CLIMATE POLICY INITIATIVE

# Blended Finance in Clean Energy: Experiences and Opportunities

Bella Tonkonogy
Jessica Brown
Valerio Micale
Xueying Wang
Alex Clark

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BUSINESS & SUSTAINABLE DEVELOPMENT COMMISSION

BLENDED FINANCE TASKFORCE

This working paper was commissioned by the **Blended Finance Taskforce** and contributes to its consultation paper "Better Finance, Better World". The Taskforce was launched as an initiative of the Business & Sustainable Development Commission in 2017 to look at blended finance from a private sector perspective and to see how blended finance can make the SDGs more "investable" for commercial players. The Taskforce is developing an action plan to rapidly scale the blended finance market in order to mobilise more private capital for the SDGs, particularly for sustainable infrastructure in emerging markets and would welcome your feedback.

The Taskforce commissioned a series of working papers on blended finance (including this one) to contribute to this action plan. "*Mobilising Institutional Capital at Scale for the Global Goals Through Blended Finance*" was prepared by **Convergence** (and **Tideline** in an advising role) and catalogues investment motivations, requirements, and constraints of institutional investors in taking advantage of blended finance mechanisms. "*Blended Finance in Clean Energy*" was prepared by the Climate Policy Initiative and analyses opportunities where blended finance can mobilise large scale private capital for clean energy. "*Financing Sustainable Land Use*" was prepared by **KOIS Invest** and explores how to unlock business opportunities in sustainable land use with blended finance.

All reports available at http://businesscommission.org/

## Descriptors

| | | |
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| Contact | Bella Tonkonogy | Bella.Tonkonogy@cpiclimatefinance.org |
| | Valerio Micale | Valerio.Micale@cpiclimatefinance.org |

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## About CPI

With deep expertise in policy and finance, CPI works to improve the most important energy and land use practices around the world. Our mission is to help governments, businesses, and financial institutions drive growth while addressing climate risk. CPI works in places that provide the most potential for policy impact including Brazil, Europe, India, Indonesia, and the United States.



# Executive Summary

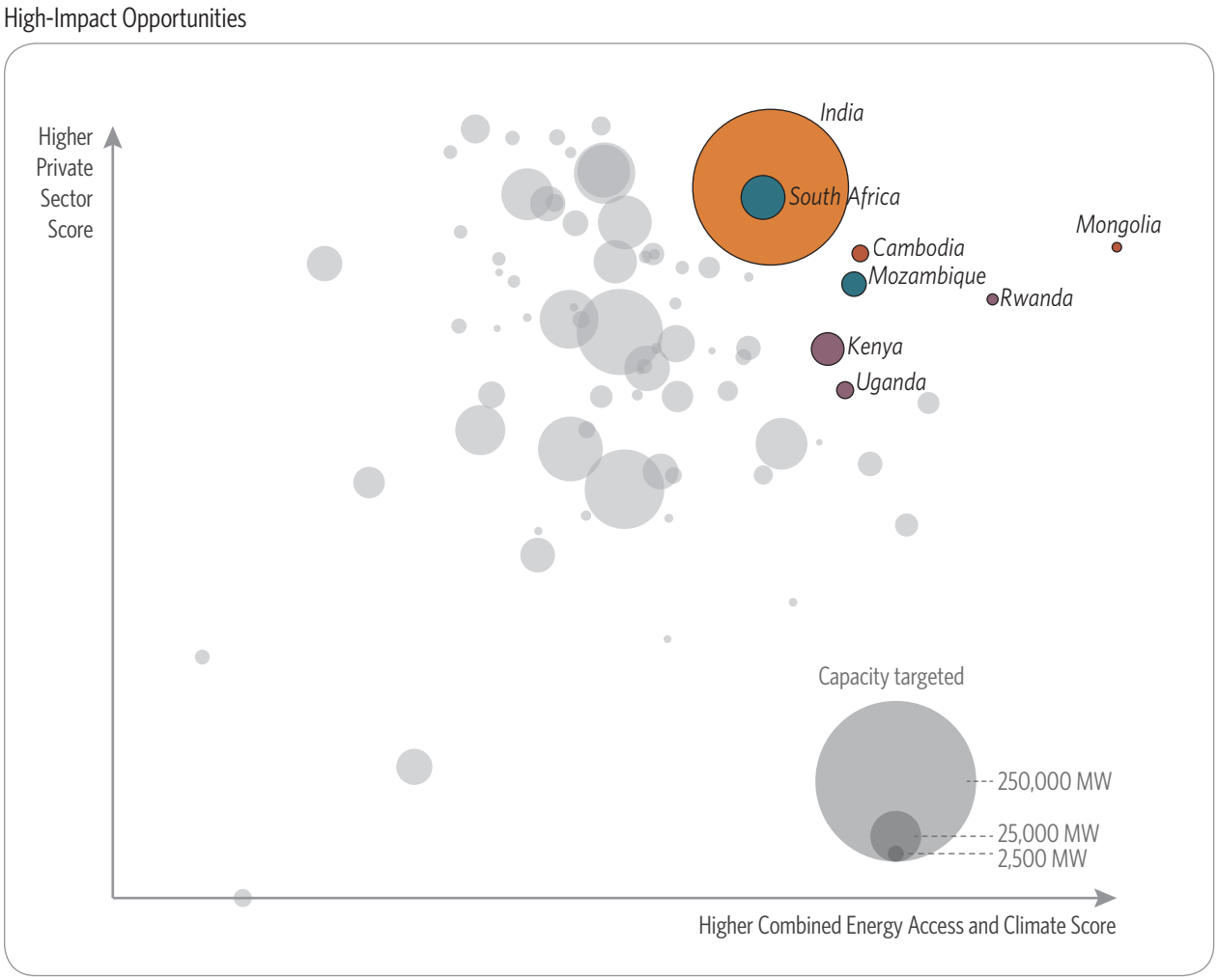
The combined challenges of energy access and climate change present major needs for clean energy investment. The Paris Agreement and United Nations' Sustainable Development Goals, negotiated in 2015, represented an inflection point for moving from talk to action in order to address two of the world's most important challenges. The objective is clear: mobilize investment to meet the goal of limiting global warming to, at most, 2 degrees Celsius while also bringing electricity to the more than 1 billion people globally who do not yet have access to it.

Within developing economies, there are significant opportunities to increase investment in clean energy: by 2030, non-OECD countries are projected to increase demand for electricity by 63 percent from 2014 levels (OECD, 2017a). This nearly 7,000 terawatt hours (TWh) of additional demand represents 85% of the expected global demand increase for that same time period (IEA, 2016).

Many developing economies already offer strong environments for investment. Countries including Mexico, Chile, Thailand, Peru, Malaysia, and China, among others, offer strong institutions and favorable policy environments, which are reflected in high sovereign investment-grade ratings.

This report looks at what is needed to unlock investment opportunities in developing economies that are still catching up. We evaluated, by geography and clean energy sector, the most significant opportunities for impact on both climate change and energy access per dollar invested; the risks and barriers that prevent investment; and how blended finance could be deployed to address investor needs.

We find that the greatest opportunities for blended finance in clean energy are in Sub-Saharan Africa and South and East Asia, with a subset of eight countries alone offering more than USD 360bn in investment potential in clean energy by 2030 (see following bubble chart).



Private investors, in particular, should note the investment potential in the following:

1. Large, relatively mature geographies, such as India and South Africa, which offer strong renewable energy policy environments and a wide variety of investment opportunities;
2. Smaller countries in which grid-connected projects in hydro, wind, solar, and geothermal can be diversified via global and regional investment vehicles; and
3. The nascent, yet quickly growing, distributed generation market, particularly in countries with large populations still without access to energy, through corporate finance and securitized assets.

Even though clean energy costs have come down significantly in recent years, risks and barriers remain in these countries and are preventing investment. The top risks identified in our research are off-taker risk, currency risk, policy risk, and liquidity and scale risks. In addition, many early stage projects and clean energy companies face barriers in accessing financing.

We looked at 75 blended finance initiatives in clean energy, diving in depth into a subset of them, to understand how barriers are currently being addressed and remaining gaps. We found, among others, that:

1. The experience to date of blended finance in clean energy offers ample successes and room for improvement going forward;
2. As clean energy closes the "viability gap" with fossil fuels, there is a gap between the investment risks and barriers addressed by earlier blended finance initiatives and those cited by investors as most important to address going forward, with liquidity, off-taker, and currency risks less frequently addressed to date;
3. There is a gap between the types of instruments most needed and those offered: risk mitigation instruments, such as guarantees and insurance, are less frequently offered than direct investment; there are also major gaps in local currency financing, early stage risk financing, and vehicles that aggregate projects, especially small ones; and
4. The limited scale of blended finance initiatives – both through direct investment vehicles as well as indirect blended finance via risk mitigation – likely limits the participation of many investors.

Blended finance is essential to increase private investment in critical markets, but changes to how it is deployed would increase its success in supporting global goals and mobilizing private investment. In particular, we recommend to blended finance practitioners that:

1. Blended finance efforts focus on the highest impact opportunities. Our analysis identifies markets in Southeast Asia, Sub-Saharan Africa, and South Asia that have high relevance for climate change mitigation and energy access and broadly conducive environments for private sector investment, yet ongoing needs for blended finance;
2. Developers of blended finance initiatives target the most commonly cited risks to private investors; and
3. Achieving scale will require, among others: supporting initiatives that are ripe for expansion, as risks can remain even after a successful pilot; building sustainability through technical advisory services and supporting networks that generate new ideas and partnerships; and improving efficiency by streamlining approval processes.

Many innovators are already taking these lessons and building the next generation of blended finance initiatives. Promising approaches are highlighted throughout the report.

# Contents

# 1. Introduction

**The combined challenges of energy access and climate change present major needs for clean energy investment.** The Paris Agreement and United Nations' Sustainable Development Goals, negotiated in 2015, represented an inflection point for moving from talk to action in order to address two of the world's most pressing challenges: mobilizing investment to meet the goal of limiting global warming to, at most, 2 degrees Celsius, while also bringing electricity to the more than 1 billion people globally who do not yet have access to it.

While the objectives set by both agreements are ambitious, falling clean energy costs bring the achievement of these targets within reach. Technology costs decreased by an average of 10% between 2015 and 2016, with particular decreases in solar (Buchner et al, 2017). In 2016, capacity additions in PV solar surpassed the growth of coal. These trends have led the International Energy Agency to revise up its forecasts of solar PV capacity growth by over one third from its report issued just last year (IEA, 2017b). The market for off-grid solar, which is key to addressing lack of energy access, is also accelerating, though still small (SE4All, 2017).

However, despite both the need and the opportunity, barriers remain for the main investor groups to invest in developing economies. While institutional investors and commercial banks are the largest asset managers globally (PPIAF, 2013), they face significant constraints in investing in clean energy, and particularly in developing economies. Investors regularly express concerns over the volatility of developing economy currencies; the risks of policy and political change; the reliability of renewable energy buyers, whether utilities or individuals, to pay for the services; and the lack of scale of investments, among others (see, e.g., Frisari et al, 2013).

**Blended finance instruments that address these barriers and risks are a promising solution to increase investment in clean energy.**[1] Blended finance is defined in this report as "the use of public/philanthropic funds to mobilize multiples of additional private capital."[2] In particular, the focus is on the use of "concessional" capital—that is, capital that is extended at below market terms—both directly within the financing structure of an investment (or, the "capital stack") and indirectly by using concessional capital to catalyze investment (e.g., through the use of a guarantee or a grant for project preparation).[3] To narrow the scope, this report does not consider support through policy and other generalized public subsidies, such as tax credits and feed-in tariffs, as blended finance.

There is already a lengthy track record of blended finance in clean energy. Public and philanthropic institutions, including multilateral development banks such as the World Bank Group, multilateral climate funds such as the Global Environment Facility, bilateral development finance institutions such as the Netherlands' FMO, and bilateral aid agencies such as the UK's Department for International Development, have long experimented with different approaches to mitigating or transferring risk to leverage private investment for clean energy. This report draws lessons learned from these experiences and outlines a path forward for the next generation of blended finance in clean energy.

1 This report adopts the definition of clean energy to be consistent with the Business & Sustainable Development Commission (BSDC)'s report on Better Business, Better World. The BSDC created the Blended Finance Taskforce, which commissioned this report. The BSDC's clean energy definition includes renewable energy generation, energy transmission, distribution, and storage, and carbon capture and storage. Other critical focal areas for energy-related emissions reductions, including energy efficiency, are separate categories in the Commission's report, and their exclusion in the present report does not imply any difference in importance.

2 This report adopts this definition of blended finance to be consistent with the Blended Finance Taskforce, which commissioned this report.

3 This report considers public concessional investors as government grant making agencies such as bilateral aid agencies and multilateral trust funds (such as the Green Climate Fund and Global Environment Facility). While from a private investor perspective development finance institutions (DFIs) (including multilateral development banks, bilateral development finance institutions, and national development banks) often offer rates lower than what can be obtained in local commercial markets – primarily due to their global/regional diversification and sovereign backing – they are not typically considered sources of "concessional" finance as they are profit-making and self-sustaining. They require additional sources of concessional capital to deploy "blended finance". For example, some of them have windows, such as the World Bank Group's International Development Association, that focus on lower income economies and are considered concessional as they need periodic replenishment. Many also access concessional capital via the Green Climate Fund, Global Environment Facility, and previously, the Climate Investment Funds.

**This report attempts to:**

1. understand the clean energy investment opportunity by evaluating the investors, countries, and technologies that are best suited to play a role in mobilizing greater investment in clean energy, and by looking at what is stopping this from happening (Sections 2 and 3);
2. map the blended finance landscape: the trends, lessons learned, and gaps in blended finance offerings to date (Section 4); and
3. recommend how blended finance can be better deployed to meet the opportunities identified (Section 5).

**The report draws heavily on:**

- previous CPI research on renewable energy policy and finance, and case study analysis (SGG case studies");[4]
- CPI learnings as Secretariat of the Global Innovation Lab for Climate Finance and its sister programs (The Lab);[5]
- previous CPI work on Risk (Frisari et al,, 2013; Micale et al. 2013; Frisari and Micale, 2015), and subsequent expansions of the analytical approach in unpublished consulting work. Since then, CPI's Climate Finance team has strengthened and expanded its analytical capabilities on risk analysis, in relation to both the tracking and characterization of risks, as well as in the assessment of financial and non-financial impacts of risks (and their mitigation) on return metrics for different sets of public and private stakeholders, through modeling analysis at the project and fund level;
- a country-level scoring system measuring the attractiveness of potential target countries on private sector attractiveness, and their energy access and climate change priorities, relying on a database with more than 23 raw data sources
- current and prospective deployment data on installed capacity, based on data from Bloomberg, Platts, and REN21 country-level targets;
- a database of blended finance initiatives developed by CPI, and supplemented with the clean energy blended finance initiatives catalogued by Convergence; and
- a series of investor interviews conducted for this project.

4 https://climatepolicyinitiative.org/sgg/publications/
5 https://www.climatefinancelab.org/

# 2. Understanding the Clean Energy Opportunity: investors and their constraints

This chapter summarizes the different types, characteristics, and behavior of private investors in order to identify which are best suited, and thus should be targeted, for clean energy investing, and also which constraints and barriers need to be overcome to unlock capital. First, the chapter provides a brief background on different models for clean energy investing; second, the chapter describes the characteristics and constraints of different investor types regardless of geography; and finally, the chapter describes and categorizes investment risks and barriers most prevalent in developing economies. The chapter closes with key takeaways and a comparison of blended finance needs for large grid-connected electricity projects and distributed generation.

