debt in capital structures for solar PV have converged with and even surpassed those for wind

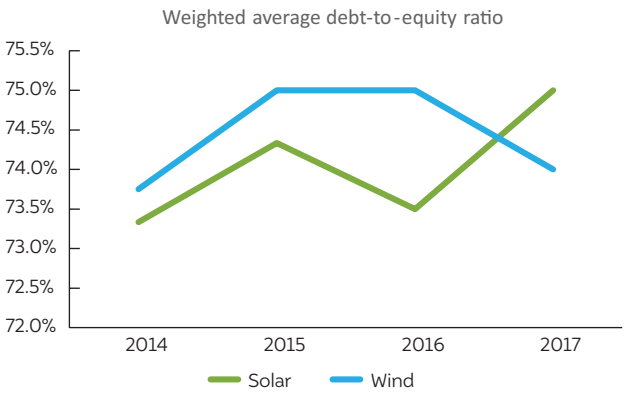
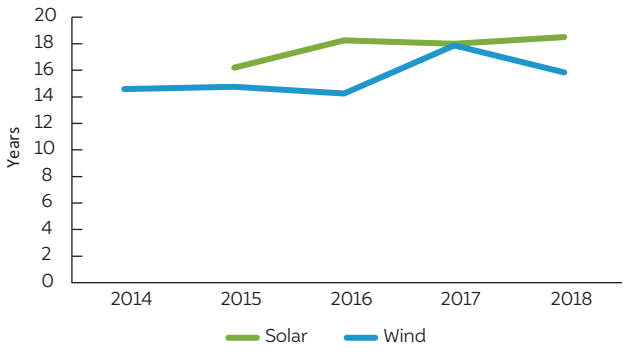


Figure 5: Evolution of loan tenures for solar PV and wind projects



Source: CEEW & IEA, Clean Energy Investment Trends: Evolving Risk Perceptions for India's Grid-Connected Renewable Energy Projects, 2019

Figure 6: Solar energy has been characterised by concentrated markets

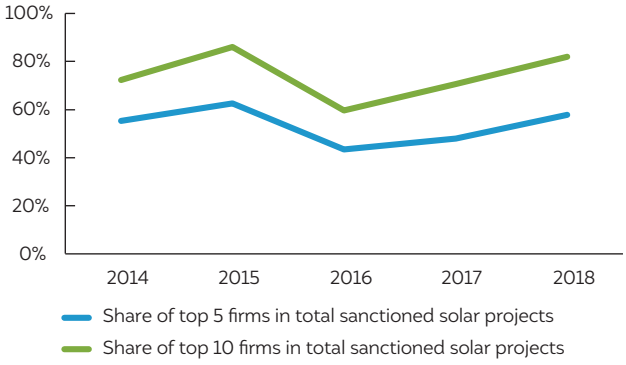
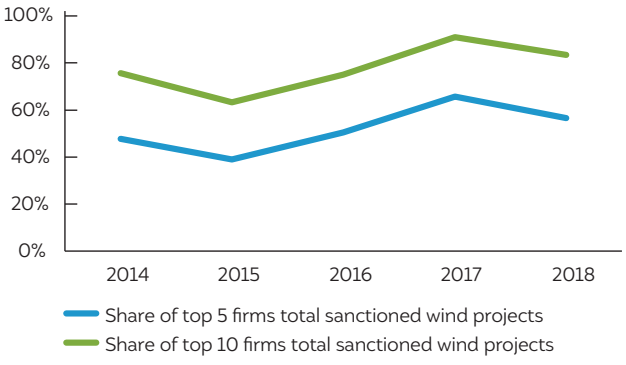


Figure 7: Wind energy has been characterised by concentrated markets



Source: CEEW & IEA, Clean Energy Investment Trends: Evolving Risk Perceptions for India's Grid-Connected Renewable Energy Projects, 2019

companies not only have the competitive advantage in structuring competitive auction bids, but are also likely have greater risk-taking capacity to navigate regulatory uncertainty.

