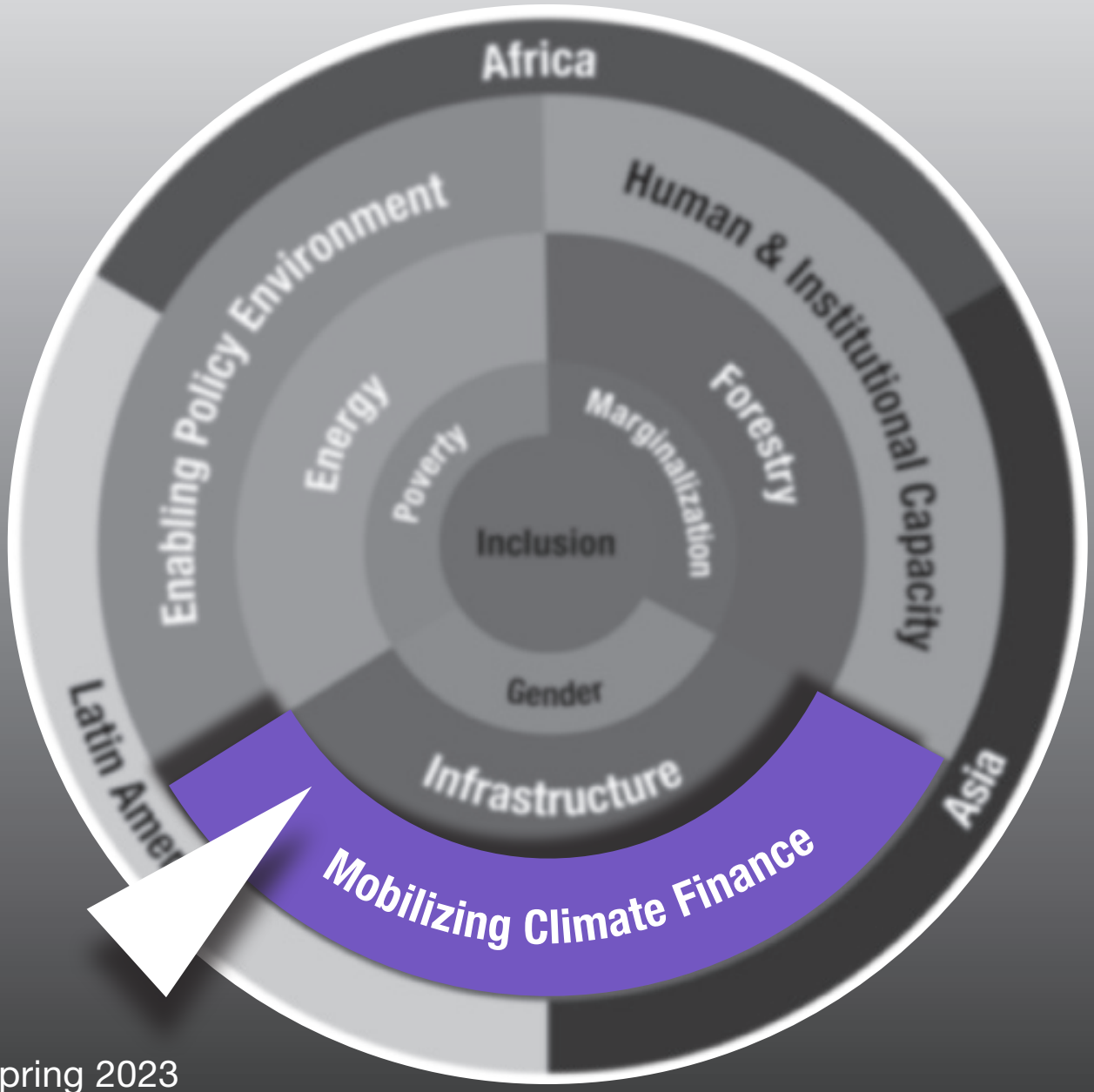
AN ACTIONABLE RESEARCH AGENDA FOR INCLUSIVE LOW-CARBON TRANSITIONS FOR SUSTAINABLE DEVELOPMENT IN THE GLOBAL SOUTH

Mobilizing new climate investment models

EfD
Environment for Development

FUNDED BY:
IDRC · CRDI
Canada



Spring 2023

Contents

Preface

All countries now face enormous challenges posed by climate change. The consequences of continued greenhouse gas emissions are dire. According to AfDB (2022), this is especially true for countries in the Global South that are both more affected and more vulnerable to climate change at the same time as they have less capacity to adapt. The realization that a low-carbon transition needs to be implemented also in countries in the Global South is well established and reflected in most countries' ratification of the Paris Agreement and in their Nationally Determined Contributions. In effect, most countries in the Global South are now confronted with the fastest and most dramatic transformation of their economies that they have ever experienced – or at least they would need to be.

The low-carbon transition in the Global South needs to be guided by research since such a transition is an inherently knowledge-intensive process. This is why the Sustainable Inclusive Economies (SIE) Division of the International Development Research Centre (IDRC) has identified this area as particularly interesting to support. This report is commissioned by SIE as part of an initiative to develop an actionable research agenda that IDRC can support to achieve a low-carbon transition with gender equity in the Global South.

Mobilizing New Climate Investment Models is part of the Research Agenda for Low Carbon Transition and Gender Equity in the Global South series of papers. The consortium that is working on this series is global and consists of 60 researchers from a multitude of universities and institutions. This particular paper is written by Jonathan Phillips, Victoria Plutshack, Ipsita Das, Jackson Ewing and Abhay Rao, all affiliated with the James E. Rogers Energy Access Project at Duke University, Durham.

Mobilizing New Climate Investment Models presents an in-depth analysis of the supply and demand side of climate finance. It presents a snapshot of climate finance flows and shows that there is a big gap between what is needed and what is being received. We will then revise the paper for validation by policy makers and senior civil servants in the Global South. Based on the reviews and validations, we plan to prepare final versions of both the paper and the accompanying High-Level Research Agenda by March 2023. The ambition is that these papers will be useful both for donors and research institutions in supporting an even greater contribution by research to a much needed low-carbon transition with gender equity in the Global South in this crucial Decade of Action.

Gunnar Köhlin
Director, Environment for Development

Mobilizing New Climate Investment Models presents an in-depth analysis of the supply and demand side of climate finance.

MOBLIZING CLIMATE INVESTMENT MODELS

1.1 Introduction

In order to limit global warming to a 1.5 degree C temperature rise, GHG emissions will need to fall by 7 percent a year over the course of this decade. In 2020 and 2021, many countries met this very high bar, but only because significant parts of their economies were shut down due to pandemic-driven policies (Carney, 2021). Similarly, Russia's invasion of Ukraine has resulted in one of the most severe food and energy crises in modern history with price spikes threatening the world's most vulnerable populations, which may ultimately prove to reduce emissions by cutting global consumption and accelerating a transition away from fossil fuels (G7 Foreign Ministers, 2022). These painful crises are hardly something to be repeated. A more just, equitable, and predictable low-carbon transition will require massive strategic investment, especially in low- and middle-income countries (LMICs), where population and economic growth are projected to drive the vast majority of future growth in GHG emissions (Anis, 2021).

The increase in investment required for low-carbon development in emerging markets and developing economies has been estimated to be more than 2% of developing economies' GDP, slightly more than the percentage increase needed in developed countries (Stern, 2021). These are investments to support development and growth—much of which includes infrastructure and other investments needed as LMICs move to higher income levels. This increase in investment is modest, and the evidence overwhelmingly indicates that the returns on these investments across a broad range of criteria will be high. The Global Commission on Adaptation found that an investment of $1.8 trillion from 2020 to 2030 could generate $7.1 trillion in total net benefits. (GCA, 2019) However, while these are attractive investments from a cost-benefit perspective, underlying market risks and uncertain financial returns can make it challenging to mobilize the scale of capital needed.

At the UNFCCC Copenhagen Conference of Parties (COP) in 2009, parties agreed that developed countries would mobilize $100 billion annually to developing countries by 2020 to help mitigate and adapt to climate change (UNFCCC, 2009). Later enshrined in Article 9 of the Paris Agreement in 2015, this commitment, and the financing of low carbon development more broadly, has since become a central issue of negotiation in the UNFCCC process (UNFCCC, 2015). Nevertheless, OECD data indicates aggregate investments mobilized by advanced economies to Annex II countries was only $83.3 billion in 2020, falling short of the target (OECD, 2022a).

However, the problem runs far deeper than whether advanced country governments can provide $50 billion or $100 billion or even $200 billion annually—the latter figure representing the Glasgow Climate Pact's call for developed countries to double their investment commitments to developing countries (UNFCCC, 2022a). The Sharm el-Sheikh Implementation Plan from COP27 noted that climate financing requirements are rather in the order of trillions: $4 trillion per year needs to be invested globally in renewable energy up until 2030, and developing countries require almost $6 trillion through to 2030 to implement their Nationally Determined Contributions (NDCs) (UNFCCC, 2022b).

Realizing the vision of increasing LMIC climate investment "from billions to trillions" will require a range of actions: the mass mobilization of private capital, the alignment of NDCs with the realities of climate investment instruments and institutions, and connecting resources (incl. government assistance, development finance, export credit, and philanthropy) in ways that demonstrate and scale low-carbon technologies and business models. At the same time, there is a need to enable Global South-led innovation and channel investment to support local small and medium enterprises (SMEs) that can drive sustainable economic growth (Phillips et al., 2022a). This is an sector where women's businesses are also more prevalent, offering an opportunity to concurrently drive sustainability and gender equality outcomes (IFC, 2017). Domestic policy and resource mobilization can be accelerated and complemented through international partnership and leveraging relevant institutional strengths, both from the West and China. Researchers have an important role to play in unpacking these dynamics, diagnosing the effectiveness of different approaches in overcoming barriers, and identifying key variables across geographies that are determining outcomes.

Throughout, this report acknowledges that the lack of climate action impacts women and men in different ways (MacGregor et al., 2022), and that women consistently have less access to finance across sectors and geographies. Access to finance is critical for enabling both women and men to

adapt to climate change, and centering women in decision making can be a part of the solution (Atmadja et al., 2020). There is need for clear gender criteria in results measurement frameworks and for the evaluation of climate funding options, as well as a need to increase local women's groups' access to climate funds.

This report addresses the question of where research should focus in the coming years to support governments and investors to deploy capital that demonstrates and scales transformative low-carbon development pathways in LMICs. It aims to identify (i) research opportunities to support governments in identifying where climate finance investments can assist sustainable, low-carbon development gains, and (ii) what challenges and knowledge gaps must be overcome to catalyze that investment and needed changes in climate investment flows. The report provides a snapshot of the state of the field for policymakers, researchers and stakeholders interested in the challenges and opportunities that climate finance represents.

1.2 Snapshot of climate finance flows and data gaps

The Climate Policy Initiative finds that financing from public and private sources to support climate mitigation and adaptation actions reached approximately $632 billion annually in 2020 (CPI, 2021a). A much smaller share of that flowed to lower-income regions of the world, including just $19 billion to sub-Saharan Africa and $30 billion to South Asia. The OECD estimates that $83.3 billion in climate-dedicated and climate-related investments flowed to developing countries from developed countries in 2020, up from $52.4 billion in 2013. This includes investment flowing through bi-lateral development finance institutions (DFIs), multilateral development banks (MDBs), multi-lateral climate funds (MCFs), export credit agencies, as well as private investment motivated by those public investments (OECD, 2022a).

The Paris Agreement sets out a vision for an equitable partnership between high-income country (HIC) donors and LMIC recipients of climate finance, which is to be allocated according to the needs of LMICs as set out in their NDCs. However, to date, climate finance flows have not been determined by NDC needs, but instead by a host of factors from geopolitical relationships to climate mitigation potential to commercial interests (Halimanjaya, 2015; Pauw et al., 2020a; Rübbelke, 2011; Weiler et al., 2018). Indeed, climate finance flows are generally misaligned with national climate priorities in LMICs, where NDCs put a great focus on climate adaptation and resilience. Despite this, only $46 billion of global climate finance is channeled exclusively to adaptation projects, in comparison to $571 billion to mitigation activities. At the root of this issue is that many LMICs rely on overseas capital for 90% or more of climate investments. Those capital sources are generally not under a mandate to direct investment toward host country priorities, and their primary investment instruments are not necessarily what LMICs need.

Responding to LMIC priorities, COP27 saw the emergence of the Loss & Damage (L&D) Fund, which seeks to address the impacts of climate change, as opposed to mitigate or adapt to a changing climate. However, participation in the new fund has been voluntary and the scale of commitments has been relatively small amount from $2.2 million (Scotland) to $177 million (Germany) (Kattumuri et al., 2022). There is not yet an agreement on key questions such as how much money should be put into the fund, who should contribute, how much they should contribute, who can withdraw it, or under what circumstances they can withdraw it (Kurukulasuriya et al., 2022). Some of these questions will require policy-level discussions around the definitions of loss and damage and how that differs from humanitarian assistance or development funding more broadly (Bhandari et al., 2022). Other questions focus on what climate science can tell us about the attribution of negative climate events due to historical emissions, issues of relative less scientific certainty which may be vulnerable to greater politicization due to the liability implications for leading historic emitters (Callahan and Mankin, 2022; James et al., 2019).

The overwhelming majority of international climate investment to LMICs does not come from the multilateral climate funds (MCFs), which as financing mechanisms of the UNFCCC have a mandate to invest in country-led climate strategies reflected in NDCs. MCFs like the Green Climate Fund, Global Environment Facility, and Adaptation Fund represent just $3.5 billion of the total $632 billion in global climate finance. As illustrated in Table 1, roughly three-quarters of climate finance delivered from developed countries to LMICs flows through MDBs and bi-lateral DFIs, institutions that developed countries have worked through for decades, where operations are nimbler in many cases, and where they exert greater control as shareholders and board members.

Table 1 Climate finance channeled to developing countries from OECD countries, 2013-2020 (OECD, 2022a)

	2013	2014	2015	2016	2017	2018	2019	2020
Bilateral Development Finance	22.5	23.1	25.9	28.0	27.0	32.0	28.7	31.4
Multilateral Development Banks	13.0	18.0	14.4	15.7	23.8	26.7	30.5	33.2
Multilateral Climate Funds	2.2	2.0	1.4	2.6	2.9	3.5	3.8	3.5
Inflows to multilateral institutions (where outflows unavailable)	0.3	0.4	0.4	0.6	0.5	0.3	0.3	0.2
Export Credit Finance	1.6	1.6	2.5	1.5	3.0	2.7	2.6	1.9
Private Capital Mobilized	12.8	16.7	N/A	10.1	14.5	14.7	14.4	13.1
Grand Total	52.4	61.8	44.6	58.8	71.6	79.9	80.4	83.3

Of critical note, the dominant financial instrument available through DFIs and MDBs is market-rate debt. This form of capital may be a poor fit for climate projects that produce public goods and are unable to generate sufficient financial returns to repay market-priced debt. The majority of adaptation projects fit this description. Such projects are generally dependent on a much smaller pool of grants and concessional debt, typically in the form of low- or zero-interest loans. This dynamic immediately puts LICs at a distinct disadvantage in attracting climate financing, as projects in these markets tend to have higher levels of overall risk and lower expected returns. Grant capital and concessional debt are primarily reserved for LICs, which receive far lower levels of aggregate investment (OECD, 2020).

Most MDBs and DFIs have explicitly designated climate change as a priority investment category and aim to align financing with host country NDC implementation. However, they can be severely constrained by having to balance financial returns, development impact, and donor country policy priorities. For example, the US DFI, the US International Development Finance Corporation (DFC), has a directive in its authorizing statute to prioritize investment in low-income and lower-middle-income countries, as well as target investments that complement US foreign policy interests (115th Congress, 2018). Yet, reaching lower income markets is challenging to do in practice without increasing overall credit subsidies to projects or relaxing financial return requirements. MICs tend to have relatively more and larger commercial firms, higher household incomes, stronger institutions and regulatory certainty, and, ultimately, these regions carry higher expectations of repaying debt. As a result, upwards of 43 percent of DFC investments went to upper-middle income countries and high-income countries between 2020 and 2021 (Landers et al., 2021). This trend was especially true in the energy sector, where fossil investments to higher-income markets continued to make up a greater share of investment compared to renewables investments in lower-income markets (Phillips, 2021). This imbalance remains common across the banking sector due to risks associated with clean technologies and relatively low rates of return in many markets(Sachs et al., 2019).[1] Questions around whether the DFC and other DFIs are sufficiently

1 Sachs, J.D., Woo, W.T., Yoshino, N., Taghizadeh-Hesary, F. (2019). Importance of Green Finance for Achieving Sustainable Development Goals and Energy Security. In: Sachs, J., Woo, W., Yoshino, N., Taghizadeh-Hesary, F. (eds) Handbook of Green Finance. Sustainable Development . Springer, Singapore. https://doi.org/10.1007/978-981-13-0227-5_13

reaching the poorest countries and deploying appropriate climate technology relate directly to ability and willingness to take on risk while maintaining a desired financial return target (Congressional Research Service, 2022).