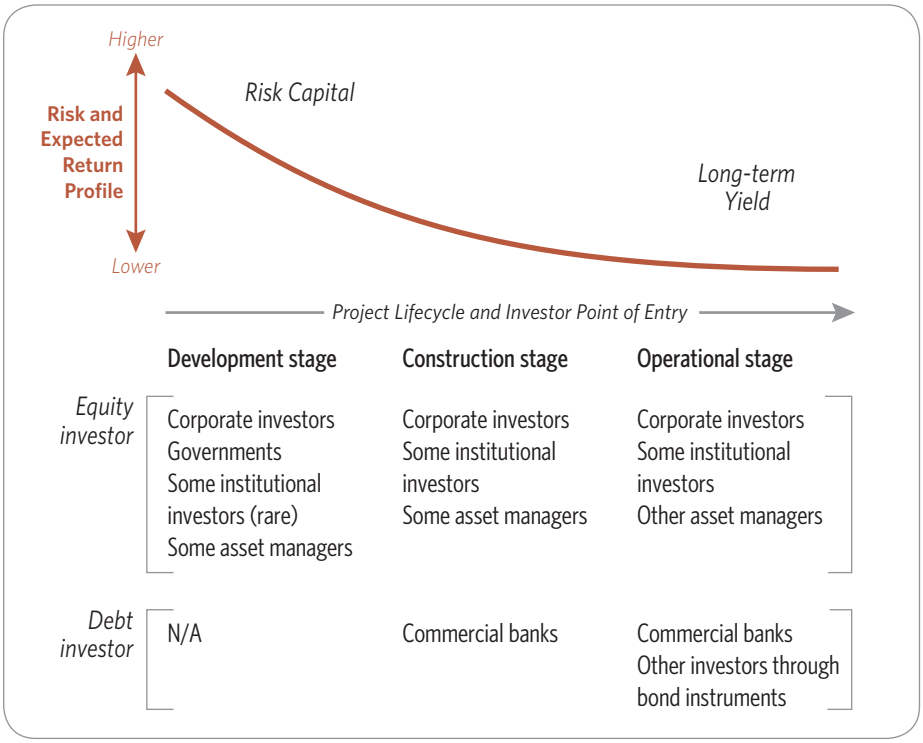
## 2.1 Background on clean energy investing

Under the Sustainable Development Goals and Paris Agreement, two separate, but related, objectives were established: 1) to achieve universal energy access by 2030 and 2) to keep global warming below 2°C ("de-carbonization"). These twin objectives have important differences that affect investment and the need for blended finance instruments. This section provides a brief background and identifies several sources of more in-depth information.

**Grid-Connected Electricity:** The clean energy project lifecycle typically includes three stages: the development stage, the construction stage, and the operational stage, with decreasing risk as the project moves towards operation. Projects are typically financed either through the balance sheets of corporate sponsors (such as utility companies) or through the establishment of non-recourse Special Purpose Vehicles that align multiple investors(BNEF, 2016). Because of the changing risk and return profiles throughout the clean energy lifecycle, different types of equity and debt investors are often active in different stages of the project through vehicles that match their risk appetite. Figure 1 illustrates the characteristics and typical participants at each stage of the clean energy project lifecycle (EMPEA, 2015).

**Distributed Generation:** Distributed generation has different financing needs to large-scale renewable energy projects. Rather than a single, large source of power with one off-taker, distributed generation more typically involves multiple small-scale off-grid or mini-grid setups serving a larger number of customers on discrete contracts, or a small community on a single contract through a local off-grid utility. Distributed generation is generally more effective in increasing households' energy access in rural areas where grid extensions are uneconomical and time-consuming (SE4All, 2017). The relevant financing structures for distributed generation are more often based on a corporate finance model in which the service provider seeks capital to expand its operations, rather than project financing (Expert Interviews, 2017).

Figure 1: Risk return requirements at each renewable energy project stage



## 2.2 Investors and their investment characteristics

*The investors that are, in theory, the best fit to support clean energy investments include commercial banks, life insurance companies, and defined benefit pension funds; however, each faces constraints to investing in clean energy.*

Global financial assets are held by different types of investors. Broadly speaking, private investors can be classified into the following categories: institutional investors (pension funds, insurance companies, both life and property/casualty, endowments and foundations, sovereign wealth funds), commercial banks, and other asset managers.[6,7] Based on total assets under management alone, institutional investors – specifically, insurers and pensions funds – and banks from developed countries have the largest potential to unlock finance to clean energy (PPIAF, 2013).

Table 1 provides a summary of the different investor groups and their investment profile and characteristics, including the total market value of assets that an investment company or financial institution manages on behalf of investors (Asset under Management, or AUM) and average annual inflows. The total global AUM represents the "stock" of funds received over the years by these investors (e.g., funds that have already been spent on existing assets). The annual inflows figure represents the cash inflows these investors can spend on new assets each year, plus appreciation of existing assets under management, and are likely the most appropriate target for new clean energy investment (Reicher, Brown and Fedor, 2017).[8]

To narrow the universe, it is helpful to identify the investor groups that are "best suited" for clean energy investing, by matching the clean energy investment profile with the profile and characteristics of the different investor groups, as laid out in the table above.

Commercial banks are most suited at the construction and operational phase, as they have a preference for shorter-term investments, and have only moderate liquidity needs. Life insurance companies are most suited at the operational phase, as they require less liquidity and have a long investment horizon driven by long-term obligations. Life insurance companies, in particular, are, among the various types of institutional investors, the best suited and most capable investors in renewable energy projects, and many are active participants in the project finance market. (3) Defined benefit pension plans may also be a strong fit as they are also driven by long-term obligations and seek steady, stable returns, but the fit for clean energy depends on the liquidity needs of the particular pension plan. Defined benefit plan liquidity needs are affected by the number of retirees (who require the financial payouts) in the plan, relative to the amount of the sponsor's contribution to the plan. Therefore, if contributions are high, relative to the retirees who seek payments, then liquidity needs are relatively low, and such plans could be a strong fit for investing in clean energy projects or funds.

## 2.3 Investor constraints: institutional Investors

There are key constraints preventing institutional investment, such as from life insurers, pension funds, and foundations and endowments, from flowing to clean energy. These constraints include:

- **A mismatch in investor requirements related to liquidity, risk, and the profile of an energy project.** The majority of institutional investors, and pension funds in particular (often a focus of advocacy for clean energy investment), invest primarily in traditional, typically liquid assets, such as cash, bonds, publicly traded stocks, and asset backed securities. In 2014, only 15% of the overall allocation went to illiquid assets such as real estate, mortgages, private equity, hedge funds, and infrastructure, according to a study by OECD assessing the asset allocation of pension funds in 34 countries (OECD, 2015). Even less is allocated to clean energy, which typically falls within the infrastructure asset class.

6 Households are also technically a category of private investor, but are not included in the analysis here as a potential target investor group. Similarly, corporate project developers who design, commission, operate, and maintain clean energy projects, and who invest in clean energy projects from their own balance sheets, are not included here as this is not a targeted investor group, though such actors play a critical role in financing clean energy investments. Other corporates, e.g., Google, who invest money into clean energy assets are included in the "other investors" category.

7 For further detail on different types of institutional investors, see Nelson and Pierpoint, 2013.

8 Note that because appreciation of existing AUM is included, the figures are likely to overstate the annual new amounts of money available.

Table 1: Investor groups and their investment characteristics

| INVESTOR CATEGORY | GLOBAL AUM (USD TN) ('16 OR 17) | AVG ANNUAL INFLOW (USD TN) ('10-15)[a] | HORIZON | DRIVEN BY LONG-TERM OBLIGATIONS | LIQUIDITY REQUIRE-MENTS | RETURN REQUIREMENTS / RISK TOLERANCE | ASSET ALLOCATION | THEORETICAL FIT FOR INVESTMENT IN RE |
|---|---|---|---|---|---|---|---|---|
| Insurance – life | 8.7[b] | 0.2 | Long | Yes | Low | Low-Mid | Dominated by fixed income | Active participants in RE project finance markets, given low liquidity/long horizon |
| Insurance – property | 10.1[c] | | Short to mid | No | Mid to high | Mid | Dominated by fixed income | Back short-term policies, requiring liquidity |
| Pension Funds | 36.4[d] | 1.0 | Long | Yes | Mid, depen-dent upon plan | Low to mid | Allocation tilted towards equities | In most defined contribution plans, beneficiaries can switch in and out of investment options, generating a need for liquidity. Defined benefit funds are better suited to RE projects.[e] |
| Foundations & endowments | 1.1 – 1.3[f] | n/a | Long | Yes | Low | Mid to high | Tilted towards equities | Smaller size means largely reliant on external managers; may have interest from "mission-driven" organizations |
| Sovereign wealth funds | 7.5[g] | 0.5 | Long | Yes | Context dependent | Context dependent | Tilted towards equities | Would need to develop expertise in RE in order to invest |
| Commercial banks | 85.3[h] | n/a | Short to mid | No | Mid to high | Low | Commercial and consumer loans, gov't securities, cash | Can invest in shorter term, moderate liquid investments, and tend to be a good fit for construction phase RE financing. Engaged in both corporate finance and project finance, depending on the bank |
| Other inves-tors/asset managers[i] | Asset manag-ers: 69.2[j] | HNWI: 0.4 Mutual funds: 1.3 | Context depen-dent | No | High | Context dependent | Mix reflects market demands | Funds require high liquidity to allow for investment switching. Liquidity needs likely preclude investment in RE |

a These numbers have been taken from Derisking Decarbonization: Making Green Energy Investments Blue Chip, Stanford Steyer-Taylor Center for Energy Policy and Finance. Retrieved from: https://energy.stanford.edu/sites/default/files/stanfordcleanenergyfinanceframingdoc10-31_final.pdf. Note that these numbers are slightly outdated and come from a different source than global AUM data presented in the first column.

b Estimated based on World's Largest Insurance Companies, GFM Asset Management (2017). Retrieved from: https://gfmasset.com/2017/10/worlds-largest-insurance-companies-top-146-listed-insurers-assets/. Note that data includes Top 146 listed insurers by assets.

c Ibid.

d Global Pension Assets Study, Willies Towers Watson (2017). Retrieved from: https://www.willistowerswatson.com/en/insights/2017/01/global-pensions-asset-study-2017. Note that the value includes pension fund assets in 22 major markets.

e A defined benefit plan is a retirement account in which the employer/sponsor commits to pay out at a set amount at retirement, and all investment risk is on the sponsor's investment decisions. The strategy and risk tolerance of the sponsor determines investment choices. A defined contribution plan, like a 401(k), requires the individual member (employee) to put in his/her own money, and investment decisions lie with the individual rather than the plan or sponsor, but with investment options set by external investment managers and mutual funds. The performance of the investments determines how large a pension the member receives.

f Estimated by Systemiq and Convergence (personal communications).

g Largest Sovereign Wealth Funds, Sovereign Wealth Fund Institution (2017). Retrieved from: https://www.ipe.com/reports/special-reports/top-400-asset-managers/top-400-asset-managers-2016-global-assets-now-563trn/10013542.fullarticle

h The world's 100 largest banks, S&P Global Market Intelligence (2017). Retrieved from: https://marketintelligence.spglobal.com/our-thinking/ideas/ranking-the-world-s-100-largest-banks. Bank assets include assets of asset/wealth management units within banks.

i We exclude some investors that can be considered both asset managers as well as asset classes such as private equity investors, venture capital, and infrastructure funds as there would be double counting with institutional investors. Instead these are treated as potential investment opportunities.

j The top 400 asset managers, IPE (2016). Retrieved from: https://hub.ipe.com/top-400/total-global-aum-table-2017/10007066.article. Note that there is likely some double-counting within this category, for example pension assets can potentially be invested in mutual funds under other investors/asset managers category.

- **A mismatch between institutional investor capacity and the project investment profile.** Most institutional investors do not have the capacity to invest directly in unlisted energy assets. Outside some of the largest institutions, there are many factors that limit ability to invest directly, including high transaction costs, large minimum ticket sizes,[9] as well as the cost of maintaining requisite deal teams.

Previous CPI research indicates that the potential direct investment in renewable energy project debt and equity is 1% of total assets under management of institutional investors globally,[10] or an estimated USD 305bn, once accounting for short-term liquidity requirements and narrow investment mandates, removing funds of insufficient size to employ direct investing, considering strict limits on illiquid investment potential, and applying a limit on clean energy as a share of illiquid investments (Huxham et al, 2017).

*In order to unlock more capital, there is a need to increase investor capacity to invest directly in illiquid assets[11] and/or repackage clean energy opportunities into standardized, publicly tradable assets.*

## 2.4 Investor constraints: commercial banks

While commercial banks are critical investors in all stages of the project lifecycle, there exist some notable constraints that may be hindering clean energy investments:

- **Basel III regulatory requirements for greater liquidity and lower leverage to reduce risk have unintended consequences, limiting long term investment by international commercial banks.** Basel III's "Net Stable Funding Ratio (NSFR)" effectively mandates that banks exposed to less liquid, longer term assets require more stable funding to be available. As a result, banks must secure longer-term, higher-cost sources of funding in order to invest in long-term, illiquid assets (like energy/infrastructure projects), and thus creating an incentive for banks to avoid such assets altogether. While the NSFR doesn't come into force until 2018, banks are already adjusting their funding profiles to meet these requirements (Ma, 2016).
- This is reflected in shorter tenors being offered for project finance loans: largely as a consequence of Basel III's NSFR, banks are increasingly unwilling to finance project finance with long-maturity loans. The marketplace for tenors greater than seven to ten years is shrinking, and loan tenors above 15 years are minimal (Ma, 2016). This means that renewable energy projects need to be re-financed at the end of the original loan, introducing interest rate risk.
- **Regardless of these regulatory changes, many commercial banks in developing countries are already dominated by short-term lending outlooks.** It is estimated that from 2010 to 2012, 49% of bank loans had a tenor of less than one year, and only 19% of loans in developing countries are over five years in duration (World Bank, 2015).

## 2.5 Investment risks and barriers in developing economies

In addition to the investor-specific constraints described above, there are additional risks and barriers that come into play when considering investing in energy infrastructure that are frequently amplified in developing economies, and are restricting investment. Expanding upon previous CPI work, these risks and barriers are explored in Table 2, detailing where clean energy increases these risks, and at what stage in the project lifecycle the risks are most relevant. These risks and barriers can be categorized into the following four macro categories: political, technical risks, commercial barriers and market risks, and other investor barriers that are not manageable or apparent at the project level.

9 To contextualize this, the average range of pension fund and insurance company investment into private equity (as a proxy for direct investment) is $13-$53 million. SWF range from $46-118 million (see WEF, 2013).

10 Note that the methodology used to derive this number is based on 2013 OECD institutional investment data, which is different (and older) data from what is presented in Table 1. Basing the methodology off the data presented in Table 1 would likely increase the total "investable" universe.

11 Through e.g., building up clean energy deal teams, or working through intermediaries such as the Aligned Intermediary.

Table 2: Investment risks and barriers in developing economies

| RISK CATEGORY | | CLEAN ENERGY RISK "ADD-ON" | RELEVANT AT WHAT STAGE IN PROJECT CYCLE | | |
|---|---|---|---|---|---|
| | | | DEV'T | CONST'N | OPER'N |
| **POLITICAL RISKS** | | | | | |
| **Political and social risks** | Corruption and governance risks (including repeal of contracts), legal and ownership rights infringements risks (risk of property expropriation; ownership claims); and social risks (social opposition/violence) | Projects often need to be developed in cooperation with the public sector<br>Social resistance tends to be high for large hydro projects<br>Corruption risks are considered lower for clean energy | X | X | X |
| **Administrative risks** | Permitting delays, denial or repeal; Forced relocation | Some RE technologies (wind, hydro, Concentrated Solar) are highly site-specific | X | X | |
| **Policy / Regulatory risks** | Change of support to tariffs or level of subsidization | Less mature RE technologies often rely on public support | X | X | X |
| **TECHNICAL RISKS** | | | | | |
| **Construction delays and risks** | Relate to uncertainty over the timing of construction and sub-standard construction. | Increased risk due to novelty of some technologies | | X | |
| **Upstream resources-related risks** | Upstream risks such as the availability of material and workforce, uncertainty over the effective availability of natural resource on the specific site. | Increased for geothermal exploration | X | X | |
| **Operation risks and other downstream output-related risks** | Risks related to technical operations in the plant, catastrophe risks impacting on project, and environmental risks resulting from project activities (e.g., potential clean up liabilities) | Increased risk due to novelty of some technologies, natural variability of outputs | | | X |
| **COMMERCIAL BARRIERS** | | | | | |
| **Access to Capital (bankability of investment)**[a] | All relate to risks for the project developer to access capital and cost of capital for financing /re-financing | Potentially higher if market/technology is unfamiliar to capital provider; increased due to long investment horizon typical of RE projects | X | X | X |
| **Market-specific construction, financial, and operation costs increase** | Relate to uncertainties in project-related investment, financial and operation costs related to the particular technology | Increased risk due to novelty of some technologies | | X | X |
| **Currency Risk** | Related to unfavorable currency fluctuations occurring when projects are financed with loans in foreign currency but have revenues in local currency. Can also relate to the availability in a country of foreign currency to pay back investors | No additional risk | | X | X |
| **Counterparty / Offtaker / Credit Risk** | Refers to the inability of counterparties to honor contracted obligations due to lack of enforceable collateral or unreliable counterparties | Potentially higher due to lack of established investment networks | | | X |
| **Revenues Attractiveness and Volatility** | Low attractiveness and uncertainty on realized output price; excessive market volatility, lack of demand | High risk due to long horizon of investments | | | X |
| **OTHER INVESTOR BARRIERS (NON-MANAGEABLE AT PROJECT LEVEL)** | | | | | |
| **Investment Horizon/ liquidity** | Refers to uncertainties about the realized value when monetizing the investment before end of asset's lifecycle (for equity sponsors), or maturity of loans (for lenders) | High, as investments in clean energy tend to have long time horizons and there has been little securitization | | | X |
| **Scale of investment** | Size of investment needs to be appropriate to match investor profiles | Clean energy projects often not large enough | X | X | X |
| **Lack of capacity at local level** | Lack of capacity and resources at local level can limit the ability to identify a suitable pipeline of projects | High, as specialized knowledge is involved, local understanding likely to be low | X | X | |

See Frisari et al, 2013 and Micale et al, 2013 for an earlier version

a Whiie access to capital is a major barrier to project developers, there is a corresponding barrier on the side of the investor, who may not be able to identify a bankable pupeline of projects that matched their investment requirements (e.g. size of the project, investment horizon). See next section on (non-developer) constraints for more information.