These characteristics of the Indian renewable energy ecosystem are captured by market concentration (illustrated in figures 6 and 7). Market concentration here is defined as the share of top developers in the total project capacity awarded in a particular year. Though market concentration has witnessed some variation over the years, both solar and wind markets have been characterised by high concentration levels. Market consolidation is observed across nascent and emerging sectors, and the success of a few, rather than all, can be attributed directly to access to debt and equity, and good governance practices.

However, limited access to capital at scale for the larger universe of developers adversely impacts the pace of the overall energy transition. This problem is especially true in countries where the complex political economy of the power sector makes investments in clean energy prohibitive. Indonesia is a good example. Despite having considerable solar and wind power generation potential, 208 GW and 61 GW respectively, and both latent unmet energy demand as well as growing demand on some islands, renewable energy sources remain largely untapped. Solar and wind tariffs realised in other countries are much lower than Indonesia's average generation costs of US cents 7.66/kWh. These compare unfavourably against US cents 4/kWh in India and with lowest tariffs achieved globally standing at US cents 2/kWh and US cents 3/kWh for solar and wind, respectively.

There is recognition of this opportunity that renewable energy presents, with Indonesia's National Energy Policy (NEP) 2014 targeting at least 23 percent of new and renewable energy (NRE)[1] in the energy mix by 2025. The Indonesian electricity utility PLN (which is a vertically integrated behemoth) also targets 23 per cent renewable energy in the electricity generation mix by 2025, and a planned renewable energy capacity addition of 16.7 GW over the period 2019-2028. However, planned solar and wind capacity addition over the 2019-28 period so far stands at a meagre 908 MW and 855 MW respectively (PLN 2019).

Multiple interests and the complex governing mechanisms have resulted in heightened risks for investors, thereby constraining the growth of renewable energy investments in Indonesia. These include: uncertainty over a pipeline of projects, regulatory provisions impacting project viability and bankability, transmission related risks, challenges in land allotment and acquisition, and absence of strong and clear policy ambition for variable renewable energy.

While policy and finance have a role in India's rapidly growing clean energy markets and the complex ecosystem of the Indonesian markets is inhibiting progress there, South Africa makes for an interesting juxtaposition to both of these cases. South Africa was the poster child of a modern renewable energy policy and auction framework, which informed its market design at the start of this decade. However, sustained policy uncertainty, project execution delays, and political upheaval from 2015 to mid-2018 resulted in a major slowdown in the renewable energy sector, with investors looking away from investing in renewable energy capacity in South Africa. In mid-2018, government agencies tried to revive investor sentiment

1 This includes hydro, geothermal, solar, wind, biomass and other renewable sources.

by signing 2.3 GW of power purchase agreements (PPAs), which had been outstanding for three years.

So even as South Africa battles with its vertically integrated energy utility Eskom's outstanding debt of USD 35 billion (Aggarwal and Chawla 2019a) there is major domestic market interest in scaling up renewable energy supply. This can be attributed to three major drivers, and yields many lessons for other emerging economies. The first is the availability of domestic currency financing. Renewable energy assets in South Africa are predominantly funded through domestic sources of capital, and denominated in domestic currency even if through foreign capital. This is particularly helpful as the independent power producers do not have to bear any currency risk. Some of the power producers do have US dollars or Euro-denominated engineering, procurement and construction contracts but these are accompanied with upfront forex swaps, which mitigate the burden of currency fluctuations. There is large appetite in the domestic debt market, predominantly from banks, to finance renewable energy projects.

Secondly, South African renewable energy PPAs are one of the most bankable in the developing world. The Implementation Agreement (IA), signed between the government and renewable energy developers, guarantees any sum due from ESKOM to the developers within 40 business days (Aggarwal and Chawla 2019a). The take-or-pay clauses around technical curtailment provide adequate comfort to renewable energy investors. Commissioning timelines for the renewable energy projects are usually three years, allowing renewable energy developers to procure their input materials strategically and take advantage of any price movements over the course of construction period.