OECD data presented in Figure 1 illustrates the challenge in channeling investments to lower income countries runs deep across MDBs and DFIs, with climate finance provided for MICs (70%) far exceeding that to LICs (8%) (OECD, 2022a).

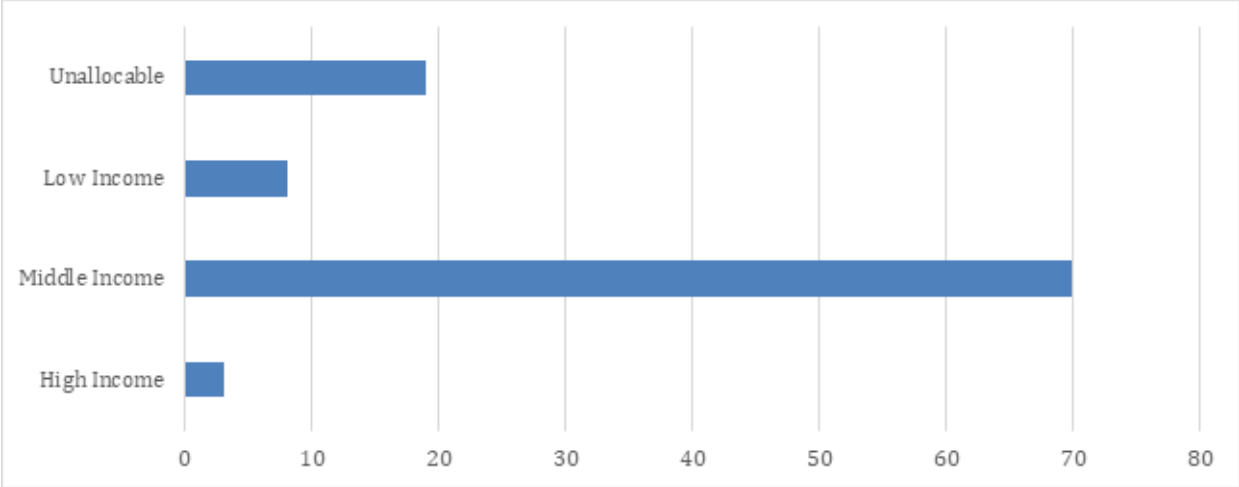


Figure 1: Percentage of climate finance provided and mobilized 2013-20, by recipient country income group (OECD, 2022a)

For most LMICs, overseas investments from MDBs, DFIs, and other public institutions make up the majority of climate investment. While regions like the US & Canada and East Asia & Pacific are able to source well over 90% of climate investments domestically, sub-Saharan Africa relies on foreign capital for 90% and South Asia for nearly two-thirds.

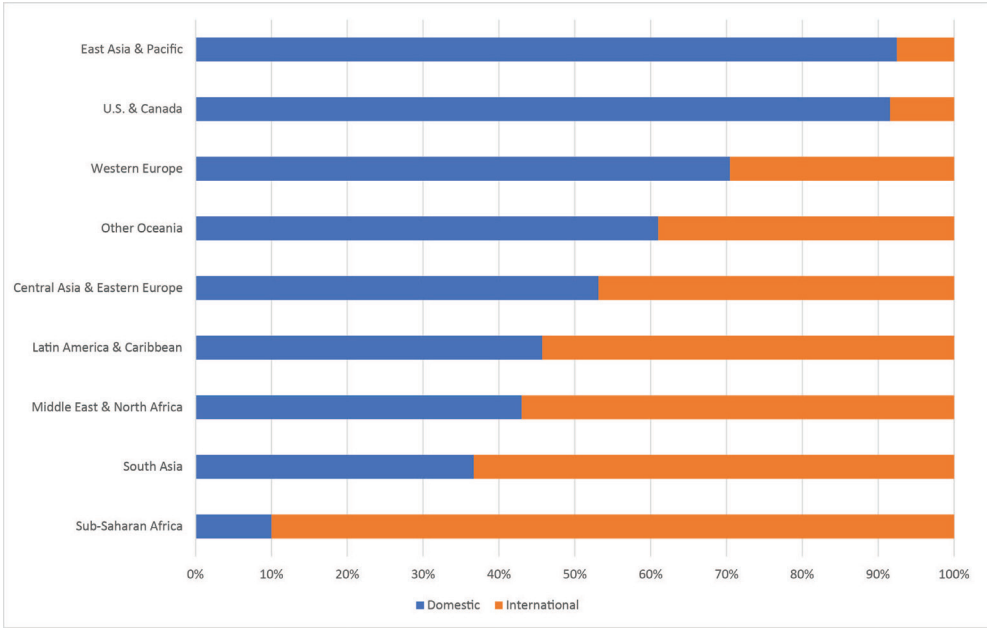


Figure 2: Domestic and international climate finance flows by region of destination (USD billion, 2019/2020 annual average)(CPI, 2021a)

The ability to source domestic capital for climate investments is largely driven by whether the private sector is engaged and, again, this is where many LMICs suffer. These markets with higher political and regulatory risk, currency risk, and other macro risks contribute far higher costs of capital across most of the Global South. The cost of capital is up to seven times higher in developing country markets compared to the United States and Europe, with higher levels in riskier segments, making it very challenging for projects to raise debt and offer investors sufficient returns on equity (Agutu et al., 2022).

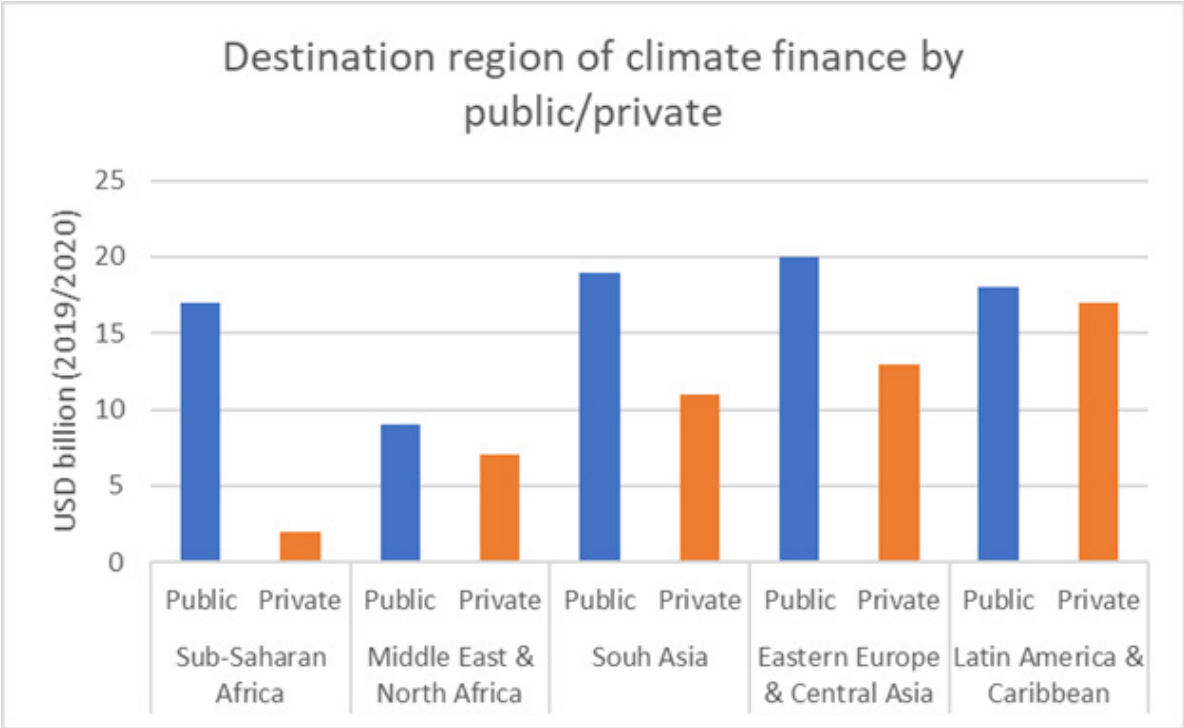


Figure 3: Climate Finance Flows by Region (CPI, 2021a)

How much climate finance will ultimately need to come from public versus private sources to meet LMIC needs depends on the nature of country-level climate goals, how attractive projects are for private investors, and the extent to which public investment is able to de-risk projects and sectors (Franks et al., 2018). As of 2019, the OECD estimates that public funding of $4 per year to developing countries only mobilized about $1 per year in private investment. Leverage ratios vary significantly by region, with $9 of public investment need to mobilize just $1 of private capital on average in sub-Saharan Africa (OECD, 2021).

At the global level, concessional investment (primarily from public and philanthropic sources) constituted 13% of overall climate finance in 2019-20, split between grants ($36 billion) and below-market rate debt ($47 billion). About 28% of grants went to sub-Saharan Africa (CPI, 2021a). Roughly half of all global climate finance in 2019-20 was raised as market-rate debt ($337 billion). Equity investments totaled $206 billion, flowing mainly to renewable energy systems, followed by transport and then infrastructure (CPI, 2021a).

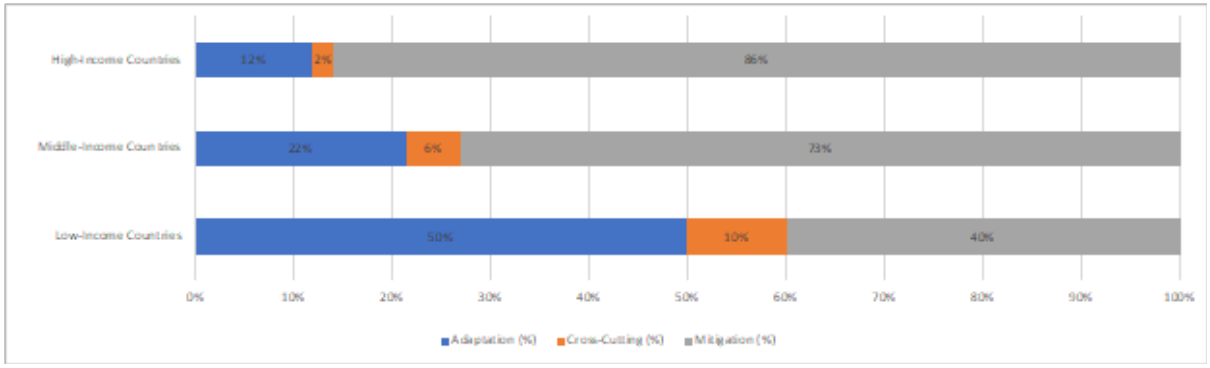


Figure 4 Adaptation, cross-cutting and mitigation investment from OECD members to recipient countries by income group, 2016-2020. (OECD, 2022b)

Developing countries are estimated to require as much as $300 billion annually to cover adaptation costs by 2030 (Timperley, 2021a). While reported adaptation investments to LMICs are increasing, investment remains disproportionately weighted to mitigation, and the even split between adaptation and mitigation that was called for under the Paris Agreement is falling short. The OECD reports that 41% ($34 billion) of flows to developing countries address adaptation. As seen in Figure 4, LICs are seeing an equitable split between mitigation (40%) and adaptation (50%) investment (OECD, 2022a). However, investment to middle income countries—where nearly nine times as much total climate investment is flowing—remains highly skewed to mitigation projects, mostly in the energy and transport sectors, as seen in Figure 5. Globally, 37% of adaptation finance is sourced domestically, although this is highly skewed by China's robust domestic adaptation investments (CPI, 2021a).

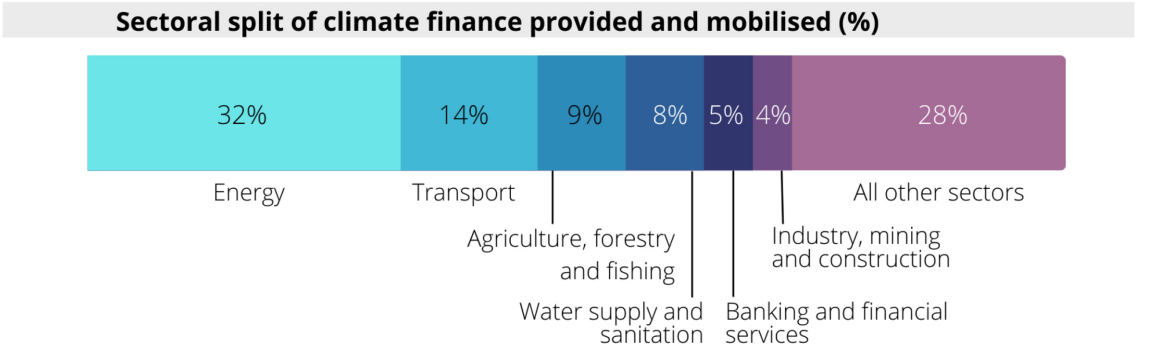


Figure 5: Sectoral split of climate finance mobilized for developing countries (2020) (OECD, 2022a)

In most LMICs, critical sectors for low-carbon development outside of utility scale renewables—like climate-smart agriculture, distributed renewables, e-mobility, clean economy supply chains, and nature-based solutions—are attracting little or no investment. The most obvious example is food systems, a sector that accounts for about one-third of global emissions and the overwhelming share of livelihoods and income for most people in LMICs, yet only 1.7% of climate-related financing addresses small-scale agriculture (Chiriac and Naran, 2020). Figure 6 illustrates how the sectoral focus of climate investments tends to vary based on country income category.

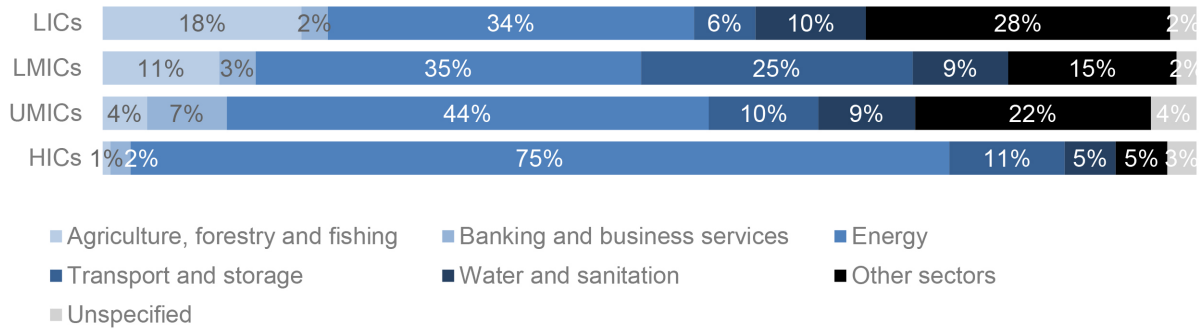


Figure 6: Climate finance according to income group and sector (2016-18) (OECD, 2020)

1.2.1 Investment Data Gaps

There are two key data sets that help us see and understand climate investment flows in LMICs: the OECD's annual report "Climate Finance Provided and Mobilised by Developed Countries," and the data set accompanying Climate Policy Initiative's flagship annual report, "Global Landscape of Climate Finance." The OECD dataset explicitly looks at climate finance from developed to developing countries as reported from member countries' biennial reports to the UNFCCC and OECD, which is used to measure international financial flows against the $100 billion target. This data is based on climate finance assessment methodologies that aggregate climate-dedicated investments and fractions of financial flows deemed climate relevant.[2] OECD data captures private finance that is mobilized by governments and multilateral agencies, but does not track unrelated private flows.