*The most prominent risks and barriers preventing scaling up of private investment in clean energy in developing economies are off-taker risk, currency risk, policy risk, the attractiveness of revenues, liquidity risk, and size/scale mismatches.*[12]

The lack of access to early stage risk financing, for both grid-connected projects and distributed generation companies, has also been highlighted repeatedly. These risks and barriers are helpful to inform what is needed in terms of blended finance instruments.

## 2.6 Key takeaways from the clean energy investment landscape

While clean energy appears to be a suitable match for a number of investors, in particular life insurance companies, defined benefit pension plans, and commercial banks, uptake is limited given constraints related to limitations inherent to investor asset allocation processes, and their preference for more liquid, low risk investments.

In the near term, blended finance tools can focus on reducing risk in developing economies to attract existing institutional investor allocations for less liquid, non-tradeable assets, as well as to increase the flow from commercial banks, particularly local banks. In the longer term, a shift towards the development of investment-grade tradable instruments will be critical to reach a broader pool of institutional investors, as the availability of institutional investment in non-standard asset classes is likely to remain limited. However, securitization and other liquidity solutions, alone, will not address several other relevant risks that require attention and mitigation. Thus, liquidity solutions aside, blended finance is critical to address the multitude of risks and barriers that are currently preventing clean energy investment through any channel.

Table 3 summarizes the investment profiles and blended finance needs of grid-connected electricity and distributed generation products.

Table 3: Understanding investment opportunities in grid-connected electricity vs distributed generation

| FEATURE | GRID-CONNECTED ELECTRICITY | DISTRIBUTED GENERATION |
|---|---|---|
| **Primary impact** | De-carbonization: helping to reduce existing or planned carbon-intensive generation | Primarily off-grid or mini-grid clean energy helping to bring electricity access to new customers without generating new GHG emissions; can also include grid-connected electricity |
| **Project size** | Medium (10-50MW)<br>Large (>50MW) | Small (<10MW) |
| **Relevant technologies** | Onshore wind<br>Offshore wind<br>Solar PV<br>Concentrated solar<br>Hydro<br>Geothermal<br>Carbon capture and storage<br>Energy storage<br>Rooftop solar | Solar home systems<br>Rooftop solar<br>Bioenergy generators<br>Clean cookstoves<br>Solar lanterns<br>Mini-grids<br>Mobile payment<br>Small hydro<br>Energy storage |
| **Target private sector investors** | Institutional investors<br>Asset managers<br>Commercial Banks | Commercial Banks<br>Venture Capital/Private Equity<br>Households<br>Corporations<br>Other asset managers (for securitized products) |
| **Financing structure** | Project finance<br>Corporate finance (e.g., via project sponsors) | Corporate finance – equity and debt, often to small and medium-sized enterprises (SMEs) |
| **Primary investment barriers** | Currency risk<br>Political risk<br>Regulatory/policy risk<br>Off-taker risk<br>Construction risk<br>Access to finance (especially early stage)<br>Liquidity | Upfront costs<br>Lack of risk assessment capacity<br>Access to finance (especially early stage)<br>Payment risk (individual)<br>Technology risk<br>Liquidity |

12 Based on previous CPI work, interviews conducted, and literature reviewed.

# 3. High-impact Investment Opportunities and Barriers

In this section, we look at which geographies and technologies are most promising from both an investment and impact perspective, and are most likely to benefit from blended finance support. We then consider the risks and barriers investors face in investing in these geographies and technologies.

We identified potential markets for high-impact investment opportunities requiring blended finance support by examining 140 developing economies. As a starting point, we looked at those countries that are not classified as investment grade, as achieving investment grade is indicative of strong enough institutional environments in which blended finance should not be required, except in very specific circumstances.[13] From the sub-set of non-investment grade countries, we selected countries that scored well in terms of being the most attractive for private sector investment, and reached at least 500 MW in projected planned and targeted capacity for renewable energy sectors.

We then ranked the 46 countries that met the above-mentioned criteria by their energy access and climate change relevance scores, indicative of the marginal impact that a dollar invested in such countries in clean technologies would have in increasing the quality of energy access and addressing climate change.

More specifically:

- investment grade countries were considered as those scoring 60 or more on the Trading Economics index[14]
- projected untapped capacity was estimated considering current deployment vis-à-vis planned deployment and country targets by 2030 (BNEF,[15] PLATTS World Electric Power Plant Database,[16] REN21[17] and IRENA). Renewable energy sectors considered included Solar, Wind, Hydro, Geothermal, Biomass, and Tidal energy
- the minimum level of attractiveness for the private sector was set to 0.5 of the private sector score (within a 0-1 range),[18] while the aggregate final impact of investment was estimated by combining climate relevance[19] and energy access relevance[20] scores.

Finally, we calculated the investment opportunity for the countries identified by applying regional or country specific capital costs of technologies to the planned and targeted capacity in megawatts (MW).

Please see our detailed methodology in Annex 1 for specifics on the raw data and sub-indicators used, and how they were weighted and rescaled when aggregating them into a score, as well as on the country-specific assumptions used for calculating investment estimates.

## 3.1 Identification of high-impact opportunities

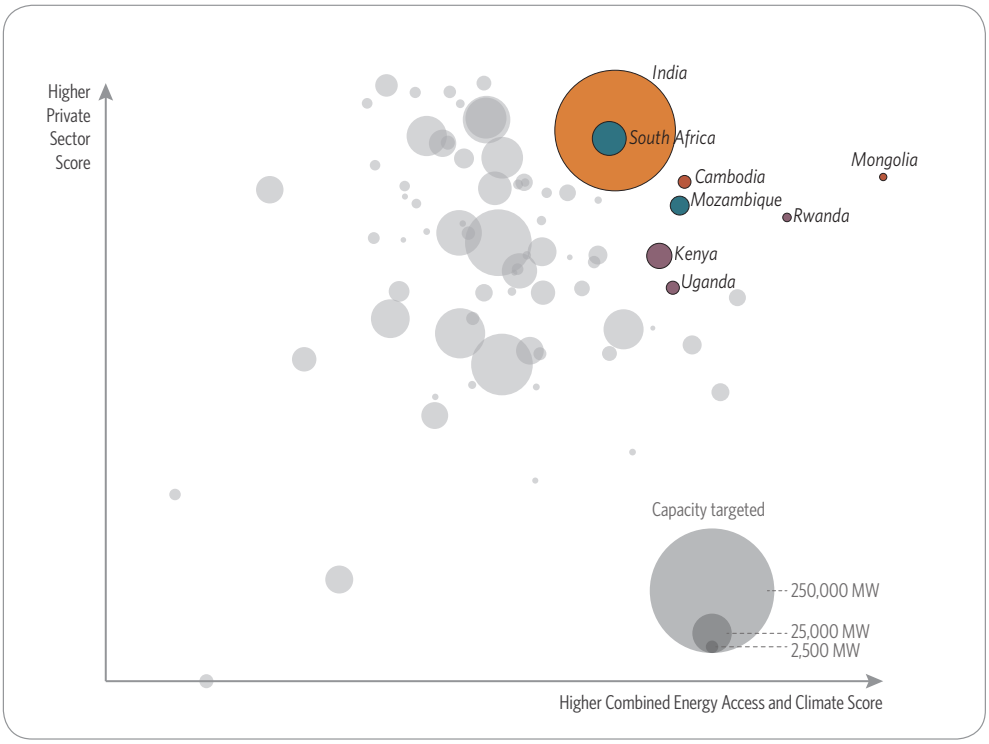
*Sub-Saharan Africa, South Asia, and East Asia & Pacific are the three regions that present the most significant investment opportunities in both energy access and climate change mitigation.*

Our analysis shows that Sub-Saharan African countries and East Asia & Pacific countries in lower-middle income groups have higher potential in terms of energy access improvements. In terms of climate change impact, East Europe & Central Asia, Middle East & North Africa, and South Asia in the low to lower-middle income range, as well as Sub-Saharan Africa and East Asia & Pacific countries in the upper/middle income group show high potential. These results are consistent

13 This assumption was supported in stakeholder interviews for this project. We exclude from the analysis investment grade countries with significant relevance to meeting global goals, such as China, because in our view these should not be priorities for blended finance.
14 Trading Economics Index – Credit Rating. Accessed October 2017. https://tradingeconomics.com/country-list/rating
15 Bloomberg New Energy Finance Database. Accessed October 2017. https://www.bnef.com/core/market-size?tab=Capacity
16 S&P Global Platts World Electric Power Plants Database, June 2017, Accessed October 2017. https://www.platts.com/products/world-electric-power-plants-database
17 REN21. 2017. "Renewables 2017: Global Status Report." http://www.ren21.net/wp-content/uploads/2017/06/17-8399_GSR_2017_Full_Report_0621_Opt.pdf
18 Private sector score is based on a country's Market potential, Access of foreign investment, Access of private investment, Access to affordable credit, Loan repayment risk (attractiveness of), Country risk (attractiveness of), Currency risk (attractiveness of), Inflation stability, Ease of doing business.
19 Climate change relevance score is based on a country's Energy Intensity, CO2 emissions intensity, Supporting environment for climate change.
20 Energy access relevance score is based on a country's Share of Population w/o Access to Electricity, Electricity Prices, Electricity consumption growth.

with the general understanding that lower income countries have greater needs in energy access, whereas higher income countries should focus more on decarbonizing existing or planned electricity generation assets. However, specific sectoral opportunities in these regions in hydro,[21] solar, wind, and geothermal generation vary significantly. Each country has its distinctive resource potential and planned capacity addition, and investment barriers are also country-dependent.

Figure 2: Key barriers and risks in high-impact countries




Several additional tiers of countries are listed in Section 1.1.1 of the Annexes.

By ranking individual countries in terms of private sector attractiveness, quality of energy access, and relevance for climate change investment (see Methodology in Annex 1), it is possible to identify, within the different regional groups mentioned above, a number of specific countries representing potential high-impact investment opportunities. Within the regions identified, India, South Africa, Mozambique, Cambodia, Mongolia, Uganda, Kenya and Rwanda are countries that can deliver the highest impact per dollar invested both in improving the quality of energy access and delivering climate impact.[22] Figure 2 shows how the abovementioned countries score relatively higher in terms of private sector attractiveness and energy access and climate change relevance, filling the top-right section of the graph. The area of the bubble shows the extent of additional planned and targeted capacity in each market, while colors indicate the different regional groups identified (orange = South Asia, Green = Southern Africa, Red = East and South-East Asia and Purple = East Africa).

Table 4 summarizes the potential (in MW) of planned and targeted renewable energy capacity in each market identified. India represents 80% of total renewable energy investment potential, followed by Kenya (7.9%) and South Africa (7.5%). Hydropower represents 49% of investment potential, followed by solar (29%) and wind (15%), with geothermal energy leading investment opportunities in East Africa.

It is important to note that the above results do not indicate that the particular countries and regions mentioned should be the sole focus of attention for investors. Many other countries also provide interesting opportunities. See Annex 1 for additional results on regions and countries.

21 Large hydro (>10 MW) is often excluded from definitions of clean energy; for completion we have kept it in.

22 We looked at countries with both climate mitigation and energy access potential. Another possibility is to look at these impacts separately.

Table 4: Planned and targeted capacity and investment potential in high-impact countries

| HIGH-IMPACT COUNTRY FOCUS | MARKET | KEY SECTORS | PLANNED ADD'L CAPACITY (GW) | TARGETED ADD'L CAPACITY BY 2030 (GW) | INVESTMENT POTENTIAL (USD BN) |
|---|---|---|---|---|---|
| India | South Asia | Hydro, Solar, Wind | 121.3 | 109.2 | 292 |
| South Africa, Mozambique | Southern Africa | Hydro, Wind, Solar | 10 | 12.4 | 36 |
| Cambodia, Mongolia | East & South-East Asia | Hydro, Wind, | 2.8 | n/a | 4 |
| Kenya, Uganda, Rwanda | East Africa | Geothermal, Wind, Hydro | 5.1 | 7.5 | 37 |

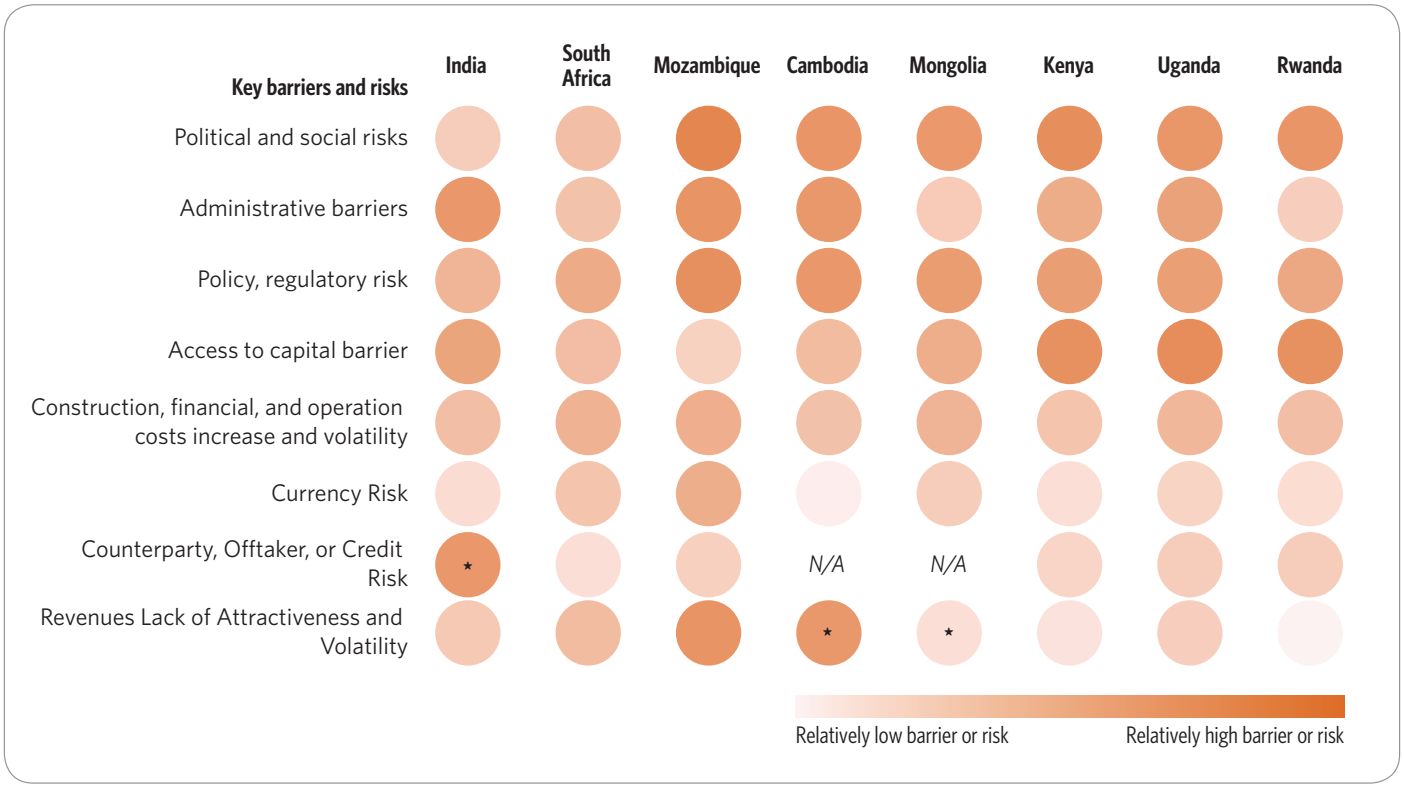
Note: planned additional capacity refers to the current advanced pipeline of projects in a country, while targeted additional capacity refers to the further project additions that would be needed in the long term to meet country and technology specific targets.