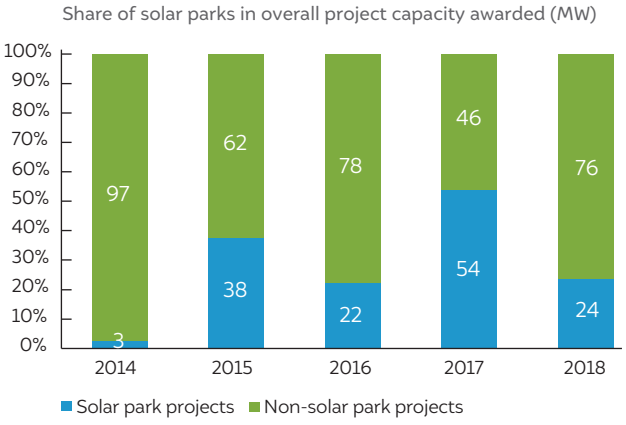
> **South African renewable energy PPAs are one of the most bankable in the developing world. The Implementation Agreement, signed between the government and renewable energy developers, guarantees any sum due from ESKOM to the developers within 40 business days**

Certainty over demand growth is the third driver for investors in South Africa, and one that is common across developing countries. However, the certainty and accuracy of the forecasted growth is central to providing investor comfort. In the South African context, load shedding has been a norm since 2008. As much as 9.5 GW of outages are likely in the winter of 2019 due to shortages in the power being procured (ESCOM 2019). Unreliable and poor quality of coal supplies has been the primary reason for such poor operational performance of many of South Africa's established and newly built thermal plants such as the Medupi power plant (ESCOM 2019). Renewable energy plants do not face such supply chain risks, and are seen by policymakers and South Africans as a reliable alternative to mitigate load shedding. Further, more than 10 GW of thermal capacities are set to retire in South Africa by 2030. This would effectively translate into 36 GW of renewable energy market for project developers[2].

The evidence on both the drivers and challenges from emerging economies around the world has lessons for countries to develop policy and market-based solutions to systematically address the risks constraining investments, such that global capital supplies can flow towards these demand hubs for clean energy investment.

Policy plays a key role in addressing some of the key market challenges and enhancing investor sentiment. One such instance is India's experience with resolving land acquisition and transmission related constraints, which presented a significant challenge for international developers and investors. India resolved this through the development of solar parks (or aggregated land parcels with power evacuation infrastructure available for a fee), which allow developers to adopt a plug-and-play model. The ease of doing business and the reduced

Figure 8: Solar parks have driven India's solar capacity deployment

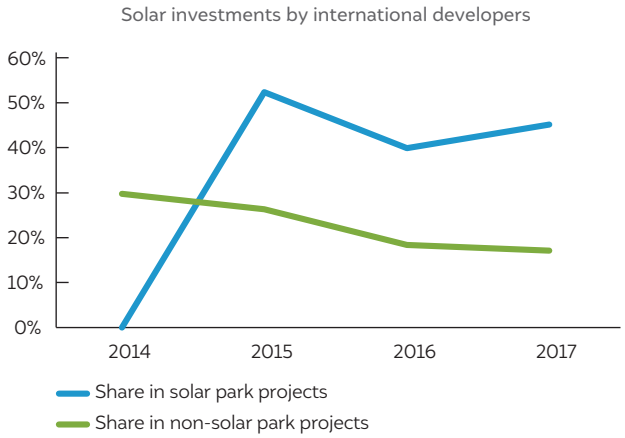


Source: CEEW & IEA, Clean Energy Investment Trends: Evolving Landscape For Grid-Connected Renewable Energy Projects In India, 2018

2 Assuming a capacity-weighted average CUF for wind and solar plants and PLF for thermal plants to be 25% and 90% respectively.

construction phase timelines also allow developers to access cheaper capital. Solar parks have been instrumental in driving solar capacity addition in India (Figure 7). This simplified deployment model presented has found favour with foreign investors (Figure 8), driving greater foreign investment into India's renewable power generation sector.