In addition to public sector investment flows, the CPI dataset also attempts to more comprehensively capture private financial flows, including from commercial financial institutions, corporates, funds, and households. CPI's data has historically only been available at a regional level, a limitation that prevents country-level analysis and comparisons between "developed" and "developing" countries, categories which UNFCCC commitments are predicated on. However, their 2022 report on climate finance in Africa provides country-level breakdown of finance needs and current flows (CPI, 2022). CPI tracks climate finance based on the UNFCCC definition[3] , and its mapping is limited to "primary capital flows directed toward low-carbon and climate-resilient development interventions with direct or indirect greenhouse gas mitigation or adaptation benefits" (CPI, 2022). CPI's dataset includes OECD data as well as over thirty other variously overlapping sources, including Bloomberg New Energy Finance, Convergence, and the IPCC. CPI notes that the lack of standardized definitions and methodologies in the source data they draw from, as well as a lack of data access in some cases, impacts the comprehensiveness of the data, especially as it relates to adaptation, private sector investment, and domestic public budget expenditures (CPI, 2021a).

The use of different frameworks and data sources leads to some conflicting interpretations. For example, CPI only includes disbursement-based finance in its analysis and does not include certain types of investment like guarantees and insurance, which can be significant and powerful tools, especially for motivating private investment (CPI, 2021b). OECD data, on the other hand, includes guarantees, which it estimated to constitute nearly a third of mobilized private climate finance in 2018.

Further, CPI and OECD are subject to constraints around disaggregation, caused in some part due to project-level confidentiality concerns expressed by some MDBs. As a

2 The Rio Markers, adopted by OECD Development Assistance Committee members, scores the climate-relevance of a given investment on a scale of 0-2; and Climate Components, used by MDBs, identifies climate-related aspects of a project, and apportions a dollar amount on a fraction (up to 100%) of the climate investment accordingly

3 "Climate finance aims at reducing emissions, and enhancing sinks of greenhouse gases and aims at reducing vulnerability of, and maintaining and increasing the resilience of, human and ecological systems to negative climate change impacts."

result, the most specificity available in OECD datasets and reports on climate finance is around countries and sectors invested in. Gaining insight into sub-sector investments (for example, investments in "geothermal energy" as opposed to "power sector") requires the analysis of other more dispersed datasets. In their global reports on climate finance, CPI does not disaggregate data beyond the regional, outside of their 2022 Landscape of Climate Finance in Africa report, which does break down private vs private and sectoral investments by country (CPI, 2022). CPI's level of sectoral disaggregation is similar to the OECD's.

Additionally, there are some questions around the integrity of climate finance accounting methodologies (Timperley, 2021b). For instance, Oxfam compiles an annual climate finance "shadow report" that estimates climate-specific "net assistance," counting only the grant equivalent of loans, guarantees and other non-grant instruments, so that future debt service payments, interest, and administrative fees are not included in what is transferred on net to recipient countries (Oxfam, 2020). Additional questions remain on whether all climate investments should be categorized as such. An extreme example is Japan reporting investments in coal plants in Indonesia and Uzbekistan as climate finance in filings to the OECD in early reporting years (Nakhooda et al., 2015). This was because, they argued, the investment in more efficient coal plans would reduce emissions over the other options these countries were poised to employ (Nakhooda et al., 2015). This is likely to become a resurgent debate as financing to support the early decommissioning of existing coal plants becomes central to Just Energy Transition Partnership packages in South Africa, Indonesia, and Vietnam. There are also concerns that counting all climate-related financing overestimates how much money is actually going to climate action when climate is just one component of a project (Hattle and Nordbo, n.d.; UNFCCC, 2021).

In terms of climate finance recipients, the OECD does track which countries and institutions are counterparties to the investment, although it is frequently not clear which companies or organizations ultimately end up with that capital or who is impacted. Just 58% percent of the OECD's climate-related development finance delivered in 2020 is channeled directly to the central government or final recipient (OECD, 2019). Intermediaries include international and national NGOs, UN organizations, national development institutions, and others. This type of detailed tracking of funding through the financial value chain is also not fully available in the CPI dataset, leaving a significant gap in our understanding of how finance is delivered to implementers.

1.2.2 Tracking domestic finance

By tracking finance within the country, governments are better positioned to assess whether they are on track to meet their goals, gauge alignment between policy and finance, and consider the creation of new financial instruments, programs, or institutions when appropriate. Reviewing domestic funding, rather than just relying on international finance, provides a view into how governments are supporting NDC implementation most directly. This is especially relevant for adaptation investment as well, since these projects usually take the form of infrastructure or local economic development, areas where domestic budgets are critical (Allan and Bahadur, 2019; EU REDD Facility and Climate Policy Initiative, 2019).

The enhanced transparency framework in Article 13 of the Paris Agreement is intended to drive that tracking by requiring Annex II parties and non-Annex I parties to report on climate finance support. It has driven a range of efforts to track domestic climate finance within LMICs, and target this thorny challenge of tracking capital flows through financial value chains (European Forest Institute et al., 2021). A non-exhaustive list of relevant investment sources, intermediaries, project developers, sector and financial instruments can be seen in figure 7.

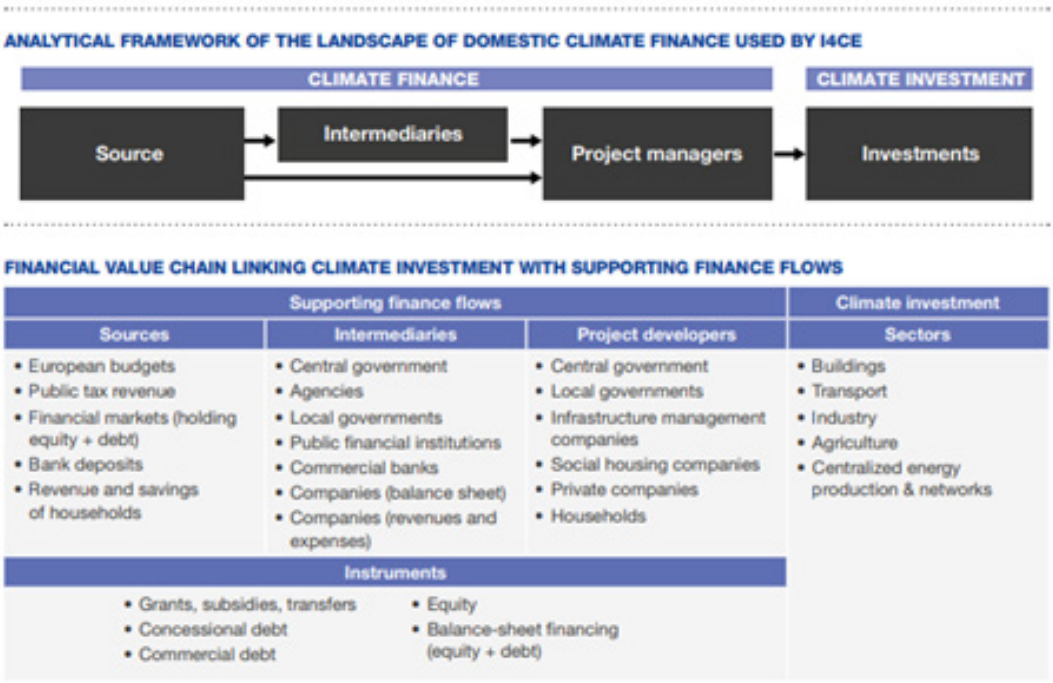


Figure 7: Analytical Framework of the Landscape of Domestic Climate Finance (Hainaut et al., 2018)

Several noted tools have been used by researchers and governments to assess and evaluate domestic climate investment across dozens of countries (see Figure 8).

- Effective land-use financing can be transformative, as protecting and regenerating forests, alongside adopting sustainable agriculture and land-use practices can deliver up to 37% of the reductions needed by 2030 to comply with the Paris Agreement (EU REDD Facility and CPI, n.d.). The land use finance tool (LUFT) was developed by the EU REDD Facility and the Climate Policy Initiative as a diagnostic tool to enable qualitative and quantitative analysis of the alignment of public and private spending with climate and forest objectives in a national context. This tool has been used of note in Cote d'Ivoire, Papua New Guinea and Vietnam.
- The climate public expenditure and institutional review (CPEIR) assesses opportunities and constraints for integrating climate change concerns within national and sub-national levels, by analyzing public expenditures, donor, and civil society investments in combatting climate change. The CPEIR has been used at the national level in several countries in Asia, Latin America and Africa.
- Climate budget tagging (CBT) was developed by the United Nations Development Programme (UNDP), as a tool for monitoring and tracking climate-related expenditures within a national budget system. It broadly consists of four components, which include defining and classifying climate activities, weighing their climate relevance, and designing a tagging procedure. CBT has been implemented in the Philippines, Bangladesh, Nepal and Indonesia (World Bank, 2021a). It is intended to be implemented alongside other analytical tools, such as the CPEIR.
- The private sector expenditure and institutional review (PCEIR) was commissioned by UNDP to provide guidance for developing countries that are interested in integrated public and private expenditure reporting and planning systems for mitigation activities (UNDP, 2015). The objective of the PCEIR is to enable countries to have visibility on what has happened, and may happen around financial flows for mitigation efforts within their borders.
- Investment and financial flow (I&FF) assessments are forward-looking tools that compare possible scenarios for future expenditure on actions to determine the costs of climate change measures and possible sources

of investment. They consider five broad areas: the main mitigation and adaptation measures needed within a given sector: the investor(s) in the sector; the stakeholders; changes and increases needed in investments and financial flows; and additional resources required (EU REDD Facility and Climate Policy Initiative, 2019).

- Domestic climate finance landscape assessments, developed by CPI, track domestic climate finance flows of specific focus countries, including national and/or sub-national reports for India, China, Indonesia and other select countries.

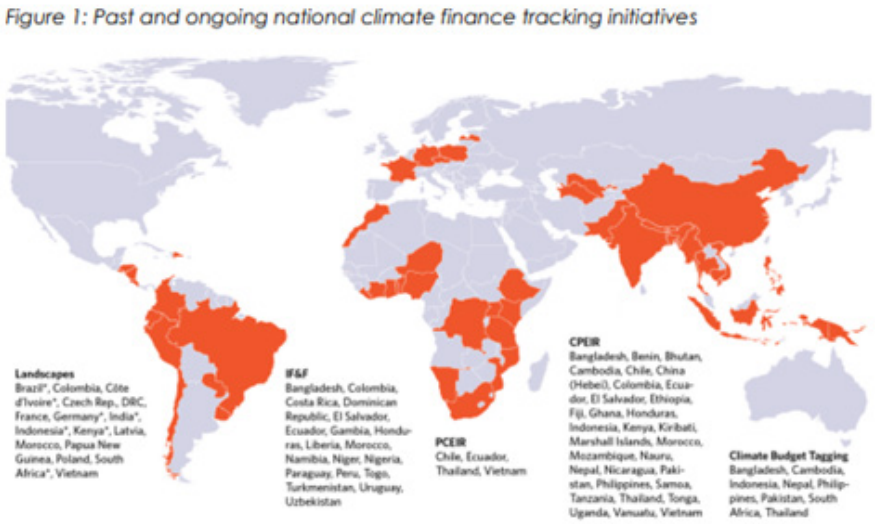
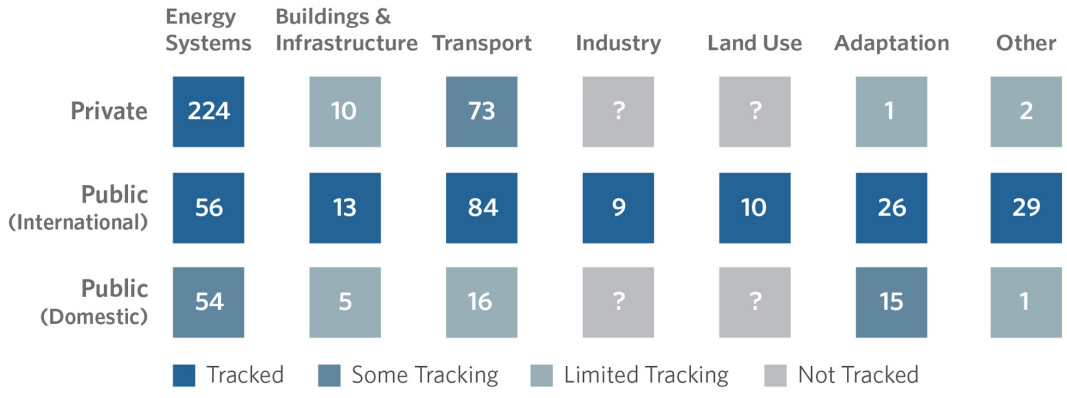


Figure 8: Past and ongoing national climate finance tracking initiatives (European Forest Institute et al., 2021)

However, domestic finance tracking remains limited and incomplete in many LMICs due, in part, to disagreements on definitions, lack of institutional capacity to track, and missing systems to support tracking. In general, domestic public investment tends to be less tracked than foreign public investment, as seen in Figure 9. From a sectoral perspective, energy tends to be better tracked, whereas industry, land use and adaptation face limited or no tracking. In summary, data and both domestic and international investment flows suffer from a lack of transparency and comparability across sectors and countries. The subsequent analysis in this report should be considered in the context of these data gaps, which inhibit a full understanding of how climate finance is flowing, who it is reaching, and why.



Note: *Numbers in the boxes represent currently tracked annual climate finance flows in each sector (2019/2020 annual average in USD billion)*

Figure 9: Tracked and untracked climate finance by actors and sectors (CPI, 2021a)

1.3 Supply-side climate finance: modernizing tools and approaches of development finance

The last 70 years have seen a massive shift in who owns capital and how it is deployed. Private capital under management has grown from $250 billion in the 1950s to more than $111 trillion today and is estimated to reach $145 trillion by 2025 (PWC, n.d.). The developing world, once dependent on public capital flows for most investment, today sources more than 90% of general investment capital from private sources—although this is clearly not the case in the climate space. Institutional investors like pension funds, insurance companies, and endowments are now 900 times larger than the balance sheets of all the MDBs combined (Increasing Financial Action for Green and Sustainable Development, 2022). Yet the institutions and instruments of development finance have changed little over the past several decades to adapt to the shift in capital ownership and set goals around reducing risk in order to mobilize private capital.

Meeting the low-carbon financing needs of LMICs will require a modernization of the international development finance architecture to reflect these realities of capital. It will require the co-mingling of capital with different risk appetites and return requirements. It will also require operational changes and coordination on an unprecedented scale to leverage tools and resources in new ways. Delivering the volume of capital needed to reach the climate and development goals of LMICs requires public investment to orient more around mobilization and to reduce real and perceived risks to investments. This could have major ramifications in terms of where public capital is deployed (geographically and by sector) and who it serves. As shifts begin to happen in how institutions operate and how development finance is deployed, researchers have an important role to play in understanding the trade-offs and unintended consequences in play. Research will be critical to increasing our understanding of how new and innovative approaches are succeeding or failing to de-risk sectors and markets and mobilize the resources needed for low-carbon development.

In some country contexts, approaches to reducing investment risk are being considered and deployed in parallel, while other markets may be more hamstrung due to weak enabling environments, low household incomes, or a lack of infrastructure or other key inputs. Physical climate risks, which vary greatly across markets, are shifting private sector strategy as pressure builds for businesses to increase transparency around climate-related risks and even move to reduce exposure to them. This could further starve investment to climate-vulnerable populations if the private sector withdraws.

Vast differences across markets and national policy environments can make it challenging to identify the most effective strategies, or how a combination of different approaches could lead to different investment outcomes. Researchers have an important role to play in describing these dynamics, because a deeper understanding of the linkages between climate and financial risk, policy and enabling environment reforms, and capital deployment will help policymakers, donors, investors, and local communities develop and finance effective climate strategies.

1.3.1 Public investment approaches targeting risk mitigation

Climate risk can take a number of forms for investors. There are physical risks associated with climate change, such as floods and droughts, as well as transitional risks associated with the low-carbon transition itself, such as new regulatory standards or the proliferation of new favored sectors (Basel Committee on Banking Supervision, 2021). That means that there are risks to transitioning away from fossil fuels and risks inherent in not transitioning. Financial Institutions use a range of tools, from stress-testing to scenario modeling, to make decisions around risk (Basel Committee on Banking Supervision, 2021).