## 3.2 Analysis of key barriers and risks in the high-impact countries

Identifying the key barriers and risks to investment in each high-impact country is critical to targeting blended finance instruments. To identify key political and commercial barriers to investment in each of the high-impact countries, we referred to individual or combined country level indicators, assumed as proxies for specific risks.

The intensity of risks and barriers in the high-impact regions are displayed in Figure 3. Other technology-specific barriers in the target areas were identified through desk research, and are discussed in the following section. More details on the analysis of barriers for each country, as well as data sources, are provided in Annex 2.

Figure 3: Key barriers and risks in high-impact countries




Note: (*) indicates that in the absence of a quantitative figure to estimate the barrier or risk, the intensity has been qualitatively determined by combining expert judgement with performance of other risks within the same country. N/A indicates data not available.

## 3.3 Profiles of high-impact opportunities

This section provides more detail on each of the high-impact opportunities and accompanying barriers to investment, incorporating both quantitative and desk research.

### INDIA – DEEP DIVE

We examined India in significantly more detail given the magnitude of the opportunity. We also provide, below, some information on current blended finance opportunities.

**Investment opportunity: India represents a USD 292bn market opportunity, 80% of the total renewable energy investment potential in the high-impact countries identified in this report.** As the world's third-largest economy, yet with 244 million people lacking electricity access, India is critical in achieving global climate change and sustainable development goals.

**Targets and policies:** India has ambitious renewable energy targets (REN21, 2017), including 40% electricity generation capacity from renewables (including large hydro) by 2030. It has an interim goal of 175GW in renewable generation (excluding large hydro) by 2022, with 100GW of solar PV, of which 40GW distributed rooftop solar, and 60GW wind (REN21, 2017). **Meeting India's targets will require up to USD 189bn additional investment by 2022, the majority in debt finance** (Sen, Sharma and Shrimali, 2016), **and up to USD 292bn by 2030.** The off-grid market opportunity is estimated at USD 215m by 2018 (The Climate Group, 2015). Furthermore, the government plans to invest USD 11bn in rural electrification by 2022 to reach all unelectrified villages. Feed-in-tariffs have been set at the state level since 1993; however, starting with solar in 2010 and wind in 2017, auctions have begun to replace feed in tariffs (ClimateScope, 2016b). Net metering for rooftop solar is currently being rolled out state-by-state. India has wholesale power markets and unbundled generation and transmission, and added 28,000km of transmission lines in 2016.

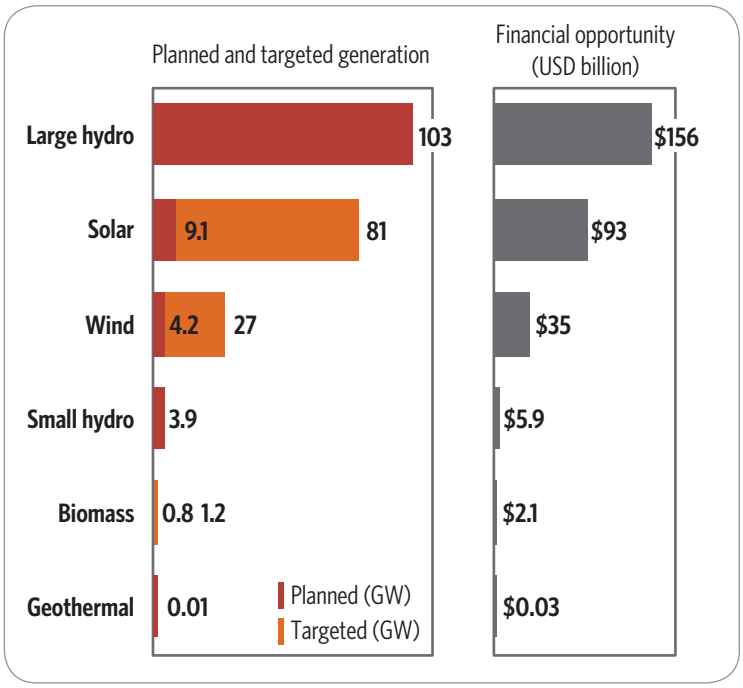
**Market trends:** Investment from 2011-15 in clean energy was USD 48.3bn (REN21, 2017). New investment in 2016 totaled USD 9.2bn (of which USD 5.5bn solar), and USD11.2bn in 2015. After China and Japan, India is the largest solar PV market in Asia.

The average levelized cost of electricity for renewables is falling rapidly; recent auctions have seen bids at USD 0.05 per kWh for wind and USD 0.038 per kWh for solar (Upadhyay, 2017a; 2017b). Several Independent Power Producers (IPPs) are expected to launch initial public offerings in the near future, and the green bond market is expanding rapidly. Both of these developments should free up capital currently tied up in project financing and offer non-project investment opportunities in debt and equity vehicles (BNEF, 2017). 3.1 million off-grid solar systems were sold in 2016, and 2.5 million in 2015.

*Institutional investors,[23] foreign and domestic, may be capable of bridging the shortfall in debt and equity financing of required renewable energy investment in India,[24] but face additional barriers.*

**Barriers:** Given current conditions, India will likely fall short of the 2022 required investment by approximately 30%, on both debt and equity (Sen et al, 2016). Unfavorable terms of capital, especially high cost and short tenors of debt, can increase renewable energy project costs by approximately 30% (Nelson et al, 2012).

Figure 4: Clean Energy Investment Opportunity in India




23 Domestic institutional investors, with a lower cost-of-capital, can meet 54% of the debt gap.

24 Climate Policy Initiative. 2016. "Reaching India's Renewable Energy Targets."

Finally, although off-grid solar markets are active, with 40+ established players, few companies have achieved profitability and most need to scale 2-4 times to break even. Most providers sell under 5,000 units annually at 1-5% operating margins. Many barriers play a role. First, off-taker risk is driven by low credit ratings for operating assets. Utilities struggle with high debt burdens (USD67bn sector-wide in 2015) and operating losses of 20-25%. The UDAY debt restructuring program, launched in November 2015, aims to decrease debt servicing costs and increase efficiency in the long-term. In the short-term, Payment Security Schemes are being developed to provide comfort to lenders (Farooquee and Shrimali, 2016). Second, currency risk for financing denominated in foreign currency is a major risk for investors (India Innovation Lab for Green Finance, 2016b). Third, there is a shortage of liquid instruments for renewable energy investment (Sen, Sharma and Shrimali, 2016).

**Blended finance needs: Blended finance can play a key role in providing much needed capital on attractive terms.** Table 5 describes specific needs and initiatives under development.

### Southern Africa: South Africa and Mozambique

**Overview:** South Africa produces 85% of Southern Africa's power, fueled primarily with coal. South Africa's clean energy tender program has been successful, and has installed renewable capacity of 2.5GW with 88% of the population is grid connected. Mozambique, heavily reliant on large hydro and with significant transmission constraints, uses parts of South Africa's transmission infrastructure to serve heavy industry and Swaziland (Climatescope, 2016d). With 29% electricity access, it is a high-impact country for energy access financing.

**Targets and policies:** South Africa is planning 1.5GW of solar to serve local manufacturing in the Northern Cape and is developing a regulatory framework for

Table 5: Tackling barriers to investment in India

| PRIMARY BARRIERS | BLENDED FINANCE STRUCTURE | EXAMPLE INITIATIVE UNDER DEVELOPMENT | DESCRIPTION |
|---|---|---|---|
| Liquidity | **Warehousing and securitization structures** such as green bonds (for debt finance) and infrastructure investment trusts (for equity/mezzanine finance) | **Sustainable Energy Bonds** | Debt instruments targeting impact investors, including an impact assessment mechanism. Aims to generate investable project pipeline for sustainable energy sector and aggregate small projects to reduce transaction costs (India Innovation Lab for Green Finance, 2016b). |
| | | **Solar Energy Investment Trusts** | Aggregates small-scale rooftop solar projects in order to lower the cost of capital by diversifying risk, increasing liquidity and increasing access to debt (India Innovation Lab for Green Finance, 2017a). |
| | **First loss support within the capital stacks of debt and equity facilities**, especially targeted at distributed renewable energy | **Rooftop Solar Private Sector Financing Facility** | Provides long-term debt financing at appropriate cost and tenor, with first loss support, to rooftop solar PV developers, reducing transaction costs through aggregation (India Innovation Lab for Green Finance, 2016c). |
| Off-taker and currency risk | **Hedging instruments and payment security mechanisms** to re-allocate risks and reduce costs | **U.S.-India Catalytic Solar Finance Facility** | Uses catalytic, first-loss, capital to create not only direct capital infusion in financial intermediaries but also create risk mitigation facilities, such as a payment security mechanism as well as a currency hedging facility (U.S. Embassy and Consulates in India, 2016; Expert Interviews, 2017). |
| | | **FX Hedging Facility** | Foreign exchange hedging product backed by a tail risk guarantee, allowing allocation of risks to suitable parties and reducing the cost of currency hedging by 30% by eliminating the credit risk cost and with estimated public & private leverage of 1:9 (India Innovation Lab for Green Finance, 2017b). |
| Early stage risks | **Grants** to cover discrete up-front costs to make projects bankable. | **U.S.-India Clean Energy Finance Initiative** | Provides grants for meeting project preparation costs for viable rooftop solar companies ready to scale, and is targeted explicitly at mobilizing debt finance. |

biofuel blending. A carbon tax is planned but not yet implemented, and the country plans for 17.8GW renewables by 2030, with 42% of new installed capacity from 2010-2030 being renewable (REN21, 2017). Mozambique introduced a feed-in-tariff in 2014 and a biofuels blending mandate in 2011 supported by tax incentives for attracting foreign investment. Un-dated targets have been published for wind and solar PV (2GW each), solar home systems, and rural biogas systems (Climatescope, 2016d).

**Market trends:** South Africa has Africa's largest renewable energy capacity, comprising 5% of generation in 2016. It led the world in new solar CSP and solar thermals installations in 2016, with an additional 300MW in CSP expected by 2019. 2016-17 saw 1.3GW pumped-storage hydro installations. South Africa has the highest regional wind potential, and onshore wind is the most cost-effective option for grid-connected power (REN21, 2017). Clean energy investment in 2011-15 totaled USD 16bn, with USD 4bn in 2015. 2.2GW of wind and solar is expected to be commissioned between 2017-19 (Climatescope, 2016g). Mozambique saw just USD 2m in clean energy investment from 2011-15, but the recent Public Private Partnership law has opened up space for independent power producers. A 1.5GW hydro facility is under development (Climatescope, 2016d).

**Barriers:** Relatively low electricity prices in South Africa are compensated by a generally strong policy and financing environment for renewables. Currency risk, linked to domestic political issues, has become more significant with the South Africa Rand exhibiting greater volatility in recent months (Brand, 2017). The national utility, Eskom, began to refuse to sign PPAs in August 2016, citing needs for pricing reform, creating major concerns among IPPs, investors and suppliers, as it is the only off-taker. Economic contraction and delays in policy decisions in recent months have heightened the off-taker and construction-phase risk environment for new renewable capacity and seen investment drop sharply from USD 4bn in 2015 to under USD 1bn in 2016 (Climatescope, 2016g). In Mozambique, political and administrative barriers remain high and the overall attractiveness of investments is reduced by relatively low electricity prices and by the risk of revenue volatility, heightened by the lack of standardized PPAs. High inflation and depreciation against the U.S. dollar contribute to high currency risks, and access to domestic debt capital remains a problem, partially compensated by access of foreign investment.

### East and South-East Asia: Cambodia and Mongolia

**Overview:** East and South-East Asia is heavily populated and a large energy consumer, but energy use patterns and development potential varies widely across the region. Despite abundant renewable and fossil resources, Mongolia's antiquated electricity grid is dependent on electricity imports from Russia and China, and serves only two-thirds of the population (IRENA, 2013). The country is, however, seeing increased activity in solar and wind as it upgrades the distribution grid and extends electrical service to rural populations (U.S. Department of Commerce, 2017). Cambodia (along with Myanmar and Lao PDR) is among the region's least developed countries, with 40% of the population lacking reliable electricity access and high electricity prices. There is no single, integrated electricity grid in Cambodia.

**Targets and policies:** Mongolia aims to become a net exporter of renewable energy, while bolstering domestic baseload power with coal and hydro generation. Targets include 20% renewable energy capacity by 2023, and 30% by 2030. Mongolia offers feed-in-tariffs for wind and solar, and tax incentives on equipment costs (U.S. Department of Commerce, 2017b). Cambodia is sustained primarily by hydro, coal, and oil power. Its policies are firmly focused on electricity access, with renewables playing a potentially vital role in expanding off-grid generation and replacing existing diesel generators. Cambodia is targeting electrification for all villages by 2020 (and 70% of households by 2030) and 2.2GW of hydro capacity by 2020. It aims to reduce GHG emissions by 27% relative to the baseline (IEA, 2017c). The government is encouraging private involvement in the power sector, targeting USD 3bn private investment in the sector by 2027. Off-grid solutions also have significant potential (U.S. Department of Commerce, 2017a).

**Market trends:** Mongolia's first utility-scale wind farm came online in 2013; various wind, solar (PV and CSP), and small-hydro projects are under development. Mongolia is rich in all three resources, and is promoting energy storage to manage intermittency and balance loads in rural or off-grid areas (U.S. Department of Commerce, 2017b). Cambodia has seen rapid growth in hydro generation, making up 50% of the energy mix in 2015. Significant resources are still untapped, and are expected to be developed to meet demand growth (IEA, 2017c). Environmental concerns associated with large hydro may lead to a greater role for solar (an abundant power source) and wind (IRENA, 2013).

**Barriers:** Administrative barriers to entering the Mongolian energy market are relatively low. The country recognizes the need to provide a stable framework for renewable power development, and projects can qualify for concessional arrangements with the government. However, general policy and regulatory risks remain high. Low electricity tariffs and a weak regulatory framework are barriers to private sector investment in utility-scale renewable energy projects (U.S. Department of Commerce, 2017b). In Cambodia, currency risk is relatively low, as the dollarized economy minimizes exchange risk, and relatively high regional electricity prices provide in general good framework for investment. Administrative issues and ease of doing business can be a barrier for energy generation investments. Cambodia ranks poorly in terms of starting a business, obtaining construction permits, enforcing contracts, and retaining stable electricity supplies (GlobalEDGE, 2017). Policy risk is significant in the development of (non-hydro) renewable energy in the absence of feed-in-tariffs and other supporting policies.

### East Africa: Kenya, Uganda and Rwanda

**Overview:** East Africa presents abundant clean energy and energy access opportunities, with low electrification rates and significant off-grid potential. Kenya is a prominent example, with a sophisticated distributed energy value chain and 46% renewable power generation (excluding hydro). Kenya also has significant geothermal resources, while Uganda has large hydro resources. Rwanda, with limited domestic resources, has established a robust policy environment for small-scale bioenergy and renewable-powered mini-grids. Private investment on- and off-grid in the region is rising, supported by feed-in-tariffs (although Kenya is transitioning to a tender-based system) (SE4All, 2017). The region is considered to be highly relevant for energy access, with Kenya's 2016 electrification rates at 65%, even lower in Rwanda (30%) and Uganda (19%) (IEA, 2017a).