Figure 9: Solar parks have been the preferred mode of project deployment for international investors and developers



Source: CEEW & IEA, Clean Energy Investment Trends: Evolving Landscape For Grid-Connected Renewable Energy Projects In India, 2018

Plugging the gap? Evolving capital structures to respond to evolving markets

Investments in energy require long payback periods and create assets that last a long time. These factors build in an inherent conservatism among investors. For renewable energy, this hesitation is compounded by the need for large upfront investments and the risks associated specifically with clean energy. At a systemic level the challenge is short-termism in finance, especially in developing countries. Despite a mandate to secure long-term returns, even pension funds and other institutional investors are often looking for short-term gains in financial markets.

On the supply side, investors are found to be seeking "bankable" projects, and lament the lack of a strong enough pipeline in developing countries. This is a problem of both scale and risks. While the problem of investment size is particularly palpable for rooftop and decentralised energy projects, ticket size is not a major limiting factor for investments in utility scale renewables. However, most developing economies still do not offer the scale and ambition being sought. This coupled with the modest credit ratings of most renewable energy projects, particularly in the Global South, make it harder for them to attract such investment.

> **But the pace at which renewable energy can be deployed exceeds the pace of broader reforms, thereby compounding long-terms risks for these assets. However, in order to finance the energy transition around the world, and not just in more stable and developed economies, the financing mechanics must also evolve**

However, these challenges are not insurmountable. There are attempts across the world to upgrade transmission networks, or strengthen the sanctity of contracts. But the pace at which renewable energy can be deployed exceeds the pace of broader reforms, thereby compounding long-terms risks for these assets. However, in order to finance the energy transition around the world, and not just in more stable and developed economies, the financing mechanics must also evolve. There is an urgent need to develop de-risking instruments that respond to the real challenges in the developing world, and bridge the gap between investor risk appetite and project realities.

Common Risk Mitigation Mechanism

As we have argued here, the profile of risks might be common across many developing and emerging economies, but their relevance and intensity could vary. Is there a way to design a de-risking instrument that captures a suite of risks but stays flexible enough to cover for the specific risk profile of projects as they vary from one country to another?

In May 2017, the governments of Argentina, Australia, Brazil, Burkina Faso, Cameroon, Chad, France, India, Ivory Coast, Mali, Namibia, Niger, Nigeria, Senegal, Seychelles, Uganda and Yemen entrusted an international multi-stakeholder taskforce with the mission to define and structure a common mechanism aimed at de-risking investments in solar under the aegis of the International Solar Alliance. The Common Risk Mitigation Mechanism (CRMM) was designed to pool multiple risks (political, off-taker, and foreign

exchange risks), and have many participating countries, capitalised through multiple sources of public money (CEEW 2017). The pooling of risks would reduce double counting of risk variables, providing a single guarantee cover at prices lower than the additive price of existing insurance products.

The premise of the CRMM is that a multi-risk and multi-country approach reduces the exposure for any single country, investor or project developer. First designed by CEEW, the Currency Exchange Fund (TCX) and the Terrawatt Initiative (TWI), the CRMM was designed to use pooled public resources to crowd in more, newer and cheaper private investment into grid-connected solar assets around the world. In the long run, the CRMM could create a sustainable market, making clean energy less reliant on public investment. If successfully implemented, it could leverage small amounts of public funds to crowd in billions of dollars of investment. Additionally, the CRMM cover for projects could deepen markets by underwriting risks, lowering transaction costs (homogenous credit rating of aggregated assets), and, in turn, improve liquidity of assets. New investment flows from many sources would also make capital more competitive – and cheaper – for renewable energy.

Grid Integration Guarantee

One of the criticisms often levelled against renewable energy is that it is intermittent. By being hostage to when the sun shines or the wind blows, renewables-based electricity threatens the stability of the grid. This problem can be solved but the infrastructure, regulation and policy for the effective integration of renewable energy into the electricity grid is increasingly proving to be inadequate, both in India and around the world. This is emerging as a major impediment in increasing the penetration of renewable energy in the energy mix of many countries. In turn, developers are losing revenue thanks to the curtailment of renewable power. Put simply, if the electrons generated from renewable energy have nowhere to go, they are lost –– and each lost electron cuts into potential revenue for a power producer. This poses a critical challenge on investor confidence, due to dampened certainty on cash flows.