At COP26 in Glasgow, more than 450 private firms representing $130 trillion in financial assets committed to net zero investment portfolios by 2050 at the latest. Many of those investors are interested in investing in LMICs–and emerging markets may be included in their investment thesis. However, 88% of the developing world holds sub-investment grade credit ratings or no ratings at all (Convergence, 2021). This puts entire countries outside the fiduciary mandate of most institutional investors. These macro concerns have become even more acute since 2021, as steep inflation and currency declines have further deteriorated government and household financial positions. Helping overcome these baseline financial risks is one way in which public finance is needed to mobilize private investment.

Pressure is building behind public financing institutions to adopt reforms that will help the private sector overcome these blockages. The World Bank and others have been criticized for not explicitly setting clear, specific, and ambitious targets for mobilizing climate finance (Hodgson and Williams, 2022). As new debt-for-climate swaps and guarantee structures are deployed, lessons and best practices must be distilled. Further work is also needed to determine how outcome- or performance-based payments that intervene on the revenue side can be best targeted. Public sector capital

can be deployed in various ways to reduce some of these risks and mobilize private sector investment, but further research is needed on the efficacy and impact of different approaches.

Guarantees, in particular, are one area where experimentation and exploration could prove valuable, as they can be used to target risks that are particularly difficult for the private sector to mitigate (Convergence, 2021). Foreign exchange guarantees or direct lending in local currencies, for example, can protect a private investment against losses that may result from currency fluctuations. Currency risk was on full display in many countries during the COVID-19 recessions. For example, a major Canadian pension fund with more than $30 billion in investment exposure in emerging markets—much of it in renewable energy—saw its regionally diversified emerging market portfolio decline in value by 15% during the period due to currency fluctuations alone (Stockholm 50, 2022). Guarantees may not require direct funding set-asides under many institutional budgeting norms, instead allowing for more efficient use of the financial resources of the guarantor.

Public financing can also be used to bear the "first loss" in an investment vehicle in order to catalyze the participation of private investors who otherwise would not have entered the deal because of excessive risk or a lack of experience in the sector or market. A first loss position in an investment will suffer the first economic loss if the underlying assets lose value or go out of business. By voluntarily taking a bigger share of the potential down-side of a perceived higher-risk investment, public finance can act to stimulate private sector learning and investment.

Blended finance is an application of this approach that aims to "crowd-in" capital to projects and companies that would otherwise be too risky for commercial investment. It achieves this through leveraging concessional development funding (public and philanthropic) to draw in market-rate private capital, essentially allowing the public capital to assume the top-risk position in order to reduce the rate of return requirement for private capital. Blended finance models most commonly leverage one of three structuring approaches: concessional funding to lower the overall cost of capital, credit enhancement through guarantees or insurance at below-market terms, and grant-funded technical assistance provided alongside investment (Convergence, n.d.). As blended finance transactions increase in the climate space, analysis will be needed on how much private sector finance is leveraged, and on both financial and impact returns.

Aggregate blended finance investments have totaled $160 billion to date, including about $9 billion annually across an average of 55 transactions since 2015 (Convergence, 2021). However, even putting aside the recent COVID-19-related investment dip, the blended finance market has not increased since its high of over $9 billion in 2017 (Convergence, 2021). The driver of blended transactions is concessiona;l Official Development Assistance (ODA) capital flows from donors, as this concessional funding can be used as a first-lost mechanism within transactions to crowd-in DFI and commercial capital. While ODA increased to its highest level on record in 2020 ($161.2 billion), these donor funds were mostly directed in the form of traditional aid. ODA reported as Private Sector Instruments (PSI), typically represents just 1-2% of ODA and there is no upward trend in these figures. If this figure were to rise to 7.5% of ODA and maintain current leverage rates, it would mobilize an additional $80 billion in private investment annually (Convergence, 2021).

There is an important implication of shifting ODA from more traditional humanitarian aid and towards PSI. Blended investments generally go more to MICs rather than LICs, as seen in Figure 10. (Of course, a transaction can always be blended with a higher ratio of concessional capital to de-risk a riskier low-income country market, but this quickly lowers the private sector leverage ratio.) This presents problems both in terms of equity—as resources could be shifted away from LICs and towards MICs—and institutional politics, since DFI and MDB shareholders tend to want to prioritize investments to lower-income countries. Although sub-Saharan Africa is the greatest recipient of blended finance, these instruments generally deploy capital to middle-income countries where there are relatively well-established commercial sectors.

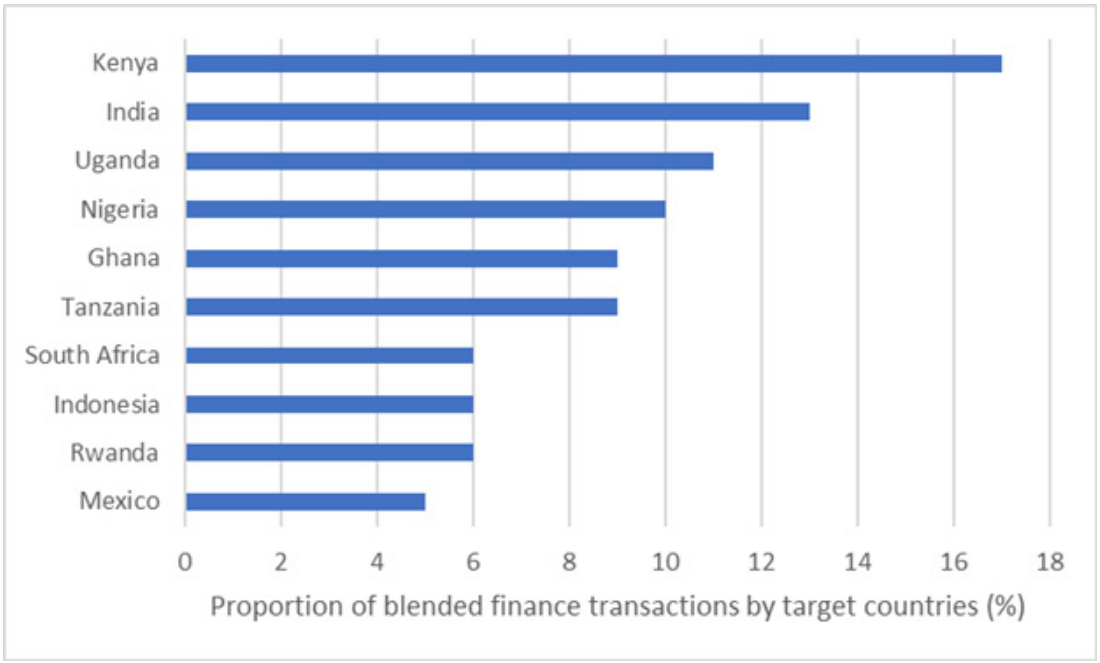


Figure 10: Blended finance transactions by top ten target countries (Convergence, n.d.)

Blended transactions do have a strong foothold in climate-related sectors, with energy (27%), agriculture (16%), and non-energy infrastructure (13%) being among the top five destinations for blended investments (Convergence, n.d.).

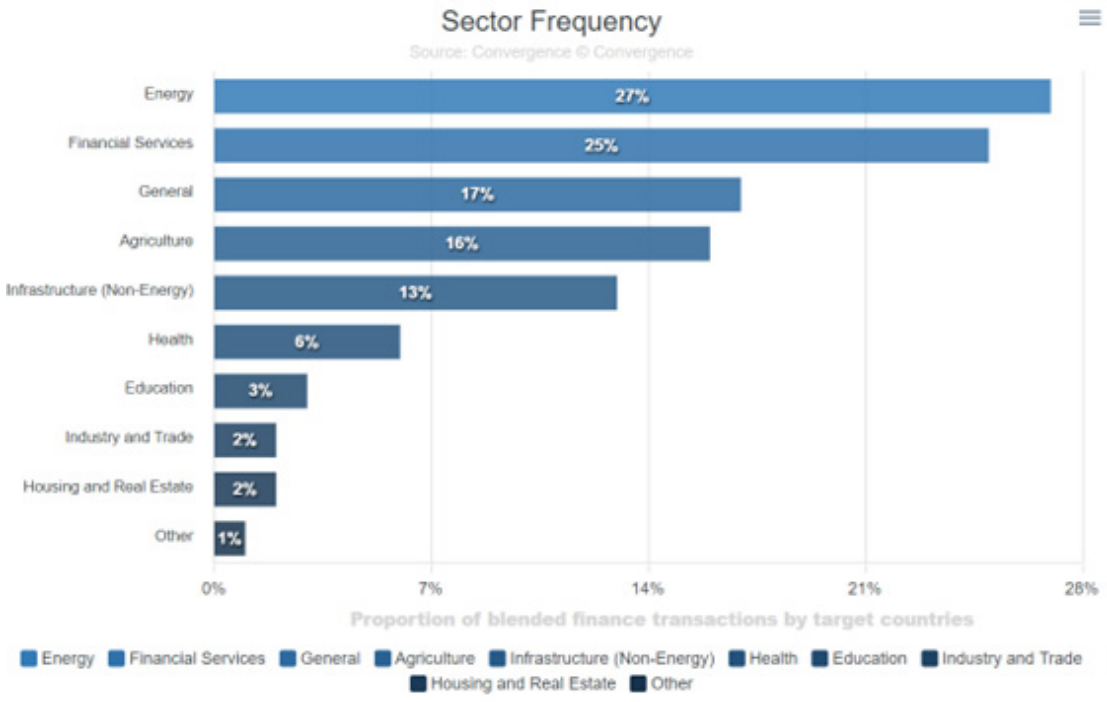


Figure 11: Sectoral split of blended finance (Convergence, n.d.) (Convergence, n.d.)

There is a need to better understand what risk-mitigation features work best in which context and the level of additionality each represent (Winckler Andersen et al., 2019). Major DFIs assume that any private finance that is mobilized would not otherwise have been interested in the transactions, but that is unverified (Attridge and Engen, 2019). Reviews of possible approaches to measuring additionality acknowledge that a truly rigorous ex-ante counterfactual method may be outside of the realm of possibility for busy DFIs, and that we may never have enough information to be able to make certain claims of additionality. An alternative would be to determine a shared definition of additionality across development finance actors (OECD, 2019). It is also worth noting that there are limited evaluations in the low-carbon technology literature on whether public sector funding is "crowding in or crowding out investment" (Owen et al., 2018).

While some social outcomes may be measured over the course of project implementation, few if any funds assess social outcome additionality with any rigor (Bhattacharya, D. and Khan, S. S., 2019; PEREIRA, 2017). The OECD recommends that funds evaluate additionality ex-ante and ex-post, but most institutions are not currently doing this (Andersen et al., 2021). Without this data, it is impossible to evaluate whether blended finance is indeed "unlocking" additional social outcomes and private investments for LMICs. It is likewise hard to determine whether specific blended finance models are more or less effective.

Another challenge is simply that many private investors—especially institutional investors deploying vast sums of capital on behalf of pension funds, insurance funds, and endowments—do not have sufficient knowledge of LMIC markets or have personnel on the ground. MDBs, with deep in-house expertise and connections to frontline capital providers in LMICs, are in a strong position to bridge these financing communities and help bring perceived risks into line with real risks by sharing certain pricing and market intelligence in cases where it does not violate deal-specific confidentiality agreements.

One recent example is sharing of data from the Global Emerging Markets Risk Database Consortium (GEMs) database, which is made of 24 members including major MDBs and DFIs (GEMS Risk Database, n.d.). The GEMS database includes anonymized data on members' projects' credit events, particularly in emerging markets and developing economies, and members can see aggregate statistics on default rates, rating migration matrices and recovery rates broken down by geography and sector. This allows members to better assess risk and make investment decisions in low-data geographies while maintaining a degree of confidentiality. However, aside from a single recent example—which turned out to be a positive surprise for many private investors and market-moving—information from this database has not been made available to other investors (Lee et al., 2021).

As the public development finance community pilots new financial instruments, transparency and information sharing initiatives, partnership models with the private sector, and internal performance indicators, researchers have an important opportunity to understand the impacts of such activities in order to support the acceleration of reform initiatives—and halt ineffective ones.

1.3.2 Impact Investing

Impact investing approaches aim to foster market development and finance projects and companies that create specific positive social or environmental outcomes that would not otherwise occur. These investments have some expectation of financial returns or, at minimum, a return of capital, and may take the form of numerous asset classes, including fixed income, venture capital, and private equity. It is a category of investing that may also involve the use of de-risking or concessional elements discussed previously.

Among many, impact investing has traditionally meant investing with a lower expectation of financial returns in exchange for certain additional social or environmental returns. However, this is not always the case. Indeed, many investors self-identify as "impact investors" while expecting market rate returns. The Global Impact Investor Network (GIIN) finds that 67% of its members expect to make market-rate returns when adjusting for risk (GIIN 2020). However, this survey does not break down financial returns by region of investment, so while 40% of assets under management are focused on emerging markets and 67% of those surveyed are looking for risk-adjusted, market-rate returns, it is not clear how those objectives overlap. What is known is how different investor-types approach financial returns. Pension funds and insurance companies are universally looking for risk-adjusted market-rate returns, whereas some family offices, not-for-profits and foundations are primarily looking for below-market returns in exchange for social and environmental impact (Hand et al., 2020).

While progress has been made on harmonizing common metrics in order to facilitate understanding of impact and support investment comparisons, there is a need for greater rigor and granularity of data collection over time. With appropriate data, researchers can support implementers and investors develop more effective theories of range calibrated for specific contexts. With greater certainty around the scale

and durability of impacts, it is possible to ask more interesting questions around what kind of businesses, at what stage and with what types of investments can total returns on investment be maximized. For example, it will be easier to conclude what combination of public and private capital is needed to capture the inevitable mix of public and private benefits flowing from scaled approaches. It could be more readily determined what type of financial instruments, sector focus, and specific projects deliver the greatest benefits as well as how relevant metrics could be adapted for different contexts.

The total assets under management for the impact investing industry is estimated at $366 billion as of the end of 2018, although it is unclear how much of this is invested in a low-carbon transition (GIIN 2019).[4] Impact investors take a variety of forms, from investment funds (69% of estimated assets under management) to banks (16%), pension funds, insurance companies, foundations, and family offices (GIIN 2019). Impact investments across a range of sectors can be linked to climate change. From 2017-2019, energy investments raised $71.5 billion, while other sectors directly related to climate mitigation and adaptation received less investment, such as agriculture ($17.4 billion) and land use ($5.6 billion) (Carroll, 2021). As was covered in Section 2 on data gaps, we have a limited understanding of how much impact investment is flowing to LMIC markets and how much is focused on low-carbon transitions.

The key to the notion of impact investing is that these outcomes are additional, and that they would not otherwise occur. However, additionality is challenging to measure and these financial instruments must consider financial additionality (would this project be financed without this instrument?) as well as social impact additionality (would these outcomes occur without this project funding?). Without a firm understanding of how additional these approaches are, it is challenging to draw conclusions about effectiveness or compare approaches (Brest and Born, 2013; Carter et al., 2021). Given the challenges of assessing additionality, larger actors like DFIs have increasingly been shifting to a probabilistic attitude to how additional their investments may be, considering multiple factors and estimating the likelihood that their investment is financially additional (Carter et al., 2021). This may also be an approach for other impact investors to consider, as they typically do not have a rigorous approach for estimating additionality. Regarding social impacts, one survey found that 66% of impact investors thought that "impact washing" - marketing based on impacts without evidence to support those impacts – was the biggest challenge to impact investing today (Hand et al., 2020).

(See figure 12 on page 19)

Other studies have also looked at internal rate of return (IRR) expectations by investor type. Looking exclusively at impact funds, a recent study found that annualized IRR on impact funds is 4.7 percentage points lower than traditional venture capital (VC) funds (Barber et al 2021). Studying their investment choices, on average impact funds are willing to forgo 2.5%–3.7% in expected IRR in order to achieve targeted social and environmental impacts. This varies by the type of investor: due to their strong mission-oriented work, foundations have a higher willingness to pay (WTP) – otherwise described as a willingness to forgo returns - for impact. On the other hand, private pensions and endowments have a much lower willingness to forgo returns for social impacts (Barber et al 2021).

What is known about impact investment returns is based mostly on self-reported data from investors. In emerging markets, private debt funds are making an average of 11% annualized returns, while private equity investments make 18% when looking at investments from 1956 to 2019 (2010 as the median year) (Hand et al., 2021b). For energy investments, those returns are 10% for private debt in emerging markets and 17% for private equity. For food and agriculture, the debt-equity return difference is more dramatic, with 6% average returns for private debt and 27% for private equity (Hand et al., 2021b).