**Targets and policies:** Kenya's relatively stable policy framework has attracted significant interest in renewable energy development. Kenya is targeting 100% electricity access by 2022 and 100% renewable energy by 2050, including 5GW of geothermal capacity by 2030, and significant investment in transmission. Kenya's INDC targets a 30% emissions reduction by 2030. Uganda, has 2-3GW of untapped hydro potential and targeted 61% renewable energy generation by end of 2017, including 1.2GW large hydro (REN21, 2017). The existing feed-in-tariff was enhanced in 2013 to fast-track 150MW of renewable projects. The government is aiming for 1.4 million additional grid connections and 26% rural electrification by 2022 (Climatescope, 2016h). Rwanda, with 30% electrification, imports most of its energy but domestic generation is over 50% renewable. The government has ambitious, but un-dated, renewable targets including 300MW biogas, 310MW geothermal, and 340MW hydro. The country is targeting 70% electricity access by 2018 (22% off-grid) and 10% renewable generation by 2050 (REN21, 2017). The targets are supported by a range of policy instruments, standardized PPAs, and a feed-in-tariff (Climatescope, 2016f).

**Market trends:** In Kenya, ongoing market reforms have seen 13 independent power producers establish themselves, and large geothermal and wind projects are driving rapid increases in installed capacity. Kenya saw USD 600m in total clean energy investment in 2016 and USD 484m in 2015 (Climatescope, 2016c). Kenya's geothermal program has seen major success, making up 27% of capacity in 2015 (REN21, 2017). Additional potential is estimated at 3GW and could supply 60% of Kenya's energy by 2030 (IRENA, 2015). Kenya has several large solar PV projects expected to sign PPAs imminently and the 310MW Lake Turkana wind farm (Africa's largest) will come online in 2018. One-third of the off-grid population own a solar home system (REN21, 2017). Uganda's clean energy sector is growing rapidly, with USD 183m investment in 2015 (compared to USD 50m in the previous four years) and IPPs make up 58% of generation, set to grow in the near term. Growth is constrained by limited transmission and distribution infrastructure, although off-grid solar is attracting significant investment as a result (Climatescope, 2016h). Rwanda saw USD 157m in investment from 2011-15. In 2016, solar developers BBOXX and Mobisol invested in minigrid development (REN21, 2017), while utility-scale solar is also expected to play a significant role going forward (IRENA, 2015).

**Barriers:** Regulatory support for clean energy in Kenya, combined with high revenue attractiveness, make it an attractive destination for clean energy investment. Access to affordable debt financing and local currency financing remain significant issues, particularly for SMEs (SE4All, 2017). Off-taker and revenue volatility risks in Kenya are relatively low, with guarantees still important for accessing debt financing (Climatescope, 2016c). Ongoing electoral instability and unresolved internal political divisions and administrative barriers may deter future investment if they affect the government's perceived ability to fulfil guarantees. Kenya's ambitious targets on geothermal energy may require additional

support on the coverage of resource risk, particularly at the early stages of drilling (Micale, Oliver and Messent, 2014). Remuneration in Uganda is generally attractive for renewable energy investment, although the market for mid-scale solutions may be limited (Climatescope, 2016h). Perceived political and regulatory risk is significant and large-scale hydro—on which the country relies—is accompanied by significant social and technical barriers (Frisari and Micale, 2015). As with other countries in the region, access to affordable capital, particularly debt, is challenging (Climatescope, 2016h). Rwanda's policy environment is relatively strong, with clear government support for renewable energy, though access to capital remains limited and off-taker risk is still significant (Climatescope, 2016f).

## 3.4 Key takeaways from Sections 2 and 3

Sections 2 and 3 identified key considerations with respect to the investors, barriers, markets, and technologies to be targeted for blended finance going forward. Regarding **investors**, blended finance initiatives should focus on attracting international and domestic institutional investors (especially pension funds and life insurers) and commercial banks. Initiatives should target both the limited asset allocations already conducive to clean energy, but also focus on instruments to make clean energy investments more broadly accessible. For example, aggregating assets into tradeable securities or attracting local finance providers through risk mitigation instruments can help to improve renewable energy profiles for a wider swath of investors. While context-specific, the most frequently cited **investment barriers** include lack of liquidity and scale, and risks related to off-taker credit-worthiness, currency volatility, policy and political uncertainty, and finally, uncertainty and lack of track record of early stage projects, technologies, and companies.

While many developing economies offer opportunities for blended finance to unlock private investment in clean energy, we focused on identifying a **subset of developing economies** that are poised to make a significant contribution to achieving global goals, on a per dollar invested basis. We identified Southeast Asia, Sub-Saharan Africa, and South Asia, as areas for focus, with 8 countries within these regions, led by India, as "high-impact" opportunities. We identified blended finance opportunities that could support deployment of both mature **technologies**, such as solar, wind, geothermal, and hydro, as well as distributed generation products, such as for mini-, micro-, and off-grid installations. Finally, while we focused on sub-investment grade countries, blended finance can play a role in supporting the development of new, advanced technologies in more mature developed and developing economies.

# 4. Mapping the Blended Finance Landscape

The risks and barriers facing investors, detailed in the previous section, prevent the realization of investment opportunities in key geographies in developing countries. Blended finance is a tool to address some of these barriers. This section considers several related questions on blended finance: 1) what is the rationale for blended finance, and what types of instruments are used in blending; and 2) how has blended finance been deployed to date in the clean energy sector.

## 4.1 Blended Finance Rationale & Framework

As noted in the introduction, this report uses the Blended Finance Taskforce's working definition of blended finance as, "the use of public/philanthropic funds to mobilize multiples of additional private capital." The focus, in particular, is the use of "concessional" capital, which can come from either public sources, such as multilateral climate funds and bilateral government or export credit agencies, or philanthropic sources, such as foundations.

**Blended finance instruments often transfer the risks of a private sector investor to the public sector.** Different tools transfer different risks that prevent investment into clean energy. As detailed in Table 2 in Section 2, these risks include political risks, technical and physical risks, commercial risks (currency and off-taker), and other investor-related barriers not manageable at the project level.

**Blended finance in clean energy can address both perceived risks and real risks.** Perceived risks typically stem from a lack of understanding or track record of a technology, business model, team, investment strategy, or asset class. These are risks that a blended finance initiative seeks to reduce through its implementation. The rationale stated for blended finance to address perceived risks is typically characterized as either providing a "demonstration effect" or as transferring "pioneer risk" (Expert Interviews, 2017; Escalante et al, 2017 forthcoming). On the other hand, real risks are those investor barriers and risks that a blended finance initiative cannot reduce through its implementation – these are often macro-economic risks such as currency

Table 6: Blended finance instruments

| INSTRUMENT TYPE | DESCRIPTION | EXAMPLES | ADDRESSES WHICH SPECIFIC RISKS/ BARRIERS |
|---|---|---|---|
| **Direct Investment** | Debt or equity instruments with direct contribution into a blended finance vehicle (e.g., project or fund) | Junior/ subordinated capital (e.g., concessional equity & debt) | Multiple risks including off-taker risks, construction risks, revenues attractiveness, etc. |
| | | Commercial capital (catalytic when used for demonstration effect, also known as "anchor capital") | Access to capital |
| **Guarantees** | Generally, three party agreements, where a third party provides an extra layer of protection for the beneficiary of a service, e.g. debt service, in case the entity who would normally provide a service fails to do so | Loan guarantees | Access to capital, counterparty / off-taker / credit risk |
| | | Performance guarantees | Technical risk |
| **Hedging instruments, swaps, and derivatives** | Contractual instruments to help manage different types of risks faced by an investor or borrower | Local currency hedges/swaps | Currency risk |
| | | Securitization | Liquidity/time horizon, scale, counterparty / off-taker / credit risk |
| **Insurance** | Two party contracts between the insurer and the policy holder. The insurance provider promises to provide financial compensation in the instance of an event that results in a financial loss | Political risk insurance | Political and social risks |
| | | Performance insurance | Construction risks, operation and output risks<br>Upstream resource-related risks |
| **Commercially oriented preparation support** | Grant or concessional funding specifically to address early stage development risks | Project preparation funding or technical assistance | Administrative risks, Access to capital, capacity at local level |

Instrument classification adapted from previous CPI work on Risk (Frisari et al. 2013; Micale et al. 2013; Frisari and Micale, 2015) and subsequent expansions of the analytical approach in unpublished consulting work. NB: Instrument classification adapted from previous CPI work on Risk (Frisari et al. 2013; Micale et al. 2013; Frisari and Micale, 2015) and subsequent expansions of the analytical approach in unpublished consulting work.

risks, or risks such as off-taker credit-worthiness, which cannot be overcome, but can be transferred to another party at the project level through the use of the blended finance tool.

As detailed in Table 6, blended finance instruments include direct investment into projects and funds through different types of equity and debt; indirect support through guarantees, insurance, hedging, swap, and derivative instruments; and finally, commercially oriented preparation support, which covers financial and technical support for early stage development risks in project preparation. Each of these instrument types addresses different risks and barriers. We exclude from this list other instruments that can be important to clean energy, but we consider outside the scope of blended finance, including technical support for institutional capacity building, contractual mechanisms, such as standardized power purchase agreements (PPAs), and subsidies, such as feed in tariffs and tax credits.

In developing a blended finance initiative, proponents will benefit from understanding the rationale for the blended finance and how it will catalyze private investment most effectively. Box 2 describes several concepts for assessing the effectiveness of blended finance.

## 4.2 Trends in Blended Finance for Clean Energy to Date

Past experiences in blended finance initiatives give us valuable insight into how blended finance instruments have typically been structured, and what are the areas for future improvements. To understand how blended finance has been deployed to date in clean energy, we researched 25 initiatives in-depth, supplementing these with additional clean energy blended finance initiatives from Convergence's database, for a total of 75 initiatives in developing economies (See Annex 3 for further notes on the methodology). In addition, we developed case studies of several initiatives (see Annex 4) and interviewed a number of investors from the public and private sectors.

Our coverage is not universal, and many more blended finance initiatives specific to clean energy do exist, but constraints on data availability mean these are difficult to assess.

**Box 2: Assessing the catalytic effect of blended finance**

Several concepts are important for assessing the effectiveness of blended finance in catalyzing private investment. One important concept is that of private finance **mobilization** (often referred to as well as leverage).[1] Mobilizing private finance towards meeting impact goals is a critical objective of most blended finance initiatives. Private finance can be mobilized directly (e.g., mobilized co-finance), intermediated indirectly (e.g., via funds or credit lines), or mobilized indirectly (e.g., via enabling outputs).[2] However, using metrics that measure private finance mobilized to assess the effectiveness of blended finance has limitations. For one, all else equal, the further upstream an investment is, the higher the mobilization, regardless of how needed that investment was. For example, fund-of-fund or fund-level initiatives will see a direct mobilization effect at the fund level (crowding in other investors), and an intermediated effect at the project level as the fund invests in a project and crowds in further investment. Therefore, another important criterion for assessing the catalytic impact of a blended finance investment is **additionality** – i.e., would the investment have otherwise occurred without the blended finance instrument.[3] An initiative may be largely additional and fill a critical gap, but may achieve low leverage, and vice versa. Another indication of an investment's catalytic impact is its ability to provide a **demonstration effect**, which may also have low direct leverage.

1 There are many lively debates about these terms and how they should be used – we do not take up this debate in this paper and rather focus on general implications for effectiveness.

2 For more detailed discussion of these topics, see Brown et al, 2015.

3 The DFI Working Group on Blended Concessional Finance for Private Sector Projects released "Enhanced Principles" for the use of blended finance in October 2017. The first of these covers additionality: "it is critical that concessionality is itself not the source of additionality. Indeed, concessionality can undermine additionality if a DFI offers the same financial services on concessional terms as commercial financial institutions are willing to provide on market terms. Such an application of concessionality would crowd-out private finance and should always be avoided." In this context, concessional funding may achieve apparently high leverage, but in doing so supplant commercial financing that would have been supplied anyway, preventing additionality and providing an implicit, unnecessary subsidy to the project/facility in question.

Figure 5: Clean energy blended finance initiatives by sectoral coverage

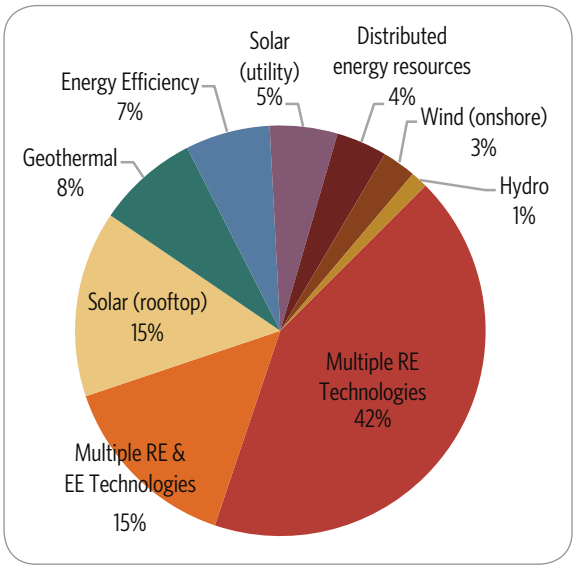
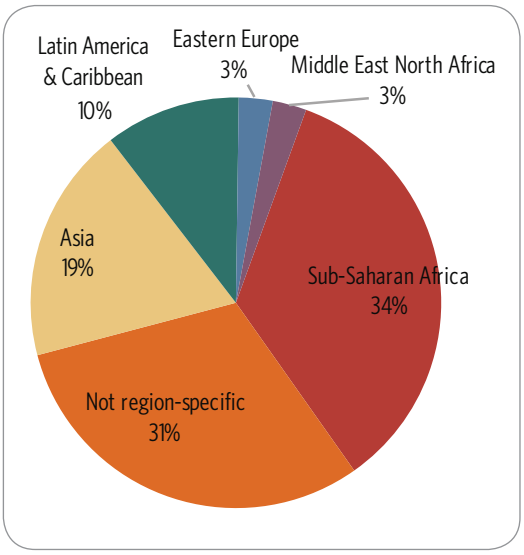



Figure 6: Clean energy blended finance initiatives by geographic coverage




Following is an overview of the 75 blended finance initiatives we looked at describing the state of supply regarding technologies, geographies, scale, risks addressed, and instruments used.

## Technologies, geographies, and scale

From a technology perspective, solar (both utility-scale and rooftop) is the largest blended finance focus, totaling 20% of initiatives, but most initiatives are not technology-specific. Forty three percent of initiatives focus on multiple technologies in renewable energy, while an additional fifteen percent of initiatives cover multiple technologies in both renewable energy and energy efficiency. Only 3% specifically target onshore wind, while 8% target geothermal, 1% hydro, and 4% distributed energy resources. There are no blended finance initiatives focusing on carbon capture and storage. Biofuels and offshore wind do not have initiatives specifically dedicated to them, but may be found within initiatives targeting renewable energy more broadly.

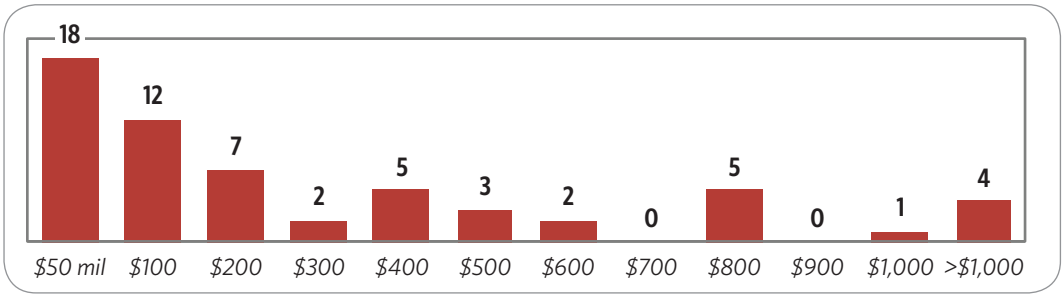
In addition, there are approximately twice as many initiatives focused on de-carbonization as an impact, than on energy access, although many initiatives target a mixture of both.

Geographically, there is a significant focus on sub-Saharan Africa (35% of initiatives) and Asia (19%), as well as a large number of initiatives covering developing countries in multiple regions (31%). Latin America, Eastern Europe, and the Middle East and North Africa have far fewer initiatives specific to their region, but may receive some coverage under the global initiatives.

However, the median size of initiatives in Sub-Saharan Africa appears to be smaller (at USD 66m), compared to USD 328 million for Eastern Europe, and USD 187m for Southeast Asia.[25] Most initiatives are focused on lower income economies. 52% of initiatives focus on lower-middle income countries, and 32% on low income countries. The remaining 16% focus on upper-middle income countries. However, many initiatives invest in a combination of these countries.