An urgent, interim solution is needed to ensure curtailment does not make existing and upcoming RE projects unviable. In the Indian context, although renewable energy tariffs are among the lowest in the world, these tariffs do not factor in high curtailment risk. When this risk manifests, banks, investors and developers are often left with stressed assets. This risk is growing as the share of renewable energy in the electricity mix continues to rise rapidly.

The Grid Integration Guarantee (GIG) indemnifies solar and wind generators against loss of revenue due to the curtailment of renewable power from the grid (CEEW 2018). Risk premiums on the GIG would further inform policymakers about the feasible pace of renewable capacity additions and help quantify the cost of grid integration(Aggarwal and Chawla 2019b). Power systems across the world use sophisticated dispatch and communication systems. CEEW has designed the GIG by using the data generated in power systems operations to model and calculate premiums using a combination of actuarial methods and big data techniques (Aggarwal and Chawla 2019b). The GIG could cover the tail-end curtailment risk with market reflective pricing, such that it could either be used to hedge the risks of a project, or an entire power purchase agreement linked clean energy portfolio. The GIG could help build investor confidence as it would help to enhance credit thanks to the risk buffer, but also help build market familiarity for investors who would be able to correctly evaluate the risk profile of projects despite the buffer (as opposed to a blanket enhancement facility).

These examples give a sense of the bespoke solutions required to address project and market risks, such that developing countries are able to attract financial capital at scale, from multiple sources, and at declining rates for longer tenures.

Means of raising additional international capital

The energy transition in developing economies requires the mobilisation of capital at a massive scale. As indicated even relatively advanced markets such as India, which has made considerable headway in the deployment of clean energy, annual investment flows need to be tripled from present levels to meet long-term deployment goals. Given the debt-heavy characteristics of clean energy projects, this translates into a requirement for mobilising debt capital at scale.

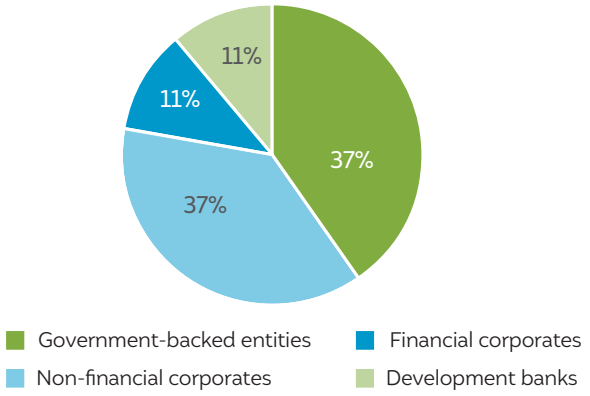
In India while traditional sources of debt capital, namely banks and non-bank financial institutions, have driven investment flows into clean energy, these are not sufficient to bridge the gap between present and desired debt flows. Limitations such as asset-liability mismatches in financing long-term clean energy projects, sectoral lending limits for banks, a high proportion of non-performing assets on the balance

sheets of financial institutions, and liquidity constraints for non-bank financial institutions, constrain the expansion in debt capital for clean energy. The situation would not be dissimilar in many other developing and emerging economies.

> Globally, the green bond market has rapidly grown from USD 36.6 billion in 2014 to USD 168 billion in 2018

Instead, the bond market, specifically the subset of green bonds, offers a useful complement to existing sources of debt capital for financing clean energy projects. Green bonds are a type of bond instrument where the proceeds are exclusively applied to finance or re-finance, in part or in full, new or existing eligible green projects. The Indian green bond market witnessed its first issuance in February 2015 and 27 green bonds have been issued by 18 issuers until May 2019, cumulatively amounting to USD 7.6 billion[3] (Dutt et al. 2019). Both government-backed entities (primarily financiers) and non-financial corporates from the private sector have driven the issuance of green bonds (Figure 9). Globally, the green bond market has rapidly grown from USD 36.6 billion in 2014 to USD 168 billion in 2018 (CBI 2019).