In terms of social impact, there has been even less published research. Although individual funds are using standardized metrics like the IRIS+ standard catalogue of metrics or the sustainable development goals (SDGs) for measuring impact, information about social impacts are limited to case studies that offer a handful of impact metrics (GIIN, n.d.). One of the main challenges is identifying uniform methods and metrics that investees can use, given their own constraints (Agrawal & Hockerts 2018; Islam 2021). One example is the Methodology for Comparing and Assessing Impact (COMPASS), which

4 Note: GIIN includes DFI investments as 27% of its total 502bn counted as "impact investments", but we have removed DFI investments from our numbers.

is a standardized comparison framework to help investors compare the impact of projects and firms (GIIN 2021) (Hand et al., 2020). There appears to be no other studies that have compared multiple impact investor projects or portfolios, hindering analysis of the relationship between financial and social returns on investment. This is further challenged by the lack of studies that directly address additionality in impact investing. While 40% of GIIN investors claim to measure additionality, the vast majority of literature on the topic only offers challenges and frameworks, but no empirical evidence on current projects (Alenius, 2016; Global Impact Investing Network, 2017; Loveridge, 2016; So and Staskevicius, 2015). Without data on social impact or evidence of additionality, it is essentially impossible to make statements on the efficacy of impact investments.

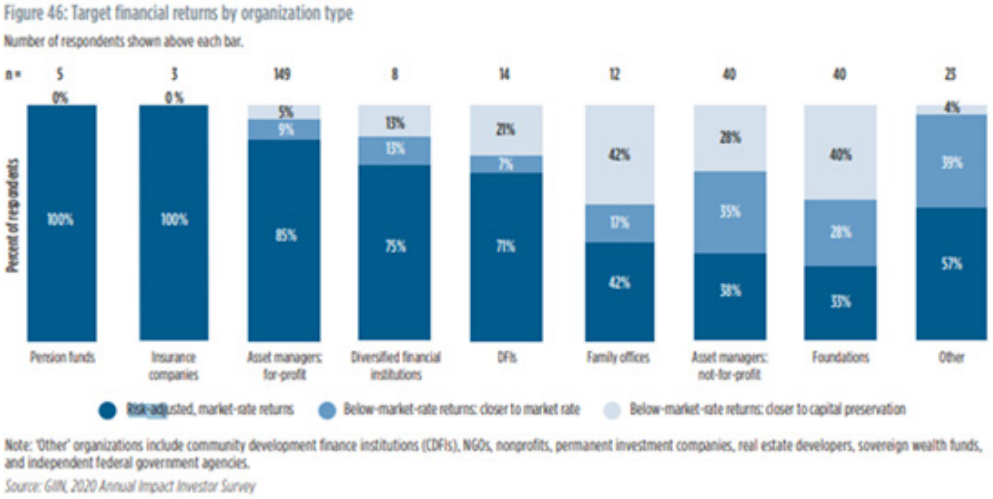


Figure 12: Target financial returns, by investor type (Hand et al., 2020)

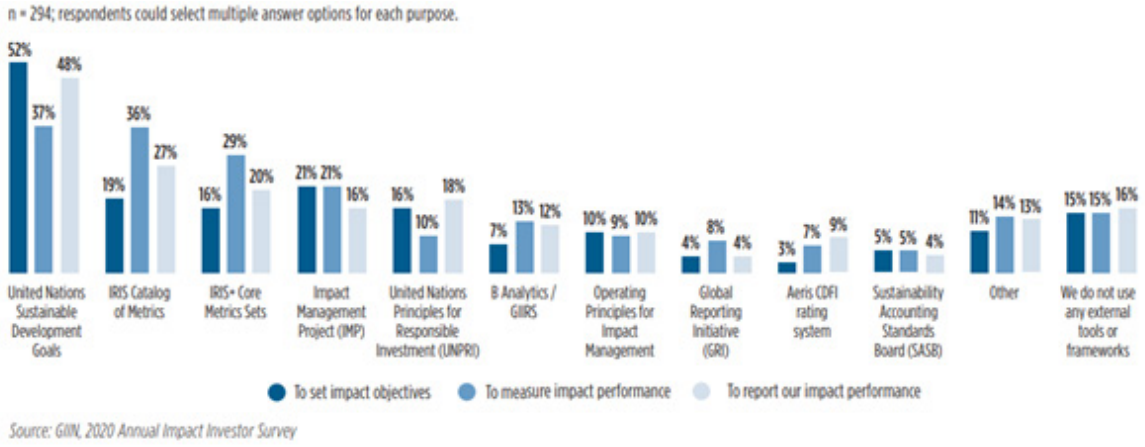


Figure 13: Percent of impact investors using selected frameworks and tools to guide investment (Hand et al., 2020)

What little work that has been done looking at the timing and nature of early-stage investment in climate-related companies has found emissions reductions are greatest for investments delivered at the venture and growth stage, compared to start-up investments. Investments with below-market return expectations also delivered more than double the emissions reduction performance by percentage change than investments with market-rate return expectations, as seen in Figure 14 (Hand et al., 2021a).

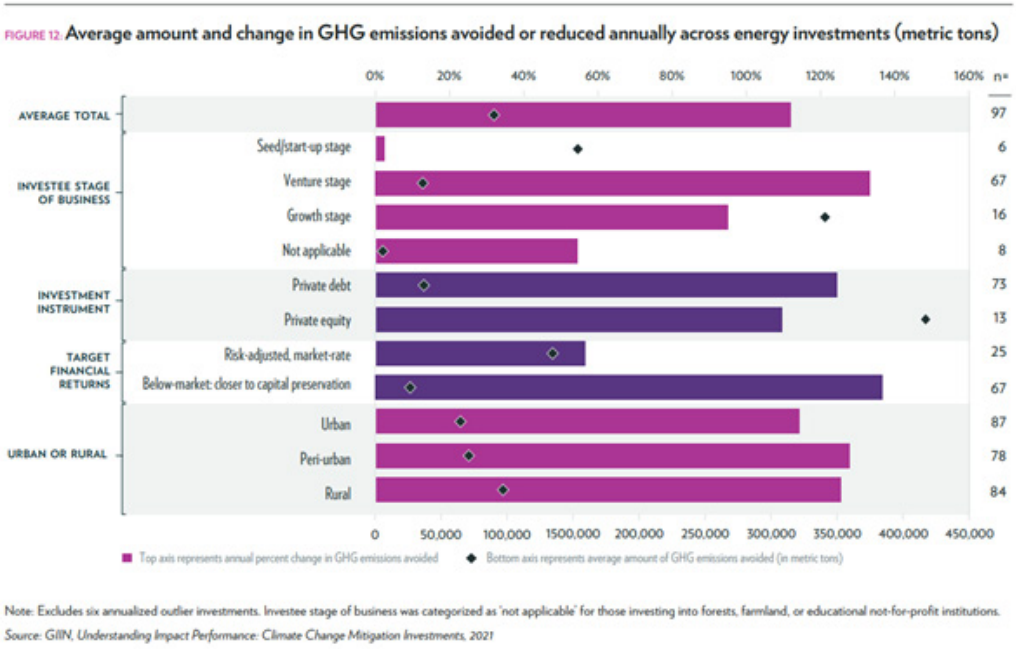


Figure 14: Average amount and change in GHG emissions avoided/ reduced across energy investments (MT) (Hand et al., 2021a)

1.3.3 Gender Lens Investing

Gender lens investing is an investing process or strategy that accounts for gender-based factors throughout the investment process to enhance gender equality and improve investment decisions (GIIN, 2017). As a process, it is focused on gender during pre-investment activities such as sourcing and due diligence, and focused on strategic advising post-investment. As a strategy, it focuses on investee enterprises with respect to vision or mission, organizational structure, use of data and metrics.

For the past decade, MCFs have worked to apply a gender lens to their investment processes. The Green Climate Fund (GCF) was the first climate financing mechanism to adopt a gender-sensitive approach in its policy frameworks and funding operations (GCF 2017). The GCF's Gender Policy and Action Plan (2015) specified that, in GCF project proposals, (a) all feasibility studies and environment and social impact assessments must include gender issues; (b) a gender expert must be a study team member; and (c) before the project is implemented, sex-disaggregated data must be collected (GCF 2017). The latest update – the Gender Policy (2019) – specifies that GCF will mainstream gender considerations both in its governance and in its portfolio decision making (Green Climate Fund (GCF), 2019). Many other funds and institutions have since attempted to mainstream gender considerations in their processes.

There are various toolkits and manuals on national- and program-level gender mainstreaming and responsiveness. These include the UNDP-UNEP Gender Responsive National Communications Toolkit, UNDP Gender Mainstreaming Manual, UNDP Capacity Building Package on Gender Mainstreaming in Mitigation and Technology Development and Transfer Interventions. However, the extent to which government bodies and climate finance institutions use these tools is not well-documented in the grey or peer-reviewed literature. Even countries that have made efforts to mainstream gender into their domestic climate finance programs, such as Indonesia, struggle to reach equality in decision making roles within funds and projects (Atmadja et al., 2020). Given the already complicated process of engaging

with MCFs, additional reporting requirements might appear daunting (Phillips et al., 2022b). Researchers can help to identify which gendered indicators can reasonably be collected across climate finance governance structures, programs and procedures, including considering the cost and benefit of this additional data gathering.

Gender lens investing has also been incorporated into some domestic finance regimes. For example, Indonesia's OCBC NISP Bank and the International Finance Corporation issued around $200 million for both gender and green bond tranches wherein the proceeds from the gender bond were used to expand lending to women entrepreneurs and women-owned businesses (Uzsoki, 2021). Further research is needed on how such gender bonds have resulted in outcomes for women and men, and the barriers to scaling such solutions.

Private investors have adopted gender policies, protocols and reports championing women in their investee companies (Calvert, n.d.; G-SEARCh, n.d.; Root Capital, 2021). In a review of technical assistance approaches, investee companies that incorporated gender by hiring more women or marketing specifically to women found a range of positive impacts, including increased sales and improved brand loyalty (G-SEARCh, n.d.). Research has found that supporting investees with technical assistance programming geared towards helping women grow within companies or better meeting the needs of women clients can improve business outcomes even if implementation has costs (G-SEARCh, 2022).

However, less research has focused on how private investors target women-led businesses, a stated objective of many investors interested in gender lens investing (Patamar Capital, 2017). One example is the Energy and Environment Partnership Trust Fund (EEP Africa), a financing facility managed by the Nordic Development Fund, which has been successful in integrating a gender lens into the investment process. They have specifically invited women-led businesses in calls for proposals, increased the percentage of women-led businesses that receive initial due diligence, and provided investment readiness technical support when needed. As a result, the number of women-led businesses receiving investment increased to 38% without compromising quality or increasing overall portfolio risk (EEP Africa, 2020; Phillips et al., 2022b). However, outside of a handful of case studies, little rigorous analysis has explored the most effective approaches to increasing investments in women-led companies – whether that involves changing internal decision-making processes (like EEP Africa), collateral requirements, or shifting financial and social expectations or targets.

At a higher level, there is very little data on where climate finance is incorporating gender or how much finance is attached to gender components. Older analysis found that that gender-responsive climate finance had increased steadily from $4.4 billion in 2010 to $8 billion in 2014 (OECD, 2016). As of 2014, 41% of bilateral aid for climate adaptation ($2.8 billion) targeted gender equality, while only 18% of bilateral aid for climate mitigation ($2.4 billion) targeted gender equality (OECD, 2016). However, fewer than half of these adaptation projects accounted for women's distinct needs and contributions, without which projects may be less effective or have negative outcomes for women (OECD, 2016). These analyses have not been regularly replicated, so there is little in the way of current comparable figures or temporal trends. There remains inadequate information to decipher how much climate investment is reaching women-led projects or the extent to which women are active players within project design, selection and implementation.

As integrated analysis and consideration of gender finance and climate finance are limited, research could focus on measuring the outcomes of investment strategies that pursue climate change solutions with explicit gender objectives such as women as leaders, managers, entrepreneurs, consumers, and workers. As with other analyses of social categories, it is important to take an intersectional approach and consider which women and men end up benefitting from these types of strategies, particularly looking at the role of education, urban versus rural populations, income, age and indigeneity.

1.3.4 Monetizing Carbon

Domestic carbon compliance markets have generally been unpopular in LMICs, and few NDCs signal an interest in adopting traditional carbon pricing mechanisms. However, voluntary carbon markets and linkages to international carbon markets are potential gateways for significant low-carbon investment capital for LMICs. A priority for countries will be developing approaches for engaging with these evolving carbon markets (Michaelowa et al., 2021).

Carbon markets have grown significantly over the past five years. The total value of carbon markets is roughly $850 billion, with 90% of that value in the EU ETS, which saw a doubling of its carbon price from 2020 to 2021 under stricter EU targets (Chestney, 2022; Nordeng, 2022). The California Global Warming Solutions Act (USA) and the Chinese National Emission Trading System (China) are the next two largest compliance markets. They use a cap-and-trade approach to encourage specific sectors and geographies to reduce emissions. Carbon compliance markets are expanding, and some middle-income countries are developing

their own compliance markets, including Chile and Indonesia (Santoso et al., 2022), targeting incentives to support low-carbon development within certain sectors, typically carbon-intensive sectors such as energy.

The 2021 agreement at COP26 on a framework for implementing Article 6 of the Paris Agreement establishes rules for an international compliance carbon market where countries can trade carbon credits and potentially leverage existing compliance markets. This has the potential to unlock investment in LMICs, to the extent that more cost-effective emissions reductions can be delivered there and governments are willing to allow the reductions to count towards other country's NDCs rather than their own. International cooperation through market-based instruments has the potential to reduce the cost of implementing NDCs by more than half--saving up to $250 billion annually--or increasing the amount of emissions removed by 5 GtCO2 per year by 2030 (Environmental Defense Fund, 2022).

More specifically, under Article 6.2, countries would be allowed to trade emissions reductions or removals, known as Internationally Transferred Mitigation Outcomes (ITMOs), through bilateral or multilateral agreements. These can be counted towards the purchasing country's own climate targets, and the country selling the credits would not count those reductions (World Bank, 2022). Under Article 6.4, the UN also would create a supervisory body to review climate projects and issue UN-recognized credits, known as A6.4ERs. These can be bought by countries, companies or individuals (Crook and Dufrasne, 2021). The new UN-regulated carbon market is distinct from the current voluntary carbon market, in that projects and credits are registered with the UN, 2% of total A6.4ERs will actually be cancelled rather than sold, and 5% of proceeds of the transfer of A6.4ERs will go to a climate adaptation fund (Klaczynska Lewis and Burzec, 2021).

The new framework faces questions about how finance will be channeled to reach key sectors and actors, as well as technical challenges on carbon accounting (Fowlie, 2021; Pontecorvo, 2021). There are concerns that carbon offsets could undermine emissions and climate justice goals due to problematic market structures/procedures and unintended outcomes (Blum, 2020; Chowdhury and Jomo, 2022). Carbon offset measures have seen a range of implementation problems, including violations involving land rights that led to evictions of resources-dependent communities (Rights And Resources Initiative & Mcgill University, 2021). More recently, the VCM has drawn intense criticism after investigations in the popular media have yielded alleged massive failure of many projects to deliver promised carbon benefits (Carbon Offsets, 2022; Greenfield, 2023). Procedural safeguards can help ensure principles related to climate justice, equitable distribution of the benefits and burdens of implementation, and participatory inclusion of multiple actors in the decision-making process are included in carbon credit projects (Burnham et al., 2013).

The existing voluntary carbon market (VCM) also represents a potentially valuable financing source for climate projects. It is expanding as a result of organizations implementing Net Zero targets, with consumer goods companies, financial institutions and energy companies becoming major participants (Donofrio et al., 2020) (Ecosystem MarketPlace, 2020). The value of the voluntary market has grown dramatically in recent years, officially topping $1 billion USD in November 2021 (THE EM INSIGHTS TEAM, 2021). These figures are likely to grow. The Taskforce on Scaling Voluntary Carbon Markets estimates that demand for carbon credits could increase by a factor of 15 or more by 2030, with 1.5 degree C warming goal driving annual global demand for carbon credits up to 1.5-2.0 gigatons by 2030 and a value upward of $50 billion (Blaufelder et al., 2021).