Most blended finance initiatives for which data are available (59 out of 75) are relatively small in size, although 17% of these are USD 800 million or more in size, and 7% are over USD 1 billion. Just over half of the initiatives surveyed are USD 100 million or less in size.

Figure 7: Size distribution of blended finance initiatives (USD millions)

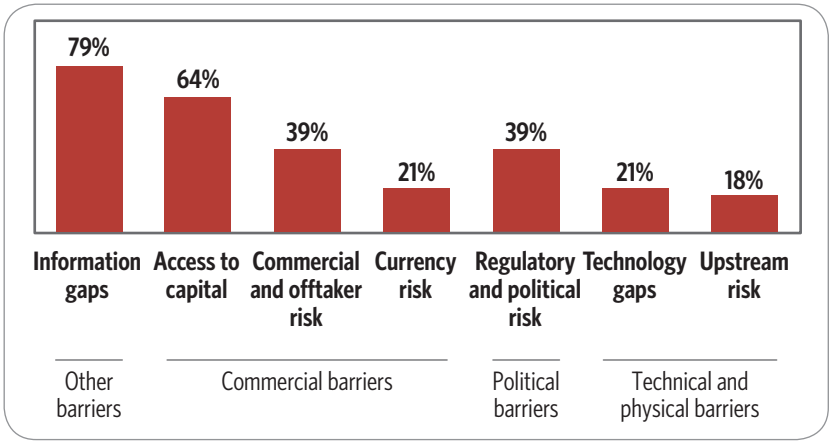



25 As the initiatives vary in terms of how they are blending – with some at the project level, others at the fund or fund-of-funds level, some results are harder to draw strict conclusions from. We consider this especially true of the size results.

### Risks addressed by blended finance initiatives

**Based on a deeper dive into risks addressed for 33 initiatives, we see access to capital and information gaps as the primary barriers addressed.** The latter refers to information asymmetries, or lack of information flow, between parties that prevent lenders from accurately assessing the creditworthiness of counterparties, for example, off-grid rooftop solar projects in which credit histories of individuals are unknown, or investors' lack of market knowledge. In combination or separately, these two barriers have the effect of curtailing access to finance, particularly in early-stage ventures – a key barrier identified in Chapter 3. Other risks, such as political risks, off-taker risk, and currency risk, are less frequently addressed.

Figure 8: Proportion of blended finance vehicles addressing specific risks and barriers



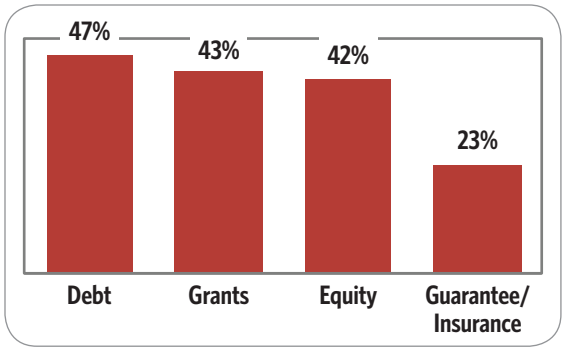

Many blended finance initiatives also seek to establish a track record for an investment strategy – this can include new technologies, teams, business models, and financial structures, and typically would allow for phasing out of concessionality once the track record has been established. Some examples are:

- **fund manager teams:** the Global Energy Efficiency and Renewable Energy Fund (GEEREF) managed by the European Investment Bank specifically focuses on seeding new private equity teams to build track record
- **new business models:** several of the initiatives work to co-invest with local banks, or to provide subsidized credit lines, to build a track record for business lines – examples of this are the U.S.-India Solar Catalytic Finance Facility and CHUEE, as well as other credit line programs, notably at EBRD and IDB.

### Instruments used within blended finance initiatives

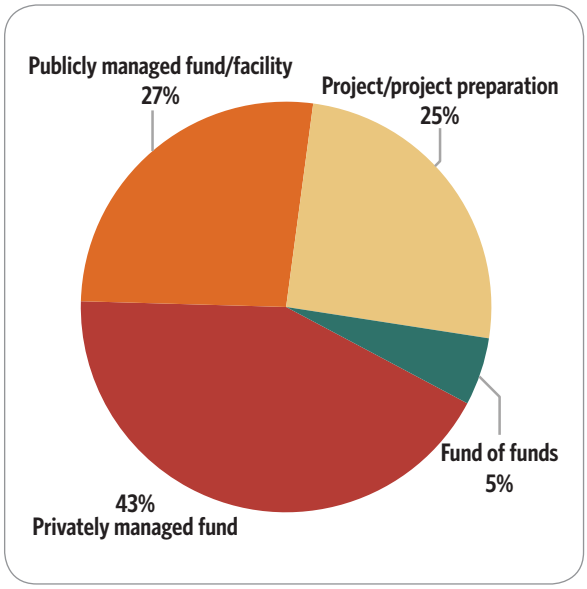
While almost half of the initiatives we surveyed make use of direct investment blended finance instruments, such as concessional equity, concessional debt, and/or grants, relatively few use guarantees and insurance mechanisms. 42% employ concessional equity (typically to catalyze debt finance), 47% concessional debt (typically subordinated, in order to de-risk senior debt and enhance equity returns), and 43% use grants. 21% use guarantees and insurance mechanisms. Nearly half of initiatives surveyed employ a combination of different instruments within their structure.

Figure 9: Concessional instruments used in blended finance vehicles




Three quarters of initiatives are incorporating blending at an aggregated fund or facility level. The remaining quarter of initiatives are blending at the project level, whether at preparation or development stages of the project lifecycle. There are 60% more privately-managed funds as publicly-managed funds or institutional facilities. 5% are fund-of-funds structures.

Figure 10: Blended finance vehicles by level of operation



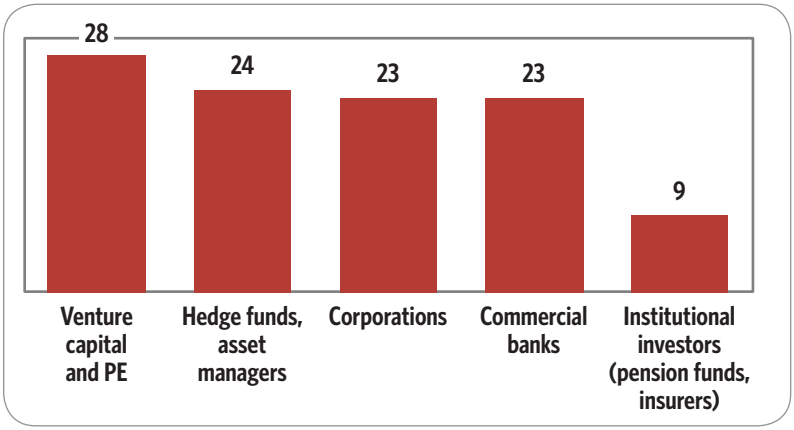
## Private investors participating in blended finance initiatives

*Private investors that participate in blended finance initiatives are diverse, but institutional investors are under-represented.*

Venture capital and private equity investors, perhaps unsurprisingly given their higher risk tolerance, are the most frequent partner of blended finance initiatives, being involved in 26% of initiatives. Banks, corporations, and hedge funds and other asset managers are each involved in ~20% of initiatives. Corporations are, in most cases, project developers or technology partners with equity holdings.

Institutional investors, notably insurance and pension funds, are under-represented, participating in only 8% of initiatives between them. This should not be surprising given their typically lower risk tolerance and preference for upstream investment channels, but, given their total assets under management, does suggest there are gaps between their requirements as investors and what is available in the market. However, although they are invested in fewer initiatives, the median blended finance initiative size in which institutional investors are invested is USD 259m, compared to an overall median size of USD 107.5 m.

Figure 11: Number of blended finance vehicles in which different private investor classes have participated




A deeper dive into several of the initiatives that have secured institutional investment reveals several commonalities:

- **Aggregation:** Seven (78%) are large fund vehicles that aggregate investments into a single fund managed by professional fund managers. For example, in its first close finalized in June 2017, Climate Investor One, a privately-managed fund, raised the majority of its financing from institutional investors. Both Denmark and Norway have established funds that have blended domestic institutional investors (pension and life insurers, respectively) with bilateral development finance; these funds in turn were two of the primary outside equity investors in the Lake Turkana wind farm (see Vestergaard Andersen, 2016, and Annex 4). Aggregation of projects into large funds allows for diversification across technologies and geographies, reducing overall risk.
- **Instruments:** all offer guarantees, subordinated capital, or both to the institutional investor (see Table 7). They typically invest in projects at construction and operational phases of the project lifecycle. Climate Investor One has mobilized private capital at fund level by offering a range of investment options across the project cycle, with several blended finance instruments (including project preparation concessional loans, a guarantee from the Dutch Export Credit Agency covering currency and construction risks, and first-loss equity) supporting the investment options. The Danish Climate Investment Fund (KIF) mobilized 1.7x private capital at the fund level, driven partly by an innovative returns structure offering upside to private investors first through a preferred returns mechanism, and partly by effective coordination and communication between public and private Danish actors helping to bring in large-ticket institutional investors.

On a more sobering note, several funds have noted the persistence required to attract institutional investment. GEEREF approached 964 private investors over two years, finally securing investment of EUR 110m from 24.[26] Climate Investor One approached 300, ultimately securing five.[27]

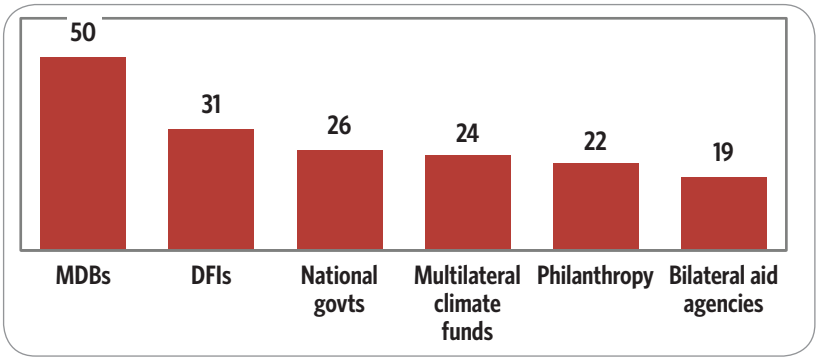
26 https://www.greenclimate.fund/documents/20182/584114/GCF_B.16_07_Add.01_Rev.01_-_Funding_proposal_package_for_FP038.pdf/dec2f220-bcef-4c33-9c22-70168c852b65

27 Personal communication.

Looking more closely at several of the initiatives that have attracted commercial bank finance, we can see that:

- Commercial banks typically participate in blended finance via guarantees and/or sub-ordinated debt. For example, both instruments were incorporated in the Lake Turkana wind project, which attracted commercial banks from South Africa and Europe (Aldwych International, 2014).
- They have also benefited from subsidized credit lines via development finance institutions, allowing them to build technical capacity while building an investment track record. One of the most prominent examples of this type of instrument was an energy efficiency credit line launched by IFC with Global Environment Facility support, the China Utility-focused Energy Efficiency Program (CHUEE), which helped local commercial banks extend loans for energy efficiency upgrades. This type of approach has since been replicated in many geographies by several development finance institutions.

Figure 12: Number of blended finance vehicles in which public and philanthropic investors have participated




### Public and philanthropic investors participating in blended finance initiatives

Among public investors typically lending at non-concessional rates, the vast majority of initiatives surveyed involved multilateral development banks (two-thirds) and bilateral development finance institutions (40%). Concessional investors were more diverse, with bilateral aid agencies, other national government agencies, multilateral climate funds, and philanthropy all providing concessional capital.

### Private Capital Mobilization

The mechanisms through which the surveyed blended finance initiatives mobilize private investment vary. Initiatives mobilize investment directly, through intermediated co-investment, and/or indirectly (see Box 2 in Section 4.1 and Brown et al, 2015 for definitions and representative diagrams). For example, the Africa Clean Energy Facility, a project preparation facility, cites expected leverage of 20 times its grant investments, as these small investments fund discrete project development needs that allow the project to reach financial close. However, this leverage is indirect and difficult to attribute to the initiative. A credit line facility, such as IFC's China Utility-focused Energy Efficiency Program may have low direct mobilization, as a borrower may not on-lend additional resources, but may have high indirect leverage in catalyzing the market – attribution in the latter is difficult to establish (IFC measured a 1.9 weighted average direct leverage in its overall portfolio of financial intermediaries lending,[28] while its CHUEE program specifically cites results of 45-50x indirect leverage). Finally, a fund of fund, such as GEEREF, can cite the direct leverage of private investment through its preferred return fund structure of 0.5x (e.g., USD 1 of private investment for every USD 1 of public investment), a targeted 7x co-investment at the level of its investee funds (both public and private), and finally another targeted 9.5x indirect leverage at the project level.[29] While these numbers can provide some indicative understanding of how an initiative mobilizes private investment, they are difficult to compare due to differences in methodology.

An example of an initiative that is seeking to increase its leverage of private investment over time is GEEREF. While its first fund directly leveraged one dollar of private investment for every dollar of public investment, its successor, GEEREF NeXt is targeting a 2:1 private to public ratio.[30]

To provide concrete examples, Table 7 illustrates the results of four blended finance funds in mobilizing private investment, particularly institutional investors, and the instruments and structures used to do so. Furthermore, Annex 5 describes some initiatives that have recently launched, and how they seek to mobilize private investment.

28 http://www.ifc.org/wps/wcm/connect/f69ea30041ca447993599700caa2aa08/Leverage+in+IFC%27s+Climate-Related+Investments.pdf?MOD=AJPERES
29 http://geeref.com/assets/documents/2016%20GEEREF%20Impact%20Report_public_final_.pdf
30 https://www.greenclimate.fund/documents/20182/574760/Funding_Proposal_-_FP038_-_EIB_-_Multiple_Countries.pdf/2cfaf3b1-1e3d-4bf8-a02a-30d954f2dd80

Table 7: Successes in mobilizing institutional investment

| INITIATIVE | FOCUS | BLENDED FINANCE STRUCTURE | DIRECT CATALYTIC INVESTMENT (CONCESSIONAL + PUBLIC) | DIRECT PRIVATE INVESTMENT | LEVERAGE RATIO[a] | EXPECTED RETURNS |
|---|---|---|---|---|---|---|
| Climate Investor One (Construction Fund) | All-equity financing of renewable energy project construction in sub-investment grade markets | Three tiers:<br>Tier 1 (20%): first loss<br>Tier 2 (40%): subordinated equity<br>Tier 3 (40%): senior fixed income with credit guarantee | USD 175m | USD 300m (with 225m guaranteed) | 1.71 | Tier 1: 2% (inflation)<br>Tier 2: 20%<br>Tier 3: 8% |
| Catalyst Fund | Fund of funds focusing on strengthening financial infrastructure for low carbon investment | Public capital invested on a pari passu basis – e.g., as anchor capital seeking demonstration effect | USD 297m | USD 120m | 0.4 | 20% |
| Danish Climate Investment Fund | Risk capital for climate investments in developing economies; a PPP between Danish government and institutional investors | Equity fund with all losses shared equally; preferred returns for private investors of 6%, catch up to 12%; returns distributed pro-rate above + carried interest to manager | USD 82.5m | USD 137.5m | 1.67 | 12% |
| Global Energy Efficiency and Renewable Energy Fund (GEEREF) | Scale-up low-risk clean energy infrastructure through equity financing in first-time private equity funds | Fund of funds with preferred return structure; Returns paid in following sequence:<br>- Principal + 4% paid to B class<br>- Principal paid to A class<br>- Next 6% paid to B class<br>- Remaining distributions paid to A/B pari passu + carried interest to manager | EUR 122m | EUR 100m | 0.82 | 20% target for investee funds[b] |

a For the purposes of this paper we have utilized a standardized leverage methodology proposed by Systemiq, which includes direct leverage only, equal to: ((total capital invested/total catalytic capital invested) – 1). Guaranteed investments are included as private investment, with no assumption made about the guarantee's leverage.

b One LP investor in B shares reports 8% returns over 3 years since inception http://www.portlandic.com/pdfs/ENG/PIC2326%20GEEREF%20Fund%20Brief.pdf

## 4.3 Blended Finance in the High-impact Regions and Countries

Some of the blended finance initiatives we analyzed provide more detailed information on their geographic focus, instrument used, and risks addressed, allowing us to look at the characteristics of these initiatives at a regional level. 56% of the initiatives we analyzed are concentrated in Sub-Saharan Africa and Asia, which aligns with our market analysis that these regions have significant potential to deploy blended finance tools. Specifically, among the countries we have identified in Section 3 as "high-impact opportunities," 17% of initiatives include India as a target country, 20% Uganda, 27% Kenya, and 21% Rwanda, indicating that many blended finance initiatives are progressing in the right direction. These figures are probably an underestimate since initiatives working in Asia, Sub-Saharan Africa or globally do not always specify individual target geographies but are likely to operate in these countries.