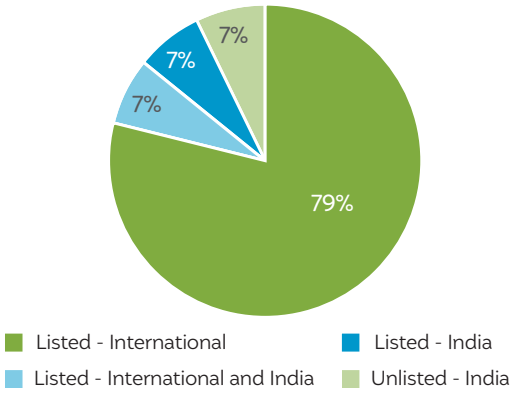
Figure 10: Both government-backed entities and non-financial corporates have driven Indian green bond issuances



Source: Dutt, Arjun, Abhinav Soman, Kanika Chawla, Neha Kumar, Sandeep Bhattacharya, and Prashant Vaze. 2019. Financing India's Energy Transition: A Guide on Green Bonds for Renewable Energy and Electric Transport. New Delhi: Council on Energy, Environment and Water

However, the bulk of Indian green bond issuances have been issued in US dollars (Figure 10) and listed in international markets (Figure 11). These point towards the current limitations of India's domestic bond markets, which are underdeveloped relative to developed country markets, reiterating the need for international capital to participate as well as highlighting the additional risk posed by hard currency financing.

Figure 11: Indian green bond issuances listed predominantly in international markets



Source: Dutt, Arjun, Abhinav Soman, Kanika Chawla, Neha Kumar, Sandeep Bhattacharya, and Prashant Vaze. 2019. Financing India's Energy Transition: A Guide on Green Bonds for Renewable Energy and Electric Transport. New Delhi: Council on Energy, Environment and Water

Refinancing primary debt through bonds not only lowers the cost of capital for operational projects but also increases the industry's access to institutional investors, such as insurance, pension and mutual funds. Bond markets can provide access to fixed-rate (fixed-coupon) debt, providing greater certainty over debt repayment to renewable energy and electric mobility projects compared to floating rate debt from banks and non-banking financial corporations.

Beyond bonds, several other means of accessing capital at improved terms need to be developed, tested, and mobilised at scale to be able to facilitate the nature of capital flows required to finance the global energy transition. Designing and deploying these market-specific and bespoke financial solutions would need the active involvement of public and private institutions in emerging markets. That is where the demand is and the innovations in finance need to respond accordingly.

> Lenders are mostly hesitant to undertake asset financing, seeking additional collaterals or guarantees to unlock finance for these new-age consumer led solutions, as secondary markets for these solutions don't exist

3 This figure includes both certified and non-certified green issuances

In the context of distributed solutions, such as rooftop solar systems, energy efficiency interventions, and renewable energy for productive uses such as water pumping for agriculture etc, there is a large potential for economic savings. The market size of the opportunity to support livelihoods in rural India with clean energy innovation exceeds USD 50 billion, in addition to productivity benefits accruing the farm and MSME sectors (Sanchit Waray 2018). Despite this the adoption of clean energy solutions among residential consumers and micro, small and medium enterprises (MSMEs) in developing countries remains low. Lack of access to affordable capital acts as a significant impediment for these consumers. Lenders are mostly hesitant to undertake asset financing, seeking additional collaterals or guarantees to unlock finance for these new-age consumer led solutions, as secondary markets for these solutions don't exist. In order to address the barrier of high transaction cost on small loan sizes, and the credit rating barrier for individual projects, an active intermediary that pools projects to create a strong pipeline of significant size, and a blended credit rating that is bankable, through a warehousing facility could be an easy way to raise pools of capital for multiple clean energy projects, be it in electric mobility, distributed renewable energy, or energy efficiency applications.