Scaled-up voluntary carbon markets could increase private financing to climate-related projects in LMICs, where the potential for economical nature-based emissions-reduction projects is especially high. These projects could have additional benefits, from biodiversity protection, pollution prevention, public health benefits, and job creation, which could make them additionally attractive (Blaufelder et al., 2021). An added benefit of carbon market revenues to LMIC-based projects is that the proceeds are typically denominated in US dollars or Euros, which provide a critical counterweight against the local currency value declines hitting most LMICs in the wake of the pandemic and inflation surges.

Although renewable energy projects have historically dominated the VCM, non-energy projects are gaining momentum due to an increased focus on carbon removal (such as carbon captured from the atmosphere through reforestation) as opposed to carbon reduction (such as carbon mitigation through renewables). Two key voices in the space - the Science Based Targets initiative (SBTi) and the Net Zero Investment Framework – only allow for removals to count towards Net Zero (World Bank, 2021b). At the same time, major standards organizations have begun excluding renewable energy projects in non-LDCs in an attempt to ensure that finance is additional (Forest Trends' Ecosystem Marketplace, 2021). These trends have implications for project developers in LMICs, wherein carbon removal projects are likely to be in demand, perhaps capitalizing on the fact that carbon removal credits were roughly five times

more valuable than carbon reduction credits in 2021 (Forest Trends' Ecosystem Marketplace, 2021; GFMA & BCG, 2021). Consequently, GHG removal projects in the AFOLU space could represent a key growth opportunity (Smith and Bustamante, 2018).

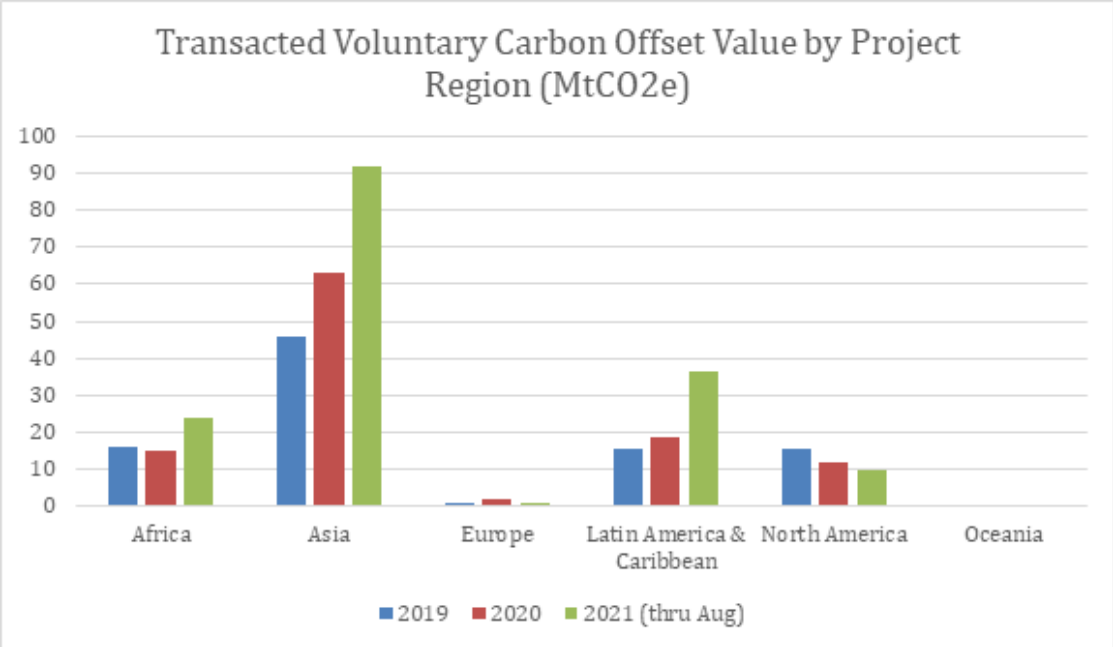
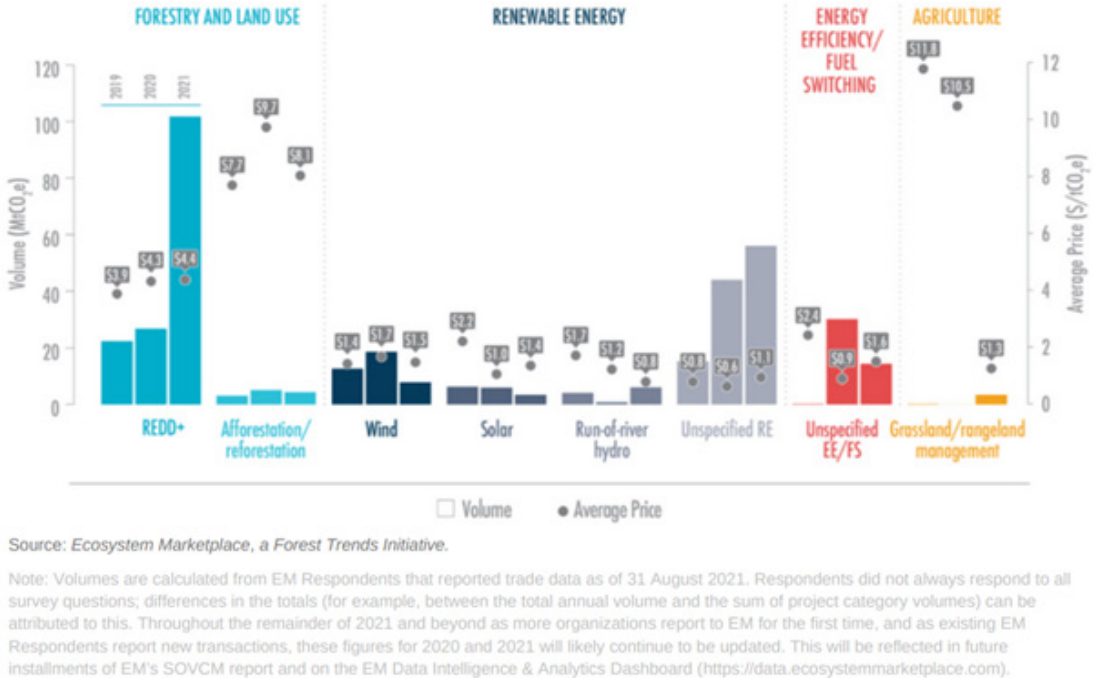


Figure 15 : Transacted voluntary carbon offset value by project region (MTCO2e)(Donofrio et al., 2021).



Source: *Ecosystem Marketplace, a Forest Trends Initiative.*

Note: Volumes are calculated from EM Respondents that reported trade data as of 31 August 2021. Respondents did not always respond to all survey questions; differences in the totals (for example, between the total annual volume and the sum of project category volumes) can be attributed to this. Throughout the remainder of 2021 and beyond as more organizations report to EM for the first time, and as existing EM Respondents report new transactions, these figures for 2020 and 2021 will likely continue to be updated. This will be reflected in future installments of EM's SOVCM report and on the EM Data Intelligence & Analytics Dashboard (https://data.ecosystemmarketplace.com).

Figure 16: Transacted voluntary carbon market sizes by largest project types (2019-2021) (Donofrio et al., 2021)

The majority of carbon offsets in the VCM currently come from Asia (91.8 MtCO2e from Jan – Aug 2021) but Latin America & Caribbean and Africa are also seeing large annual increases (Fig 13). As shown in Fig. 14, since 2019, REDD+ and renewable energy projects have dominated the voluntary markets alongside energy efficiency projects. Agriculture and reforestation projects have represented a much smaller proportion of carbon credits (Donofrio et al., 2021).

At COP27, Africa Carbon Markets Initiative (ACMI) was launched with the support of partners including the Global Energy Alliance for People and Planet, Sustainable Energy for All, and the UN Economic Commission for Africa. This initiative aims to overcome major challenges to the voluntary carbon market in Africa, such as small-scale and fragmented projects, insufficient capital and capacity, uncertain regulatory frameworks and concerns about carbon credit integrity. To do so, the ACMI's goal is to grow African carbon credit retirements from 16 MtCO2e to 300 MTCO2e and mobilize up to $6 bn USD annually by 2030 (ACMI, 2022). Throughout, the ACMI aims to ensure that a portion of those profits go to local communities. The Initiative identifies researchers and universities as key partners for developing curricula on the development of carbon credits, providing data, and supporting capacity building on validation and verification (ACMI, 2022). Another initiative, the Energy Transition Accelerator, was also announced at COP27 crediting framework that would operate at the level of a jurisdictional framework—an entire power system within a particular geography, for example—to capture leakage concerns. Countries would be eligible for credits when they increase the pace of their energy transition and could sell these reductions to qualified private sector and sovereign buyers.

Small and Medium Sized Enterprises (SMEs) are largely left out of carbon credit schemes currently because certifying projects requires significant upfront investment and technical capacity, which is beyond the scope of most small businesses in LMICs (Phillips et al., 2022c). Little research exists on how carbon markets can be better designed to support SMEs to participate in carbon markets, and only a handful of older studies on how SMEs' low-carbon activities could count towards carbon credits (Kalimunjaye et al., 2012; Sarkar, 2016).

An array of programs are underway to support LMIC engagement in carbon markets, including creating carbon credits through existing MDB lending programs; building capacity in LMIC governments to better understand how carbon credits can be monetized, structured, traded and reported; and sector-specific initiatives related to energy access, forestry and land use. Of note, the knowledge level among carbon buyers tends to be low with regards to co-benefits and how integrity is measured. Yet reputational concern from low-quality carbon is high. As a result, there is strong demand and premium prices paid for carbon that is associated with highly certain mitigation benefits and co-benefits, especially when aligned with corporate social responsibility priorities. Maintaining or increasing that price premium requires building certainty around the benefits of these projects and building investor confidence around the non-carbon aspects of the credit. Strategically deploying impact evaluations—in a manner that balances rigor with relevance and pragmatism—can clarify the relationship between business models and these impacts, increasing confidence of investors and policymakers (Phillips et al., 2023).

1.3.5 Targeting adaptation

Lagging investments in adaptation and resilience in LMICs are an indication of the unique challenges facing this category of projects, which often address water management, coastal flooding, and other climate risks. These projects and firms are often ripe for investment in terms of the benefits far exceeding costs, but they may remain unattractive to private investors because those benefits take the form of public goods, non-financial benefits or benefits that are challenging to measure. Positive externalities resulting from these investments—like increased revenue, avoided losses, and other social benefits—may accrue to local households and the local economy rather than investors.

The non-financial benefits of many adaptation projects can make them especially challenging to finance through market rate debt, which is still the most common financing instrument for adaptation projects (CPI, 2021a). Although $1.8 trillion in investments could generate $7.1 trillion in adaptation benefits through a combination of avoided costs and a variety of social and environmental benefits, matching those environmental and social benefits with the types of investors interested in them is often not possible in existing data-poor and high capital cost environments (United Nations, n.d.). It can be a challenge for governments to internalize these benefits or align them with incentives in a manner that can attract private investors (UNEP FI et al., 2019).

Compounding this, there are a number of market barriers that limit the scaling up of financing for adaptation. LDCs and other climate vulnerable countries most in need of adaptation and resilience investment also happen to be some of the riskiest markets for private investors. There are also

concerns that climate risk management is not adequately valuing adaptation and resilience projects, since managing climate risk is a relatively new activity for organizations and capacity within financial institutions is low (UNEP FI et al., 2019).

There are a number of innovative instruments and approaches emerging to address the adaptation investment gap. Firstly, there is the option to combine public financing with private investment to capture the range of benefit streams from adaptation investments, as is the case in many public-private partnerships for infrastructure. This includes blended finance, which, while much more commonly deployed in the clean energy sector, has experience being used for infrastructure development, making it a good fit for adaptation projects in some cases. Intermediary funds like Acumen's Africa Resilient Agriculture Fund invest capital from the GCF and other investors - including FMO, the Soros Economic Development Fund, PROPARCO, the Children's Investment Fund Foundation, Global Social Impact, and IKEA Foundation - into SMEs in the agriculture whose operations generate resilience benefits.

There are also a range of financial instruments like social impact bonds, green bonds, catastrophe bonds, resilience bonds and other instruments that can offer lower cost capital or risk coverage for targeted groups through different structures and incentives. Insurance options, like index insurance linked to weather events, can provide payouts to smallholder farmers and other groups based on weather-related disasters, while also encouraging farmers to take measures to improve the climate resilience of their operations, which can also increase their credit worthiness (UNEP FI et al., 2019).

In many cases, these financial instruments will rely on quantifying adaptation benefits. There is an important role for researchers to identify and estimate the monetary benefits that arise from adaptation investments so that private and public financing can be mobilized to capture the full range of private financial and public benefits that are delivered through the project or firm. This will require some form of impact quantification, which could follow a simple framework (Phillips et al., 2022b).

There is little gender disaggregated evaluation and monitoring of climate finance projects, despite the historical focus on women in adaptation (Schalatek, 2022). There is evidence that gender-responsive climate financing increases efficiency and effectiveness in projects across both adaptation and mitigation (Tinker and Alvarenga, 2018). However, while more women have historically been involved in adaptation work, women are not benefiting equally from adaptation financing. The scale of climate finance in adaptation is one barrier; most funds disburse in large amounts, while women are mostly involved in micro-scale enterprises that face barriers to accessing these funds (Schalatek, 2020). A potential problem area for adaptation work is the power dynamics and differing access to land and capital that women face. In countries where women are barred from owning land and capital, adaptation projects can entrench traditional power structures and keep women removed from the benefits of adaptation financing (Schalatek, 2020; Wong, 2016, p. 20).

Standards organizations that operate in the voluntary carbon market now commonly approve methodologies that incorporate resilience and SDG co-benefits. Gold Standard now offers carbon project certification with gender equality impacts and improved health outcomes (Gold Standard, n.d.). Similarly, Verra's SDG VISta Program has accredited methodologies demonstrating benefits like improved coastal resilience or time savings for women delivered from improved cookstove technologies (Verra, n.d.).

One key sector associated with resilience benefits is agriculture, which is also a critical economic development sector given its relationship to livelihoods and income for so many people in LMICs. Figure 17 illustrates the range of climate adaptation and resilience-related benefits that could arise from agricultural value chains like solar irrigation, solar cold storage, and processing (Phillips et al., 2022b).

Figure 8. Contributions of AgTech to Climate Adaptation & Mitigation

Notes: Colors indicate the type of benefit category, as described in the text: Dark blue colors denote direct adaptation (i.e., directly reducing exposure to climate risks); light blue colors denote direct enhancement of adaptive capacity (i.e., enhanced ability to withstand shocks when they occur); shades of green denote indirect enhancement of adaptive capacity (where improvements occur via a more complex causal chain); and purple denotes climate mitigation. Note that the figure and typology do not imply anything about the relative magnitude or ease of monetizing these benefits.

Figure 17: Contributions of AgTech to climate adaptation and mitigation (Phillips et al., 2022b)

Quantifying adaptation benefits delivered through projects and firms could mobilize capital into these sectors by allowing firms to market these benefits, either through "premium carbon" (discussed under Monetizing Carbon) that deliver SDG co-benefits or through non-market based instruments. For instance, the African Development Bank has begun piloting an Adaptation Benefits Mechanism (ABM), which is a program that quantifies expected resilience benefits at the project level and markets them to donors as "Certified Adaptation Benefits" (CABs). Specific investors pay for outputs or impacts, but the CABs are not transferred internationally or traded in a market (AfDB, 2022; African Development Bank Group (AfDB), 2021). Standardizing adaptation or resilience measurement and impact across value chains and geographies could support the entrance of new impact investors into the space, enable benchmarking, and allow for a "value for money" comparison of projects within countries (Phillips et al., 2022b).

Quantifying adaptation impacts is at a nascent stage and represents an area where researchers will be critical to identifying and prioritizing projects and firms for investment. However, balancing investor data needs with the time and resource costs of generating that impact data will require coordination and the development of more nimble evaluation methods.

Many of the critical sectors in these countries – such as agriculture, energy or transport – also suffer from a lack of data to help steer investment decisions, and which could help de-risk the sectors for private capital. Researchers could play an important role in expanding access to critical data that investors need to evaluate and manage risk through collecting and disseminating research data. Standard monitoring and evaluation approaches focused on outputs, which are relatively easier to measure, are not sufficient on their own for estimating resilience impacts. These require an understanding of outcomes, which are often challenging to measure. Impact evaluations are needed to estimate a counterfactual and track changes in outcomes that change over time, even in the absence of the intervention (Phillips et al., 2023). More publicly available evaluations will help determine which financial tools align best with what contexts, and how coupling other policies and programming could impact the effectiveness of these risk mitigation tools.