Although our findings are only based on the initiatives that have provided relevant data, and are not statistically representative of all the blended finance instruments on the ground, there are some interesting general trends:

### Instruments used

We find that among the initiatives we analyzed, relatively few of them have reported a guarantee element in the design, especially for funds that specifically target Sub-Saharan Africa. More blended finance initiatives targeting the Sub-Saharan region involve a grant element than those targeting other regions.

### Risks addressed

We find that initiatives focused on Asia are more likely to address political risks, while initiatives focused on the Sub-Saharan Africa region are more likely to address technical risks. Regardless of geographic focus, all initiatives are more likely than not to address commercial risks, indicating commercial risks are widely recognized by blended finance instruments.

We do not have a complete picture of what types of commercial risks these initiatives are targeting. However only a few initiatives seem to target currency risk or off-taker risk in their design, rather offering foreign currency on concessional terms to address a lack of availability of financing. TCX's Long Term FX Risk Management initiative for renewable energy is one exception, offering long-term risk hedging instruments in countries with underdeveloped capital markets. GEEREF NeXt, the follow-on from GEEREF, aims to mitigate off-taker risk by engaging early with regulatory bodies in target countries. Guarantees are cited by interviewees as an effective means of transferring off-taker risk to the appropriate parties and were used, for example, in the Lake Turkana wind farm project in Kenya. Table 8 summarizes key barriers and potential areas where blended finance instruments can increase their focus.

Table 8: Key takeaways for the top needs for blended finance in the key markets

| HIGH-IMPACT COUNTRY FOCUS | INVESTMENT POTENTIAL (USDBN) | KEY BARRIERS | GAPS IN COVERAGE BY EXISTING INSTRUMENTS |
|---|---|---|---|
| India | 292 | Off-taker risk<br>Currency risk<br>Liquidity risk | Not enough focus on these risks to date. |
| South Africa, Mozambique | 36 | Off-taker risk<br>Currency risk<br>Access to debt finance | Grant financing has helped cover commercial risks but not much specific focus on off-taker risk and currency risk, which are both increasing, especially in South Africa. |
| Cambodia, Mongolia | 4 | Policy/ administrative risk<br>Revenue attractiveness | More focus needed in helping early stage businesses in Cambodia and tariff supports in Mongolia. |
| Kenya, Uganda, Rwanda | 37 | Currency risk<br>Access to debt finance<br>Off-taker risk | Some positive developments in Kenya, specifically with access to finance and guarantees that could be applied to other countries. |

# 5. Recommendations for Scaling Up the Impact of Blended Finance in Clean Energy

Experiences in deploying blended finance for clean energy have led to important successes in unlocking financing for clean energy in developing economies, but much more needs to be done. This report has described the opportunities for unlocking clean energy investment, and the rationale for and trends in blended finance initiatives to date. This section seeks to complete the picture by providing recommendations to current and future blended finance practitioners in order to increase the impact of their initiatives and unlock significant volumes of private finance. Recommendations are divided into "Opportunities" in key high-impact markets where blended investments are likely to have the biggest impact; "Instruments" that are needed to mitigate and transfer risks in order to unlock private investment; and important considerations for "Achieving Scale" in order to ensure success over time.

As a starting point, practitioners need to acknowledge the highly context-specific nature of all investments. The first step towards deploying blended finance is to understand context-specific barriers to investment, identified through market analysis and discussions with private investors, and then to match appropriate instruments to these barriers. It's important to acknowledge that blended finance won't be the right solution to all problems, so a clear rationale for blending needs to be established upfront. Blended finance instruments need to be deployed in different combinations to address specific barriers, recognizing that some level of enabling environment—both generally conducive to private sector investment as well as specific to renewable energy—is a pre-requisite. As a general matter, all public and philanthropic funders should start with a focus on private investor needs and create structures and approaches that address these needs.

## 5.1 Opportunities for investment

**Recommendation #1: Invest in high-impact markets, including India, East- and Southeast Asia, and East- and Southern Africa**

*The subset of eight high-impact countries we analyzed as particularly relevant for blended finance represents a USD 369bn investment opportunity. Overall, the 46 countries that meet our criteria for prioritized deployment of blended finance represent a more than USD 1 trillion investment opportunity.*

For the high-impact markets identified in this paper, Table 9 identifies the high-impact sectors and types of blended finance instruments and initiatives that are needed. Some new initiatives are already working to fill these gaps (the India case study in Section 3.3 and Annex 5 provide additional details on these and other initiatives).

## 5.2 Instruments to Prioritize

**Recommendation #2: Invest in risk-mitigation instruments such as guarantees, insurance, and local currency hedging and financing to address the most prevalent market risks**

*Given steep declines in clean energy costs, blended finance needs to shift from a focus on covering the "viability" gap between clean energy and competing fossil fuel technologies, to a focus on targeted investment risks and barriers.*

In particular, priorities identified in CPI's data analysis as well as through investor interviews include addressing off-taker risk, currency risk, liquidity risk, and policy risk.

Table 9: Blended finance opportunities in the high-impact markets identified

| HIGH-IMPACT COUNTRY FOCUS | INVESTMENT POTENTIAL (USDBN) | BLENDED FINANCE NEEDS | SOME PROMISING INITIATIVES THAT COULD BE APPLIED IN THESE COUNTRIES |
|---|---|---|---|
| India | 292 | Small project aggregation/securitization<br>Guarantees<br>Support to local banks for local currency financing | India Rooftop Solar Facility<br>Solar Energy Investment Trusts<br>U.S.-India Solar Catalytic Finance Facility |
| South Africa, Mozambique | 36 | Guarantees<br>Support to local banks for local currency financing<br>Regionally/globally diversified project investment vehicles (for Mozambique especially) | DBSA Climate Finance Facility<br>Climate Investor One |
| Cambodia, Mongolia | 4 | Revenue support (Mongolia)<br>Early stage business risk financing and demonstrations; e.g., PayGo solar markets, receivables financing, blended equity (Cambodia) | ADB Green Finance Catalytic Facility<br>MicroGrid Investment Accelerator |
| Kenya, Uganda, Rwanda | 37 | Guarantees<br>Support for local currency financing Receivables securitization<br>Regionally/globally diversified project investment vehicles | Facility for Energy Inclusion (AFDB)<br>Common Risk Mitigation Mechanism (CRMM) |

This has important implications for which instruments to deploy – with risk mitigation instruments such as guarantees, insurance, and local currency hedging and financing more important than previously. Yet, as analyzed in Section 4, relatively few initiatives to date deploy these instruments. This is likely leaving a great deal of private sector investment on the sidelines: an analysis of multilateral institutions indicated that guarantees represent approximately only 5% of their commitments but generate approximately 45% of their private-sector mobilization (Betru and Lee, 2017). Furthermore, past CPI research found that, even among the already low-risk instrument offerings, only 10% of risk instruments focused on climate related projects (Micale, Frisari and Mazza, 2013).

Other researchers have pointed out that several administrative barriers prevent the wide use of guarantees as an instrument for private capital mobilization. First, development finance institutions typically book guarantees in the same way as loans for the purposes of risk capital allocation (as if a guarantee were a loan exposure for 100% of the amount), thus discouraging the use of guarantees over loans (Humphry & Prizzon, 2014; MIGA, 2013). Second, guarantees are not counted as official development assistance (ODA) by the OECD, and thus, many financial institutions are not incented to use them (Betru and Lee, 2017). In fact, several bilateral institutions are obliged by law to offer only ODA-eligible financial products, thus excluding all guarantees (Mirabelle et al, 2014).

A recently announced initiative, the Common Risk Mitigation Mechanism, is one effort which seeks to address this gap (Terawatt Initiative, 2017). For currency risk specifically, another example is TCX's Long Term FX Risk Management initiative, which mobilized EUR 100m of investment with a EUR 30m foreign exchange hedging facility (Global Innovation Lab for Climate Finance, 2017b).

### Recommendation #3: Design initiatives that can generate tradable, liquid assets

*To overcome investment hurdles, including liquidity risk, and access larger pools of capital for clean energy, the creation of new investment approaches that aggregate individual project and private company investments into liquid assets, e.g., through securitization, will be critical.*

This will also help to free up the balance sheets of project developers and banks to generate liquidity to invest in new projects. While initiatives in developed markets, particularly by green investment banks, have recently had successes in aggregating projects into investment-grade vehicles that have secured

institutional investment (OECD, 2017b), there is little experience to date in emerging markets. However, some recent initiatives have been proposed and are raising financing, such as Solar Energy Investment Trusts (Global Innovation Lab for Climate Finance, 2017d) and the IFC's Rooftop Solar Financing Facility (Global Innovation Lab for Climate Finance, 2016) in India, and the Green Receivables Fund (Global Innovation Lab for Climate Finance, 2017e) in Brazil.

For non-project based financing, supporting energy generation companies, including distributed generation start-ups (via early stage blended risk finance) as well as established utilities (via risk mitigation instruments) to access capital markets financing will also help to mainstream clean energy finance.

**Recommendation #4: Support early-stage risk financing**

*There are large gaps in access to early stage risk financing for project preparation, distributed generation companies, and new technologies.*

This is particularly true for **project preparation** during the earliest milestones of mid- to large- scale projects (e.g., over 10 MW) (Global Innovation Lab for Climate Finance, 2017c). Some grant initiatives, notably the Africa Clean Energy Facility (ACEF) and U.S. India Clean Energy Facility (ICEF), have focused on addressing gaps at this stage. However, to date, a financially sustainable solution has not been established. Several initiatives, including Climate Investor One's Development Fund and a newly endorsed Lab instrument, the Renewable Energy Scale-Up Facility, seek to re-coup at least some costs using innovative mechanisms.

For technologies involving high upfront commitment combined with significant resource risk, such as geothermal, where debt finance only steps in once 70% of the resource has been proven (Micale, Oliver and Messent, 2014), early stage financing is similarly difficult to obtain. In Africa, the Geothermal Risk Mitigation Facility (GRMF) program plans to address this risk, by co-financing surface studies and drilling. A similar program is being developed by IDB, combining public loans convertible to grants, with private insurance, both aimed at targeting resource risk during the exploration/drilling phase.

For **distributed generation**, which is largely financed through corporate finance, interviews have also identified a scarcity of investment at the earliest stages—including equity and debt—in particular in countries with under-developed financial sectors. ACEF sought to address this barrier as well through grants. In India, a group of philanthropies is working to build the India Catalytic Solar Finance Facility, which will use catalytic capital to help non-bank financial companies establish new business lines by co-investing in small and medium sized enterprises that are seeking to scale their clean energy businesses or deploy distributed solar generation (U.S. Embassy and Consulates in India, 2016; Expert Interviews, 2017).

Finally, **new renewable energy technologies**, such as energy storage, also face a scarcity of early stage risk finance, including in developed markets. A blended finance initiative in the U.S., the PRIME Coalition, works to deploy philanthropic capital in early stage clean energy technology companies to catalyze private investment, but large gaps remain.

## 5.3 Achieving Scale

**Recommendation #5: Replicate and scale ideas that work**

Prior to developing a new initiative, adequate analysis needs to be undertaken up front to understand whether replicating or scaling an existing blended finance initiative can address the investment barriers identified. For example, an instrument that has been effective in another geography could be applied to a new context. The Inter-American Development Bank's Energy Savings Insurance instrument, under development in seven Latin American countries, is an example of such an instrument, as it has recently been replicated by the Agence Française de Développement in Mauritius, Turkey, and India (Latin American and Caribbean Green Financing Platform, 2017).

*Scaling existing, successful initiatives can attract institutional investors.*

Our analysis of blended finance initiatives that have been successful to date in attracting institutional investment noted that large, diversified blended funds were a promising approach. Initiatives that attracted institutional investment were larger than the median size of blended finance initiatives. Examples of these include Climate Investor One, GEEREF, and the Danish Climate Investment Fund. The European Investment Bank is currently fundraising for GEEREF Next, which, at USD 750m targeted, is expected to triple the size of its predecessor GEEREF (Green Climate Fund, 2017).

In addition, mainstreaming the components underlying the success of a blended finance initiative (e.g., standardized power purchase agreements or standardized investor agreements) could also be a way to help promote scale of existing initiatives. Finally, among others, DBSA and the Asian Development Bank (see ADB, 2017) are helping to mainstream green finance through the establishment of local green investment facilities.

### Recommendation #6: Incorporate technical advisory to develop long-term local capacity

The incorporation of technical advisory services in most blended finance initiatives is critical to developing local capacity. One example of this is technical assistance to increase the availability of local currency financing. One interviewee cited the need for technical assistance to help update the risk management frameworks of many local commercial banks to more modern risk management approaches, including the use of customer payment history to facilitate receivables financing. Modernization of risk management would help open the market for energy access in particular. Other technical assistance opportunities include supporting local project developers with best practices and helping off-takers improve their credit-worthiness and standardize contract agreements.

### Recommendation #7: Support Intermediaries to "prime the pump" for innovative ideas and build investor interest and capacity

Concessional funders are well placed to help "prime the pump" through the incubation of new ideas, and to build investor participation through networks and other capacity building efforts. Networks such as the Lab, Convergence, the PRIME Coalition, and the Global Impact Investing Network are all working to establish strategic partnerships and relationships that are needed between concessional and commercial investors in order to move capital effectively. To help get ideas to launch, DBSA established an innovation unit that is creating a Southern Africa Lab for climate finance. Funders can also help to increase investor capacity to understand and participate in blended finance, and eventually, to mainstream clean energy investment in their organizations; for example, organizations such as Aligned Intermediary help remove the bottlenecks between institutional investors and clean energy investment opportunities, including through education and working directly with Chief Investment Officers.

### Recommendation #8: Work to streamline processes in order to reduce transaction costs at the institutional level

*Participants in blended finance initiatives report that aligning investors is a costly and time-consuming process, and there is a substantial need to reduce transaction costs.*

In particular, approval and asset allocation processes, staff capacity and incentives, and documentation requirements within the institutions working on blended finance initiatives and deals are creating a drag effect, with concessional investors cited by some participants as more difficult to align than private investors. This points to a need to reduce transaction costs through streamlining of processes (Expert Interviews, 2017).

Some institutions are already working to address this point. For example, some philanthropies are pooling their resources to reduce transaction costs and multiply their impact, for example, in the U.S.-India Catalytic Solar Finance Facility; this is also a key objective of multilateral climate funds. Development finance institutions could move from a project-by-project investment approach to programmatic approaches, as many have already been doing.