A more optimum equilibrium? Matching demand and supply for capital at scale

The sustainable low-carbon transition to a cleaner energy mix in the developing world needs neither free technology nor tied aid grants but fit-for-purpose market responsive financial products. A robust energy transition will need deep markets, which need support, monitoring, and correction. Markets and instruments that enable the deployment – at scale – of climate-friendly solutions in seemingly difficult environments are becoming increasingly critical. The absence of deep markets in emerging economies makes investment in clean technologies risky and prevents capital from flowing from where it is in surplus to regions where it is needed most. There is a need for committed action to build the conduits via which capital can flow from the Global North to the Global South.

> There is a need for committed action to build the conduits via which capital can flow from the Global North to the Global South

As one approach, we propose a **Climate and Clean Energy Finance Commission**. This Commission would comprise climate and clean energy practitioners and thought leaders from the Global South, which would be convened to join existing task-forces on climate finance convened by the United Nations and beyond, to deliberate on the means of mobilising finance specifically for emerging markets. Leveraging their understanding of the very specific political economy and distinct challenges prevalent in the developing markets, along with participation from leading investment groups, the Commission would design a targeted plan for leveraging existing institutions and governance structures to address the twin challenges of accessibility and affordability of capital for the energy transition. In order to be concrete in its recommendations, the Commission would be time-bound with a focus on implementation and impact. As designed, the Commission would be intentionally biased towards solving the capital gaps in emerging economies. This would be different from existing initiatives, which however well-intentioned, continue to be dominated by actors from capital-rich countries but who do not have deep understanding of the local political economy in emerging markets.

Evidence from developing economies suggests the strong value that could accrue from a learning exchange programme between them. An **Africa-India Clean Energy Co-Learnings Programme** could facilitate business to business exchanges between leading players in emerging markets. The expectation would be not just the transfer of lessons on what worked and what did not in building clean energy markets in these economies. It would also result in the creation of a more aggregated market where developing countries would have greater collective bargaining power as price-makers rather than price-takers. The main focus of the learning exchange could be on financing. Industry collaboration on financing structures, treatment of capital, financial interventions, and accessing long tenure, low-cost capital, could be some concrete outcomes of the exchange.

A third approach is to reduce information asymmetries between clean energy projects, on one hand, and prospective investors, on the other. The **CEEW Centre for Energy Finance** acts as a non-partisan market observer and driver that monitors, develops, tests, and deploys financial solutions to advance the energy transition. It aims to help deepen markets, increase transparency, and attract capital in the clean energy sectors of emerging economies. It achieves this by

comprehensively tracking, interpreting, and responding to developments in these emerging clean energy markets while also bridging gaps between governments, industry, and financiers. Each market will need specific market responsive solutions to enable the flow of private capital, and the CEEW Centre for Energy Finance will support in designing, testing, and implementation of these solutions.

India has several learnings to share on the means to address risks prevalent in clean energy markets in emerging markets, such as the risk posed by the poor financial health of utilities (offtake risk), currency fluctuations (forex risk), and the risk of integrating variable renewables in an overburdened grid (curtailment risk). Similarly, there are lessons in some African countries that could yield great returns if scaled up across the continent, and in India. These include examples of innovative financial design to attract domestic savings into clean energy assets (as in South Africa), aggregation of solar projects to access large sums of private capital (as in Kenya), and strengthening regulatory processes to enhance bankability (as in Egypt). There is a need for these lessons to not just be replicated across the developing world, tailored for need and context, but for these improvements to also be rewarded with increased capital flows.

> **The promise of climate funds has largely under-delivered thus far. Without market readiness, investors will remain wary and public funds will struggle to leverage private capital**

The promise of climate funds has largely under-delivered thus far. Without market readiness, investors will remain wary and public funds will struggle to leverage private capital. However, both the urgent need for climate action as well as the policy push and momentum for clean energy deployment in developing economies needs capital to flow into viable projects in countries around the world as the norm, rather than the exception.