1.3.6 Navigating the global power rivalry

With the bulk of energy- and climate-related finance to LMICs coming from either Chinese entities or US-aligned MDBs and DFIs, it will be important to understand what the shifting approaches to climate and infrastructure financing

from the global powers means for LMICs.

The rapid rise of Chinese overseas energy and infrastructure finance over the past decade has become a major factor in how infrastructure is developed and financed in LMICs. In addition to China's extensive domestic infrastructure spending – domestic investment there represented 81% of all climate finance flows in East Asia & Pacific (CPI, 2021a) - the "Belt and Road Initiative" (BRI), as it was called when it was rolled out in 2013, has simultaneously locked in decades of additional coal pollution, created complex environmental tradeoffs in the hydro sector, and amplified the scale of renewable energy deployment in emerging markets (Ewing, 2019). The Chinese turnkey infrastructure development model--in which complex projects can be designed, financed, built, and operated under a single high-level, government-to-government agreement has proven attractive for many LMICs. Many LMIC governments, with limited domestic capacity and frustrations with the demands imposed by Western and multi-lateral finance institutions, have found China to be a viable alternative development partner. Consequently, the BRI deployed more infrastructure investment to developing countries than all MDBs and DFIs combined over the past decade (Phillips et al., 2022c).

During the 2010s, the CDB and CHEXIM became the largest sources of energy finance for governments around the world (Gallagher, 2018). By 2016, these banks were providing more than $43 billion in energy financing annually, nearly triple the average energy lending of the World Bank and all the Western-backed multi-lateral development banks combined. Roughly 60% of the energy finance provided by these banks was concentrated in Asia, with Latin America (25 percent) and Africa (14 percent) receiving the bulk of the rest. Eighty percent of all the finance was for power plants, nearly all of which went to coal (66 percent) and hydroelectric (27%). By the latter half of the 2010s, Chinese companies and banks were involved in 240 coal-fired power projects in 25 of the 65 countries along the BRI – with activities ranging from financing, underwriting, and insuring to ownership and operations (Peng et al., 2017).

The US and G7 allies are responding. The Partnership for Global Infrastructure and Investment (PGII) in 2022 represents a new Western model of overseas investment emphasizing flexibility, speed, scale, and comprehensiveness. In certain coal-heavy markets like South Africa, Indonesia, and Vietnam, PGII is taking the form of destination-specific investment packages called "Just Energy Transition Partnerships" that aim to keep social and environmental standards high while streamlining processes and delivering the scale and speed needed to meet development needs (discussed further in "Deliberate Policy-Finance Linkages"). This is occurring just four years after the creation of a new, re-tooled $60 billion DFI in the US, the US International Development Finance Corporation.

The early 2020s is witnessing a nascent shift in China's outbound energy investment strategies in both scale and fuel type. President Xi Jinping declared to the UN General Assembly in September 2021 that China would no longer invest internationally in coal; a statement clarified through Chinese regulations released in March 2022 revealed that this meant no new investments but stopped short of rolling back the existing project pipeline (American Enterprise Institute (AEI), n.d.; Ministry of Commerce, PRC, n.d.). Given the prior dominance of coal in China's outbound energy investments, and its outsized implications for climate change, this shift is substantial.

More recently, Chinese infrastructure investment has declined, as LMIC debt loads have skyrocketed during the pandemic. Navigating LMIC debt relief and/or supporting new lending programs to governments may be fraught, as China now holds upwards of 40% of the debt of the world's poorest nations and restructuring sovereign debt will likely require bringing them to the table with western government lenders and private bond holders. At the same time China is winding down financing of coal power systems, it is promoting a "Global Development Initiative," which is expected to focus more on sustainable development (Min of Foreign Affairs, China, 2022).

Western climate and development finance efforts often muddle adversarial, competitive, avoidance-driven and cooperative approaches toward China, missing opportunities for stronger climate finance as a result. President Biden's economic stimulus plan framed China – the only foreign country mentioned – as a rival in the battle for low carbon sector primacy. The EU's Global Gateway Initiative was presented as, in the words of European Commission President Ursula von der Leyen, a "true alternative" to Chinese finance, defined by transparency, good governance and sustainability (European Commission, 2021b).

If there is a pathway to virtuous competition between Western and Chinese financing, it rests on clear local development visions with healthy LMIC project pipelines and supportive enabling environments. TA support to LMIC governments to help them navigate this rapidly shifting landscape and align policy with financing realities will be more critical than ever. Researcher support in identifying the most effective ways of doing that—including understanding

how evolving approaches vary in terms of pace, inclusivity, and overall impact—will be essential.

1.4 Mobilizing domestic resources for climate finance and evolving demand-side dynamics

The previous section has focused on the supply of climate finance, which for many LMICs means reliance on foreign governments and capital markets. However, building robust green financial systems domestically and more deliberately building policy-financing linkages can help deliver capital through the local ecosystem, and do so through pandemics, wars, and climate disasters without getting distracted, as foreign investors often do. Such a strategy is also more likely to leverage local institutions, including sub-national governments, banks and other local capital providers, or NGOs, which are often in the best position to understand local priorities, politics, risks, and partner dynamics. While this reality is often implicit in calls for greater channeling of finance through local partners or intermediary funds, it is rarely discussed at length and little academic or case-based evidence exists to support this claim (Masullo et al., 2015; UK Government, 2021; World Resources Institute (WRI), n.d.). While other papers in this series will focus on host-country financial policy, this section outlines some of the key emerging institutions and mechanisms for building stronger domestic green financing capabilities generally, and identifies research opportunities that could support governments and partners in building out these systems.

LMIC governments are especially challenged today in raising capital through global capital markets given pandemic debt loads and currency value declines (Phillips et al., 2022c). At COP27, Barbados President Mia Mottley presented the Bridgetown Initiative, a finance plan that tries to tackle the tripartite challenge that LMICs are facing: cost of living crises, the looming debt crisis and the climate crisis (Ministry of Foreign Affairs and Foreign Trade, Barbados, 2022). Her proposal, which garnered support from leaders such as President Macron and IMF managing director Kristalina Georgieva, calls for the IMF to provide emergency Special Drawing Rights, for MDBs to implement a Debt Service Suspension Initiative for loans to the poorest countries and to expand lending to governments by $1 trillion (Masterson, 2023; Osborn, 2022).

There has also been some recent international cooperation on debt as China and France have co-chaired the Creditors Committee for Zambia, which pledged to negotiate a restructuring program for Zambia's debt (Club de Paris, 2022). As China is a major lender for many countries in the Global South, it is anticipated that China will have a seat at the table for more debt restructuring arrangements post-pandemic (Phillips et al., 2022c). Further study is needed on the different levels of sovereign debt that countries carry and how that influences their ability to raise capital for a low-carbon transition, particularly for domestic initiatives like green banks and bond issuances. Another potential development for researchers to watch is expansion of debt-for-climate and debt-for-nature swaps through systematic approaches that can leverage complimentary support from the donor community.

1.4.1 Green Banking

Green banks are financial institutions at state and sub-state levels that use public capital to leverage private funds towards investments in domestic low-carbon businesses and projects. Beyond formal green banks, green banking principles can be embedded within other domestic financial institutions, like existing national development banks, to similarly catalyze investments into the targeted low-carbon development sector (Smallridge et al., 2019).

Green banking can target sectors that local commercial banks tend to ignore, and in some cases, offer more favorable rates than commercial banks. While the proportion of LMIC banks providing climate lending increased to 72% of 135 sample banks in 2017—with most activity in renewables and energy efficiency—green banking concepts around information disclosure and codes of conduct still has a long way to go in LMICs (Park and Kim, 2020). And targeted financial products are often lacking. Despite a recent survey that found that 70% of banks in sub-Saharan Africa were interested in green finance, only 10% are creating tailored green finance products (EIB, 2021). While they have a deeper roots in developed economies, green banking can work equally well in HICs and LMICs to many of the same market barriers, such as small ticket sizes and risk perception, as seen in Figure 18 (Coalition for Green Capital, 2017). They can help to increase compliance with environmental regulations and can help banks capitalize upon emerging business opportunities (Park and Kim, 2020). Sources of public capital can commonly include tax revenues, customer charges on utility bills, and payouts from firm mergers and other domestic economic activities.

Figure 18: Green Bank Solutions (Coalition for Green Capital, 2017)

Green banking can also target one of the major challenges to domestic private finance for climate actions: a lack of local bank knowledge around climate risks and opportunities (AfDB et al., 2021). This is beginning to change. In Latin America, 38% of the banks covered in a recent survey had already incorporated guidelines on climate change into their work and 24% had a climate risk evaluation and disclosure policy (UNEP, 2020). In Africa, the South African Reserve Bank instructed its banks to address their climate resilience, and announced that there would be new climate guidelines forthcoming (Clarke, 2022). In 2021, the Bank of Kenya also announced Guidance on Climate-Related Risk Management, which broadly follows the recommendations of the Taskforce for Climate-Related Financial Disclosures (Central Bank of Kenya, 2021). Green banks can be important institutions for modeling these policies and demonstrating their relationship to profitability. Researchers can play a role in supporting knowledge sharing for best practices, sharing data on risks and supporting in the development of stress test models and scenario analyses (AfDB et al., 2021).

Green banking institutions, including national development banks, can also play a critical role as "direct access" entities, or local financing partners, for channeling Multilateral Climate Funds (Innovate4Climate, 2022). The Adaptation Fund first implemented a direct access process in 2014, followed by the Green Climate Fund in 2015 (Adaptation Fund, n.d.; Green Climate Fund (GCF), 2021). While local direct access entities can include local banks, NGOs, and civil society groups, the accreditation process can be expensive, time consuming and unwieldy, favoring larger green banking entities that have the capacity to engage the process (Global Environment Facility, 2013; International Federation of Red Cross and Red Crescent Societies, 2013; Attridge, n.d.)). For example, the Development Bank of Southern Africa has partnered with the Green Climate Fund on its Climate Finance Facility, a $170 million program using a green banking model that leverages public finance with concessional terms to attract private investors to certain climate projects (Green Climate Fund (GCF), n.d.). Acknowledging that it is challenging and expensive to become accredited as a national implementing entity, actors like NDC Partnership provide climate finance readiness technical support (Caldwell and Larsen, 2021).

However, the latest evidence suggests that direct access facilities are underutilized, with only 42 of the 62 in-country institutions accredited by GCF received funding by 2021, or just 1.5% of total investment (Brown and Alayza, 2021). Assessments of Direct Access programs suggest offering "kick-off" funding upon accreditation to help green banks and other direct access entities put the processes and expertise in place to establish pipelines and begin channel funding

(Caldwell and Larsen, 2021).

In Asia, notable green banking guidelines have been developed in China, Indonesia, Vietnam, and Bangladesh. The People's Bank of China (PBOC) established Guidelines for Establishing the Green Financial System in 2016, and by the end of 2020, 21 major Chinese banks had green loans totaling $1.8 trillion (IFC, 2021a). Other countries that have issued green finance guidance have seen more modest lending, but still representing 1.4-3.7% of loans (IFC, 2021b; Volz, 2018). Some countries have also become members of the Sustainable Banking Network or Network for Greening the Financial System, like Jordan, Armenia, and Nepal. Latin American banks have generally been slower to adopt the green bank model. As more green banking institutions emerge, it will be important to increase the sustainable finance literacy of national banks. Researchers could be in a good position to synthesize international lessons learned and provide knowledge products and education for national banks.

1.4.2 Green Bonds

Green bonds are fixed-income debt instruments specifically designed to support climate and environment projects. Their development over the past few years has been underpinned by factors that include their similarity in yields to maturity with conventional bonds, and increasing climate awareness by investors (Banga, 2019). Green bonds issued by supranational institutions and non-financial corporates have been found to have benefited from a premium when compared to ordinary bonds (Fatica et al., 2021).

In 2021, annual green bonds issuances amounted to $523 billion worldwide, with primary issuers being the United States ($82 billion), China ($68 billion) and Germany ($63 billion) (CBI, 2022). Of new bonds issued in 2021 that could be tracked by geography, emerging markets represented 19% of all green bonds issued (CBI, 2022). However, green bond issuances in Africa represent less than 1% of the market (BloombergNEF, 2021).

China, driven by high-level buy-in from the People's Bank of China, along with India have been leading sources of green bond issuances in Asia, with renewable energy and low carbon transport receiving the largest proportion of proceeds (Climate Bonds Initiative, 2022, 2017) (Escalante et al., 2020). The Philippines and Indonesia have also utilized the mechanism extensively to finance energy, waste, and water sectors (Climate Bonds Initiative, 2022, 2020; IFC and Amundi Asset Management, 2021). Armenia, Uzbekistan, Jordan, Nepal, and Bhutan are in earlier stages of establishing green bond programs. Brazil, Mexico and Chile lead green bond issuance in Latin America, although the region represented only 2% of the global green bond market between 2004 and 2019 (Cárdenas et al., 2021).

The uptake of green bonds within LMICs has been impacted by institutional and market barriers that include high transaction costs, inadequate institutional arrangements, and limited knowledge on the mechanics of green bonds (Banga, 2019). Greater availability of local currency based-green bonds, in which local governments can play a pivotal role in supporting transaction costs, promoting investments, and providing guarantees on issuances, could enhance the development of local green bond markets in LMICs(Banga, 2019). The major barriers to green bond issuance in Africa include a lack of expertise in relevant agencies and banks, poor supporting regulations, the small size of issuances, and a limited demonstration of benefits (Marbuah, 2021). Researchers will have a role to play in understanding the impacts of green bond issuances and the extent to which they are correlated with positive outcomes (Marbuah, 2021).

There is increasing standardization of green bonds issuances globally, through guidelines like the Green Bond Principles (GBP) and collections of voluntary frameworks like Social Bond Principles, Sustainability Bond Guidelines and the Sustainability-Linked Bond Principles. The GBP offer best practices and a framework for identifying green projects and discerning their environmental sustainability, as well as advocating for transparent reporting on green bond issuances (ICMA, 2021). As ESG reporting increases demand for green bonds, there has been increased liquidity in the green bond market (Byrne and Chana, 2021). Some studies also find that there is a negative premium on green bonds, but more research will be needed to assess the scope of the "greenium" across sectors as the market matures (Liberati and Marinelli, 2021; Wass, 2021).

Supporting LCT technology development and transfer

A low-carbon transition requires moving to different practices and technologies, including clean energy, more sustainable modes of transportation and climate-smart agricultural practices. The research, development and deployment of these technologies have often historically required transfer from one geography to another, both in terms of high-income industrialized economies sharing knowledge and mature technologies and in terms of Global-South-led innovation and transfer of knowledge and technologies between LMICs.

In the past, technology transfer and international cooperation has driven government policies and international aid programs that back low-carbon energy development in LMICs and supported by business investments of firms

and companies in the Global South (Kirchherr and Urban, 2018). Countries also transfer technologies and expertise internationally to expand their market. For example, China is driving their low-carbon energy firms to invest in other countries in the Global South to raise government revenues, generate employment and economic growth domestically, increase market access, and develop bilateral relations. On the other hand, productivity-driving assets are more likely to be imported into markets with less frequent power shortages, a large domestic market, and low production costs (Kirchherr and Urban, 2018).

Key drivers of low-carbon technology transfer include strong systems for intellectual property (IP) protection, such as legal and strategic enforcement are also key drivers of low-carbon technology transfer (Rai and Funkhouser, 2015). And yet, research is limited on how small, innovative firms respond to IP risks when faced with unfavorable market conditions such as the global financial crisis during 2008-2010 (Rai and Funkhouser, 2015). Appropriate government policies are also critical enabling environment factors, such as tax relief programs for foreign investors, suitable capacity in recipient countries (including capital, technology, professional networks) and joint ventures between domestic firms in recipient countries and foreign firms (Kirchherr and Urban, 2018).