# 6. References


Aldwych International. 2014. "Lake Turkana Wind Power Project". Seminar on Sustainable Energy Investments in Africa, Copenhagen, 24-25 June 2014. https://old.danwatch.dk/wp-content/uploads/2016/05/Aldwych-Presentation-on-LT-WP-2014.pdf

Asian Development Bank (ADB). 2017. "Catalyzing Green Finance: A Concept for Leveraging Blended Finance for Green Development." https://www.adb.org/sites/default/files/publication/357156/catalyzing-green-finance.pdf

Betru, A. and C. Lee. 2017. "Clearing a Path for Global Development Finance: Enabling Basel and Development Guarantees to Deliver on Sustainable Development Goals." Milken Institute, Santa Monica, CA. http://assets1c.milkeninstitute.org/assets/Publication/Viewpoint/PDF/090717-Basel-SDG-White-Paper.pdf

Bloomberg New Energy Finance. 2015. "Levelized Cost of Electricity – DFID priority countries" https://assets.publishing.service.gov.uk/media/57a0897b40f0b652dd00023e/61646_Levelised-Cost-of-Electricity.pdf

Bloomberg New Energy Finance (BNEF). 2016. "Finance Guide for Policymakers: Renewable Energy, Green Infrastructure." https://www.bbhub.io/bnef/sites/4/2016/08/Finance-Guide-for-Policymakers-RE-GreenInfra-August-2016.pdf

Bloomberg New Energy Finance. 2017. "Accelerating India's Clean Energy Transition: The future of rooftop PV and other distributed energy markets in India." https://data.bloomberglp.com/bnef/sites/14/2017/11/BNEF_Accelerating-Indias-Clean-Energy-Transition_Nov-2017.pdf

Brand, R. 2017. "Traders Run for Cover as Storm Bears Down on South Africa's Rand." Bloomberg Markets. https://www.bloomberg.com/news/articles/2017-09-27/traders-run-for-cover-as-storm-bears-down-on-south-africa-s-rand

Brown, J., M. Stadelmann, D. Wang, L. Boni, R. Jachnik and T. Kato. 2015. "Estimating Mobilized Private Finance for Adaptation: Exploring Data and Methods." Climate Policy Initiative. https://climatepolicyinitiative.org/wp-content/uploads/2015/11/Estimating-mobilized-private-finance-for-adaptation-Exploring-data-and-methods.pdf

Buchner, B.K., P. Oliver, X. Wang, C. Carswell, C. Meattle and F. Mazza. 2017. "Global Landscape of Climate Finance 2017." Climate Policy Initiative. https://climatepolicyinitiative.org/wp-content/uploads/2017/10/2017-Global-Landscape-of-Climate-Finance.pdf

Business and Sustainable Development Commission. 2017. "Better Business Better World". http://report.businesscommission.org/uploads/BetterBiz-BetterWorld_170215_012417.pdf

Cahill, P. 2016. "$40bn in coverage, 800+ projects, and only 8 claims – what's MIGA's secret?". OnFrontiers. https://onfrontiers.com/blog/40bn-coverage-800-projects-only-8-claims-whats-miga-secret/

Climatescope. 2016a. "Bangladesh." http://global-climatescope.org/en/country/bangladesh/#/details

Climatescope. 2016b. "India." http://global-climatescope.org/en/country/india/#/details

Climatescope. 2016c. "Kenya." http://global-climatescope.org/en/country/kenya/#/details

Climatescope. 2016d. "Mozambique." http://global-climatescope.org/en/country/mozambique/#/details

Climatescope. 2016e. "Nepal." http://global-climatescope.org/en/country/nepal/#/details

Climatescope. 2016f. "Rwanda". http://global-climatescope.org/en/country/rwanda/#/details

Climatescope. 2016g. "South Africa." http://global-climatescope.org/en/country/south-africa/#/details

Climatescope. 2016h. "Uganda". http://global-climatescope.org/en/country/uganda/#/details

Climatescope. 2016i. "Zambia". http://global-climatescope.org/en/country/zambia/#/details

Convergence Blended Finance Deal Database. Accessed October 2017. https://convergence.finance/deal-database

DFI Working Group on Blended Concessional Finance for Private Sector Projects. 2017. "Summary Report." http://www.ifc.org/wps/wcm/connect/30635fde-1c38-42af-97b9-2304e962fc85/DFI+Blended+Concessional+Finance+for+Private+Sector+Operations_Summary+R....pdf?-MOD=AJPERES

Escalante, D., D. Abramskiehn, K. Hallmeyer and J. Brown. 2017 forthcoming. "Assessing the Additionality of Climate Investments." Climate Policy Initiative.

Ehlers, T. 2014. "Understanding the challenges for infrastructure finance." Bank for International Settlements Working Papers, Monetary and Economic Department, No. 454. https://www.bis.org/publ/work454.pdf

EMPEA. 2015. "Special Report: Private Investing in the Power Sector in Emerging Markets". http://denhamcapital.com/assets/2017/03/PowerSectorReport_WEB_public.pdf

Farooquee, A. and G. Shrimali. 2016. "Driving Foreign Investment to Renewable Energy in India: A Payment Security Mechanism to Address Off-Taker Risk." Climate Policy Initiative. https://climatepolicyinitiative.org/publication/driving-foreign-investment-renewable-energy-india-payment-security-mechanism-address-off-taker-risk/

Frisari, G. and V. Micale. 2015. "Risk Mitigation Instruments for Renewable Energy in Developing Countries: A Case Study on Hydropower in Africa." Climate Policy Initiative. https://climatepolicyinitiative.org/wp-content/uploads/2015/07/Risk-Mitigation-Instruments-for-Renewable-Energy-in-Developing-Countries-%E2%80%93-A-Case-Study-on-Hydropower-in-Africa.pdf

Frisari, G., M. Hervé-Mignucci, V. Micale and F. Mazza. 2013. "Risk Gaps: A Map of Risk Mitigation Instruments for Clean Investments." Climate Policy Initiative. http://climatepolicyinitiative.org/wp-content/uploads/2013/01/Risk-Gaps-A-Map-of-Risk-Mitigation-Instruments-for-Clean-Investments.pdf

GlobalEDGE. 2017. "Cambodia: Risk Assessment." https://globaledge.msu.edu/countries/cambodia/risk

Global Energy Efficiency and Renewable Energy Fund (GEEREF). 2017. "Investment Strategy." http://geeref.com/about/investment-strategy.html

Global Innovation Lab for Climate Finance. 2016. "Rooftop Solar Private Sector Financing Facility." https://www.climatefinancelab.org/project/rooftop-solar-private-sector-financing-facility/

Global Innovation Lab for Climate Finance. 2017a. "How It Works." https://www.climatefinancelab.org/about/how-it-works/

Global Innovation Lab for Climate Finance. 2017b. "Long-Term FX Risk Management." https://www.climatefinancelab.org/project/long-term-currency-swap/

Global Innovation Lab for Climate Finance. 2017c. "Instrument Analysis: Renewable Energy Scale-Up Facility." https://www.climatefinancelab.org/wp-content/uploads/2017/09/Global-Lab-Instrument-Analysis-RESF-1.pdf

Global Innovation Lab for Climate Finance. 2017e. "Green Receivables Fund (Green FIDC)." https://www.climatefinancelab.org/project/green-receivables-fund-green-fidc/

Green Climate Fund. 2017. "Projects and Programmes: Project FP038 – GEEREF NeXt." http://www.greenclimate.fund/-/geeref-next

Hervé-Mignucci, M., X. Wang, D. Nelson and U. Varadarajan. 2015. "Slowing the Growth of Coal Power in China: The Role of Finance in State-Owned Enterprises." Climate Policy Initiative. https://climatepolicyinitiative.org/wp-content/uploads/2015/12/Slowing-the-Growth-of-Coal-Power-in-China-%E2%80%93-the-Role-of-Finance-in-State-Owned-Enterprises.pdf

Huxham, M., U. Varadarajan, B. O'Connell and D. Nelson. 2017. "Mobilizing low-cost institutional investment in renewable energy: Major barriers and solutions to overcome them." Climate Policy Initiative. https://climatepolicyinitiative.org/wp-content/uploads/2017/08/August-2017-CPI-Energy-Finance-CEIT-Barriers-report-final.pdf

Humphry, C., A. Prizzon. 2014. "Guarantees for development: A review of multilateral development bank operations." Overseas Development Institute. https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9398.pdf

India Innovation Lab for Green Finance. 2016a. "P50 Risk Solutions: Lab Instrument Analysis". https://www.climatefinancelab.org/wp-content/uploads/2017/08/P50-Risk-Solutions_full-report-1.pdf

India Innovation Lab for Green Finance. 2016b. "FX Hedging Facility: Lab Instrument Analysis". https://www.climatefinancelab.org/wp-content/uploads/2017/08/FX-Hedging-Facility_full-report.pdf

India Innovation Lab for Green Finance. 2017a. "Solar Investment Trusts: Instrument Analysis." https://www.climatefinancelab.org/wp-content/uploads/2017/06/Solar-Investment-Trusts-SEITs_Instrument-Analysis.pdf

India Innovation Lab for Green Finance. 2017b. "Sustainable Energy Bonds: Instrument Analysis." https://www.climatefinancelab.org/wp-content/uploads/2017/06/Sustainable-Energy-Bonds-SEBs_Instrument-Analysis.pdf

India Innovation Lab for Green Finance. 2016c. "Rooftop Solar Private Sector Financing Facility: Instrument Analysis." https://www.climatefinancelab.org/wp-content/uploads/2017/08/Rooftop-Solar-Private-Sector-Financing-Facility_full-report.pdf

International Energy Agency (IEA). 2016. "World Energy Outlook 2016." https://www.iea.org/newsroom/news/2016/november/world-energy-outlook-2016.html

International Energy Agency (IEA). 2017a. "Energy Access Outlook 2017." https://www.iea.org/publications/freepublications/publication/WEO2017SpecialReport_EnergyAccessOutlook.pdf

International Energy Agency (IEA). 2017a. "Renewables 2017". https://www.iea.org/publications/renewables2017/

International Energy Agency (IEA). 2017b. "Southeast Asia Energy Outlook 2017." https://www.iea.org/publications/freepublications/publication/WEO2017SpecialReport_SoutheastAsiaEnergyOutlook.pdf

International Renewable Energy Agency (IRENA). 2013. "Renewable Energy Country Profiles: Asia." http://www.irena.org/-/media/Files/IRENA/Agency/Publication/2013/_AsiaComplete.ashx

International Renewable Energy Agency (IRENA). 2013. "Africa Power Sector: Planning and Prospects for Renewable Energy". http://www.irena.org/documentdownloads/Publications/IRENA_Africa_Power_Sector_synethesis_2015.pdf

Kaminker, C. and F. Stewart. 2012. "The Role of Institutional Investors in Financing Clean Energy", OECD Working Papers on Finance, Insurance and Private Pensions, No. 23, OECD Publishing, Paris. http://www.oecd.org/environment/WP_23_TheRoleOfInstitutionalInvestorsInFinancingCleanEnergy.pdf

Latin American and Caribbean Green Financing Platform. 2017. "Energy Savings Insurance." https://www.greenfinancelac.org/esi/

Ma, T. 2016. "Basel III and the Future of Project Finance Funding". Michigan Business and Entrepreneurial Law Review, Vol. 6, Issue 1, pp. 109-126. http://repository.law.umich.edu/cgi/viewcontent.cgi?article=1056&context=mbelr

McKinsey Global Institute. 2011. "The emerging equity gap: Growth and stability in the new investor landscape." https://www.mckinsey.com/~/media/McKinsey/Global%20Themes/Global%20Capital%20Markets/Emerging%20equity%20gap/MGI_Emerging_equity_gap_Executive_summary.ashx

Micale, V., G. Frisari and F. Mazza. 2013. "Mapping the World Bank Group Risk Mitigation Instruments for Climate Change." Climate Policy Initiative. https://climatepolicyinitiative.org/wp-content/uploads/2013/09/World-Bank-Group-Risk-Mitigation-Instruments-for-Climate-Change-Brief1.pdf

Micale, V., P. Oliver and F. Messent. 2014. "The Role of Public Finance in Deploying Geothermal: Background Paper." Climate Policy Initiative. https://climatepolicyinitiative.org/wp-content/uploads/2014/10/Geothermal-Background-Final.pdf

Mirabelle, M., J. Benn, C. Sangaré. 2013. "Guarantees for Development." OECD. http://www.oecd-ilibrary.org/development/guarantees-for-development_5k407lx5b8f8-en

Nelson, D. and B. Pierpoint. 2013. "The Challenge of Institutional Investment in Renewable Energy." Climate Policy Initiative. https://climatepolicyinitiative.org/wp-content/uploads/2013/03/The-Challenge-of-Institutional-Investment-in-Renewable-Energy.pdf

Nelson, D., G. Shrimali, S, Goel and C. Konda. 2012. "Meeting India's Renewable Energy Targets: The Financing Challenge." Climate Policy Initiative. https://climatepolicyinitiative.org/publication/meeting-indias-renewable-energy-targets-the-financing-challenge/

OECD. 2016. "Annual Survey of Large Pension Funds and Public Pension Reserve Funds: Report on Pension Funds' Long-Term Investments." http://www.oecd.org/daf/fin/private-pensions/2015-Large-Pension-Funds-Survey.pdf

OECD. 2017a. 'About – Members and Partners." http://www.oecd.org/about/membersandpartners/

OECD. 2017b. "Green Investment Banks: Innovative Public Financial institutions Scaling up Private, Low-carbon Investment." OECD Environment Policy Paper No. 6, Paris. http://dx.doi.org/10.1787/e3c2526c-en

Public Private Infrastructure Advisory Facility (PPIAF). 2013. "Institutional Investment in Infrastructure in Emerging Markets and Developing Economies". World Bank Group, Washington, DC. https://ppiaf.org/documents/1918/download

Reicher, D., J. Brown and D. Fedor. 2017. "Derisking Decarbonization: Making Green Energy Investments Blue Chip." Stanford University Center for Energy Policy and Finance, Stanford, CA. https://energy.stanford.edu/sites/default/files/stanfordcleanenergyfinanceframingdoc10-31_final.pdf

REN21. 2017. "Renewables 2017: Global Status Report." http://www.ren21.net/wp-content/uploads/2017/06/17-8399_GSR_2017_Full_Report_0621_Opt.pdf

S&P Global Platts World Electric Power Plants Database, June 2017, Accessed October 2017. https://www.platts.com/products/world-electric-power-plants-database

Sen, V., K. Sharma and G. Shrimali. 2016. "Reaching India's Renewable Energy Targets: The Role of Institutional Investors." Climate Policy Initiative. https://climatepolicyinitiative.org/publication/reaching-indias-renewable-energy-targets-role-institutional-investors/

Shrimali, G. 2016. "The Drivers and Challenges for Third Party Financing for Rooftop Solar Power in India." Climate Policy initiative. https://climatepolicyinitiative.org/publication/third-party-financing-rooftop-solar-power-india/

Sustainable Energy for All. 2017. "Energizing Finance: Scaling and Refining Finance in Countries with Large Energy Access Gaps". Washington, DC. http://www.se4all.org/sites/default/files/2017_SEforALL_FR4P.pdf

Terawatt Initiative. 2017. "Common Risk Mitigation Mechanism". https://crmm.terrawatt.org/

The Climate Group. 2015. "The Business case for Off-Grid Energy in India." https://www.theclimategroup.org/sites/default/files/archive/files/The-business-case-for-offgrid-energy-in-India.pdf

Upadhyay, A. 2017a. "Wind Power Costs Plunger in Asia's First Auction for Contracts." Bloomberg. https://www.bloomberg.com/news/articles/2017-02-24/wind-power-costs-plunge-in-asia-s-first-auction-for-contracts

Upadhyay, A. 2017b. "SoftBank and Foxconn Bring India Some of World's Cheapest Solar." Bloomberg. https://www.bloomberg.com/news/articles/2017-05-12/softbank-and-foxconn-bring-india-some-of-world-s-cheapest-solar

U.S. Department of Commerce. 2017a. "Cambodia – Power Generation Equipment." https://www.export.gov/article?id=Cambodia-power-generation-equipment

U.S. Department of Commerce. 2017b. "Mongolia – Energy Generation." https://www.export.gov/article?id=Mongolia-Energy-Generation

U.S. Embassy and Consulates in India. 2016. "Fact Sheet: The United States and India – Moving Forward Together on Climate Change, Clean Energy, Energy Security, and the Environment." https://in.usembassy.gov/fact-sheet-united-states-india-moving-forward-together-climate-change-clean-energy-energy-security-environment/

Verduow, W., D. Uzsoki and C. Dominguez Ordoñez. 2015. "Currency Risk in Project Finance". International Institute for Sustainable Development Discussion Paper, Winnipeg. https://www.iisd.org/sites/default/files/publications/currency-risk-project-finance-discussion-paper.pdf

Vestergaard Andersen, A. 2016. "Kenya Constructs Africa's Largest Wind Farm with Danish Support." State of Green. https://stateofgreen.com/en/profiles/state-of-green/news/kenya-constructs-africa-s-largest-wind-farm-with-danish-support

World Bank. 2015. "Global Financial Development Report 2015/2016: Long-Term Finance." World Bank Group, Washington, DC. http://documents.worldbank.org/curated/en/955811467986333727/pdf/99100-PUB-REVISED-Box393195B-OUO-9-until-9-14-15.pdf

World Economic Forum. 2013. "From the Margins to the Mainstream: Assessment of the Impact Investment Sector and Opportunities to Engage Mainstream Investors." World Economic Forum, Geneva. http://www3.weforum.org/docs/WEF_II_FromMarginsMainstream_Report_2013.pdf