This brief demonstrates that the energy transition in the countries where energy demand will grow the most is hemmed in by the lack of a literate conversation on finance. A decade of inaction has convinced developing countries that one shade of green capital in the form of multilateral climate finance is neither adequate nor forthcoming. Meanwhile, many developing countries have demonstrated that private capital is indeed looking for new opportunities to deploy, should the right policy frameworks be in place. This is encouraging but still inadequate.

Instead, different shades of green capital (institutional investors, venture capitalists, private equity players, etc.) can find their way into diversified portfolios of projects, within and/or across countries. What is missing is a serious attempt to unpack the risks and how they vary from one country or region to the next. Thereafter, *sui generis* financial solutions must be developed. These could happen, for example, by pooling risks and projects across countries, or insuring against power curtailment, or tapping into the international green bond market, designing warehousing facilities for distributed energy projects, or creating better end-user financing for electric mobility. Small amounts of public money can create a deeper ecosystem to prepare, absorb and deploy local and international capital at scale for clean energy infrastructure. De-risking investments in the ways described here would offer greener pastures for green investments.

All art, it is said, is political. But it is the political conversation on climate and clean energy finance that is needed to create the conditions in which clean energy finance can thrive. The September 2019 UN summit is one such opportunity – to convert the political moment into artful forms of raising and delivering finance. There will be other markers over the next year (when the Paris Agreement gets operationalised) to acknowledge, analyse and create alternatives to beat entrenched political veto points. Once that is done, and with credible Southern voices at the table, there would be greater likelihood that the appropriate financial solutions are, indeed, being developed and deployed.

> **But it is the political conversation on climate and clean energy finance that is needed to create the conditions in which clean energy finance can thrive**

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CEEW Centre for Energy Finance

The CEEW Centre for Energy Finance (CEEW-CEF) is an initiative of the Council on Energy, Environment and Water (CEEW), one of South Asia's leading think tanks.

CEEW-CEF acts as a non-partisan market observer and driver that monitors, develops, tests, and deploys financial solutions to advance the energy transition. It aims to help deepen markets, increase transparency, and attract capital in clean energy sectors in emerging economies. It achieves this by comprehensively tracking, interpreting, and responding to developments in the energy markets while also bridging gaps between governments, industry, and financiers.

The need for enabling an efficient and timely energy transition is growing in emerging economies. In response, CEEW-CEF focuses on developing fit-for-purpose market-responsive financial products. A robust energy transition requires deep markets, which need continuous monitoring, support, and course correction. By designing financial solutions and providing near-real-time analysis of current and emerging clean energy markets, CEEW-CEF builds confidence and coherence among key actors, reduces information asymmetry, and bridges the financial gap.

Financing the energy transition in emerging economies

The clean energy transition is gaining momentum across the world with cumulative renewable energy installation crossing 1000 GW in 2018. Several emerging markets see renewable energy markets of significant scale. However, these markets are young and prone to challenges that could inhibit or reverse the recent advances. Emerging economies lack well-functioning markets. That makes investment in clean technologies risky and prevents capital from flowing from where it is in surplus to regions where it is most needed. CEEW-CEF addresses the urgent need for increasing the flow and affordability of private capital into clean energy markets in emerging economies.

CEEW-CEF's focus: analysis and solutions

CEEW-CEF has a twin focus on markets and solutions. CEEW-CEF's market analysis covers energy transition–related sectors on both the supply side (solar, wind, energy storage) and demand-side (electric vehicles, distributed renewable energy applications). It creates open-source data sets, salient and timely analysis, and market trend studies.

CEEW-CEF's solution-focused work will enable the flow of new and more affordable capital into clean energy sectors. These solutions will be designed to address specific market risks that block capital flows. These will include designing, implementation support, and evaluation of policy instruments, insurance products, and incubation funds.

CEEW-CEF was launched in July 2019 in the presence of H.E. Mr Dharmendra Pradhan and H.E. Dr Fatih Birol at *Energy Horizons*.

cef.ceew.in

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