Research has focused on the transfer of physical goods or 'hardware', underexploring how technology know-how on low-carbon technology processes or 'software' must be developed or transferred to LMICs (Ockwell et al., 2009). An improved understanding of how to develop innovative capabilities in recipient countries is needed to facilitate low-carbon technology transfer in the long-term (Ockwell et al., 2009). Likewise, more research is needed on the ability of industries to integrate external knowledge and apply it to its key commercial processes (Rai and Funkhouser, 2015). These elements of market development may require technical assistance and support from funders interested in financing Global South-led innovation.

Though emerging economies like Brazil, China, India and South Africa have been playing a role in technology transfer in the Global South, the existing empirical literature explores North-South technology transfer (NSTT) and cooperation much more than South-South technology transfer (SSTT) and cooperation, or South-North technology transfer (SNTT) and cooperation (Kirchherr and Urban, 2018). Along these lines, the literature has mostly focused on Asia and Africa, with much less analysis in Latin America and the Middle East. There is limited evidence on the dynamics, features and outcomes of NSTT, SSTT and SNTT in different countries and regions. The trajectory of technology transfer in sectors like hydropower technology and in geographies like Latin America and the Middle East is understudied.

There are, of course, issues of power and injustice in the transfer of technologies. Elite power allows (predominantly Global North) actors to use the world as their laboratory, testing and piloting ideas in ways that share risks but not always rewards (Sovacool et al., 2019). Research is needed to understand how low-carbon development can end up reinforcing inequalities, in order to potentially inform investment decisions of international financial institutions in LMICs (Sovacool et al., 2019).

1.4.3 Deliberate Policy-Finance Linkages

One opportunity to connect finance and policy is to focus on nationally-led, bespoke agreements that are well-aligned with national priorities and international finance. In 2021 at COP26, South Africa unveiled the Just Energy Transition Partnership (JETP), a deal between the United States, Britain, France, Germany, and the European Union to provide South Africa $8.5 billion in grants and concessional loans over the next five years to support a transition away from coal. The agreement was designed to support the early retirement of coal generation assets, build cleaner power sources, and provide support for coal-dependent regions, which will help achieve the lower bound of South Africa's emissions targets under the Paris Agreement (Kumleben, 2021). The JETP is an example of the type of high-level agreement between one or more LMIC governments and one or more advanced economy governments to deliver targeted investment packages to support specific country-led climate strategies.

The hope with such an approach is that the level of high political buy-in, the agreement's alignment with the host country's NDCs, the scale of capital involved, and the accountability that comes with a relatively small number of partners delivers on major climate priorities of both the host country and the strategic financing partners. Notwithstanding the challenging road ahead for the JETP, if the model proves successful in mobilizing large-scale climate financing, these types of bi-lateral and multi-lateral agreements that link financing and policy at the highest levels could become an important template for other countries, especially those where mitigation opportunities are ripe.

The coal and mitigation focus of existing JETPs provides a clue as to where these types of large-scale, top-down investment agreements are likely to be targeted (Phillips et al., 2022a). There is an emerging consensus around the top 15 or so countries, beyond the OECD and BRIC countries

(Brazil, Russia, India, and China), that are expected to be major emitters in this century. This group of 15 emerging economies, as seen in as seen in Figure 19, already have substantial fossil energy foundations. Combined with steep ongoing development needs and robust future economic growth expectations, these countries could produce an emissions wave over the next two decades akin to what China produced during the first two decades of this century when it released 195 billion metric tons of GHGs into the atmosphere (Sims Gallagher, 2022).

Figure 19.. The "Emerging 15." The top 15 greenhouse gas emitters outside of Brazil, Russia, India, and China and the Organization for Economic Co-operation and Development Countries (Phillips et al., 2022a).

Beyond the Emerging 15, a set of further 15 countries - the "Next 15" - represent places where high economic growth, high population growth, high climate vulnerability, and low levels of development make low-carbon development pathways critical national priorities. These countries have some of the highest rates of population and economic growth and urbanization, and their citizens are expected to be some of the most climate vulnerable on the planet.

Figure 20. The "Next 15" (Phillips et al., 2022a).

It will be critical for policy and finance to work together to address the very different needs exemplified by the Emerging 15 and the Next 15. Top-down agreements linking policy and finance can have far-reaching impacts that need to be measured and understood. For example, the JETP agreement directly confronts employment and livelihoods, leading national economic and political priorities in South Africa that are deeply tied to coal. The threat of lost coal industry jobs has long been a barrier to power sector decarbonization, given an official unemployment rate of around 35% and more than 200,000 existing jobs tied directly to coal (Vanek, 2021; World Resources Institute (WRI), 2021). JETP's focus on just transitions at the local level acknowledges the impact on mining communities and establishes a task force that puts vulnerable communities–especially coal miners, women and youth–central to the program (European Commission, 2021a).

JETP-type agreements will necessarily be country-specific, and will require regional-, country- and local-level research along a number of dimensions. Capacity building and expertise to support the energy systems modeling and regional economic plans will be critical to defining credible and just transitions in LMIC regions (Mutiso, 2022). Understanding the impacts of these agreements, and the projects and firms financed through them, is critical to informing the design, scope, and execution of future agreements.

1.4.4 Financing Nationally Determined Contributions

Top-down agreements like the JETP are not the only way to more closely link policy and finance. Nationally Determined Contributions (NDCs) are intended to consider financing in their bottom-up design and implementation. This was generally not done well in the development of the first round of NDCs, which are to be updated every five years. It is an area that merits further exploration by researchers to help surface the most effective approaches for developing climate strategies that not only meet the needs of countries but also have a workable path to financing and implementation.

Reviews of NDCs and National Adaptation Plans (NAPs) find they are not inherently designed to be portfolios of bankable projects for investment; nor should they be. They are intended to identify and quantify national climate priorities. The vast majority (83% and 87%, respectively) of NAPs anticipate International Climate Finance and Domestic Budgets to finance adaptation efforts, while around 63% of NAPs expect finance from the private sector (NAP Global Network, n.d.). Yet their development in general isolation from capital providers, the common failure to even estimate the levels of investment needed, and the deferral of developing essential financing and implementation strategies for later has created a chasm in which bankable projects all too often fail to materialize (Phillips et al., 2022a).

For most LMICs, the first round of NDC development was a useful process that drove domestic engagement of various stakeholder groups and helped to identify and quantify national climate priorities. But the process tended to be dominated by high-level policymakers, often leaving behind capital providers and key actors that could contribute to a better alignment of the contributions with workable investment approaches (Jaramillo and Saavedra, 2021). The end result is a consistent inability to connect NDCs to financing, with a common criticism that countries lack clearly defined strategies for engaging and incentivizing the private sector to invest in sectors where the government seeks their investment to achieve NDC targets (NDC Support Programme, UNDP, n.d.). However, these NDCs were also driven by country-level consultants, who had to reach COP21 submission deadlines, and there is some criticism that this limited the stakeholder participation process (see African Regional Policy Review).

Pauw et al. (2020) argue that to increase LMICs' chances of receiving financial support, there must be inclusion of reliable cost estimates in subsequent NDCs and formulation of investment plans. The cost estimates on technology transfer and capacity building are limited in most NDCs. Future analyses of NDCs should identify what parts of the contribution will be implemented with domestic funding and what parts with international funding (Pauw et al., 2020b). In the NDCs of Brazil, Chile and Mexico, high-level adaptation goals are prominent, but they are not defined in quantitative terms; credible estimates of the financing needed to realize these goals are also absent (Abramskiehn et al., 2017b).

More recent analyses of 168 NDCs submitted as of June 2019 find that across the 136 countries that make their NDCs conditional on at least one support type, capacity building is most frequently requested (113 NDCs), then mitigation finance (110 NDCs), technology transfer (109 NDCs) and adaptation finance (79 NDCs) (Pauw et al., 2020a). Research and technology (23%) are the capacity building elements that are most indicated in NDCs (Khan et al., 2020). Other elements include education capacity needs (20%), institutional needs (21%), training (18%) and awareness raising (9%) (Khan et al., 2020).

The costs of executing all conditional contributions far exceed pledged support from developed countries, even if the yearly $100 billion of climate finance were spent entirely on NDC implementation. The differences between the

distribution of middle-income countries receiving support and those requesting support illustrate possible tensions between feasibility and equity (Pauw et al., 2020a).

Since the conditions applied to NDCs are not clearly articulated, it is challenging to assess how feasible they are to implement, and how different those conditions are from existing practices (Pauw et al., 2020a). The majority (93 percent) of least developed countries (LDCs) and small island developing states (SIDS) mention mitigation finance in the NDCs; over 50 percent of LDCs and SIDS make their mitigation contributions partially conditional, and 22 percent make their mitigation contributions fully conditional (Mbeva and Pauw, 2016a). An analysis of 43 African countries' NDCs finds that request for mitigation climate finance was universal (Mbeva and Pauw, 2016a). Afghanistan is one of the few countries that specifically identifies crucial sources of climate finance, such as the UNFCCC, GEF and GCF to provide extra finance and support (Mills-Novoa and Liverman, 2019).

While LMICs call for uniform finance allocation between adaptation and mitigation, the per country average amount requested is higher for mitigation finance than adaptation finance (Pauw et al., 2020a). Among the 122 NDC reports submitted as of January 31, 2016, 64 NDCs made quantitative estimates of financial support needed to execute their mitigation contribution, with the amounts ranging from $0.1 billion (Nauru, and Sao Tome and Principe) to $1,040 billion (India) (Zhang and Pan, 2016). The mitigation costs are primarily for projects on renewable energy, energy efficiency, sustainable transport, industrial process fugitive gases, agriculture/forestry/livestock management, waste disposal (Zhang and Pan, 2016). The key investment sectors for adaptation costs are water supply and management, infrastructure and coastal protection, agriculture and ecosystem protection, human health and disaster risk management, among others (Zhang and Pan, 2016). Of the 28 NDC reports that explicitly report their need for finance, the three countries with the greatest emphasis on mitigation are South Africa, Iran and India, which claim to require 19.7, 9.7 and 4.0, respectively times more finance for mitigation than adaptation (Zhang and Pan, 2016).

Khan et al. (2020) find that most of the capacity building requirements in adaptation are in the agriculture sector, and energy sector-related capacity building needs in NDCs are around "increasing access, increasing the share of renewable energy, enhancing the energy efficiency, and expanding energy infrastructure" (Khan et al., 2020). These include training and undertaking feasibility studies and impact assessments for energy projects (e.g. Cape Verde); awareness raising through promotion of energy standards and labelling (e.g. Burundi, India, Pakistan); technical training in developing, installing and maintaining solar and wind power (Lao PDR); technical capacity for fuel switching to alternative energy options (e.g. Azerbaijan, Indonesia, Maldives); institutional capacity building for industry energy efficiency (e.g. Afghanistan, St. Vincent and Grenadines); and implementation of energy management systems (e.g. Myanmar, Lao PDR, Pakistan)" (Khan et al., 2020).

Although approximately 78% of the NDCs explicitly mention women and/or gender, for the most part, the integration of gender varies considerably across these documents, which makes it additionally challenging to estimate the finance needed to also integrate gender equality into the climate finance agenda (IUCN, 2021). Through the Enhanced Lima Work Programme on Gender and its Gender Action Plans, countries have been encouraged to greater integrate gender in their latest round of NDC developments, but nearly a quarter of these NDCs are considered "gender blind" in that they do not explicitly integrate gender (WEDO, 2020). Within the NDCs, gender is most associated with agriculture (33% NDCS), energy (25%) and health (21%), and appears least in sections about transport (10%), the green economy (10%), tourism (7%) or the blue economy (2%) (IUCN, 2021). In general, NDCs more closely align gender considerations with adaptation efforts as opposed to mitigation (IUCN, 2021).

Most saliently for this report, there is almost no intersection between gender and finance in the NDCs. In those NDCs reviewed by the Regional Policy Reviews, only Costa Rica explicitly established finance for inclusive development through its Inclusive Fund for Sustainable Development (Fondo Inclusivo de Desarrollo Sostenible), which will have seed capital of $1.2 million USD dedicated to the promotion of projects lead by rural women related to climate mitigation and adaptation (UNFCCC, 2022c).

In most countries, there is no clear strategy for guiding the mobilization of financial sources to meet NDC goals (Cooke et al., 2018). Uganda, for example, envisions progressive commitment of 30 percent national financial resources to climate financing, and the remaining 70 percent from international sources (Bakiika et al., 2020). However, the strategy for achieving this is unclear. Latin America is an exception, with several country-level programs that seek to connect the NDCs to finance. For example, Brazil's Floresta+ Program is an ambitious program that connects the voluntary carbon market to forest conservation projects and payments for environmental services. In terms of policy coordination,

Costa Rica is aligning their financial needs for adaptation with their Disaster Risk Management plan, National Adaptation Plan, and others.

On market mechanisms, in their NDCs Brazil, China, Costa Rica, Ethiopia, Kenya, Rwanda, Nepal, and Saint Lucia mention that an emissions trading scheme will be, or ought to be central to their mitigation approach (Mills-Novoa and Liverman, 2019). But only China and Costa Rica provide details of how this carbon market will be realized and at what scale (Mills-Novoa and Liverman, 2019). There is also variation in the scale and category of carbon offset markets. While Rwanda's NDC states intent to sell carbon credits in an international marketplace, Saint Lucia proposes a national cap-and-trade market.

Of the top GHG emitters, Mexico, Brazil, and China highlight the importance of South–South cooperation to support other LMICs (Mills-Novoa and Liverman, 2019). China is one of the few advanced middle-income countries that plans to set up the Fund for South-South Cooperation on Climate Change to provide aid and support to LDCs, SIDS, African countries and other LMICs (Mbeva and Pauw, 2016b). Potential sources of finance to accomplish NDC goals could include "increase of government budget, reform of tax system, improvement of green credit mechanism, promotion of market mechanisms and expansion of public-private partnerships" (Mills-Novoa and Liverman, 2019; Zhang and Pan, 2016).

Abramskiehn et al. (2017) suggest collaboration between national and multilateral development banks to use risk mitigation instruments such as insurance and guarantees to reduce perceived risk-adjusted returns of climate projects, facilitate investment in critical sectors that are not financed but need to be, in order to meet the NDC goals and also develop the technical capabilities of national development banks (Abramskiehn et al., 2017a). Further research is needed to understand how collaboration between national and international development banks can best (a) facilitate availability and use of risk mitigation instruments for climate projects, and (b) develop the technical capabilities of banks' staff.

Technical assistance (TA) can be deployed to help countries develop financeable climate strategies, and also build processes for developing them that ensures greater equity and durability. The NDC Partnership, launched in 2016 at COP 22 in Marrakesh, is a partnership of more than 70 LMIC governments and 100 institutions providing technical capacity dedicated to supporting NDC implementation through country-driven approaches. It has coordinated over $1 billion in TA support since its launch (NDC Partnership, 2021). The bulk of TA in this space to date is provided after the development of NDCs, when countries have decided their high-level strategies and are figuring out how to implement them. This has led to insufficient consultation and integration between NDCs and financial partners. Critical coordinating, planning, piloting, and capacity building activities may be needed long before NDC Partnership TA arrives on the scene to ensure NDCs are well positioned to access finance. Once countries do tap the TA facility, the most requested area of support is for development of climate finance strategies and financial roadmaps, with 90 percent of countries submitting requests for this type of support.

While international climate finance institutions also bear responsibility for adapting their programs to the needs of NDCs and mak clear what they intend to finance, LMICs may be leaving climate capital on the table by divorcing NDC development from financing strategies. As new approaches to targeting and delivering TA to support climate policy and financing linkages are forged, it will be critical to extract lessons on best practices. We know that the combined impacts of technical assistance and direct investment may be multiplicative rather than additive, as it ensures that financial support is adequately embedded in national action and can be replicated beyond a single project (Vivid Economics, 2020). There is an opportunity for researchers to help inform how these TA programs can be optimized and how climate policy and climate finance can best be approached in parallel through evaluating the impacts of current programming and pulling out lessons learned.

1.5 Conclusion

As this report has explored, there are a range of challenges to mobilizing new climate investment models. Researchers have an opportunity to inform evidence-based policymaking and investments by improving data, the impacts of different models and the ways in which stakeholders can work together to better address climate risk and transitional risks. This section will review some of the major research gaps and highlight opportunities for high-impact research.

Investment Data Gaps. There are two key data sets that help us see and understand climate investment flows in LMICs released annually through the OECD's "Climate Finance Provided and Mobilised by Developed Countries," and the Climate Policy Initiative's "Global Landscape of Climate Finance." A lack of standardized definitions and accounting methodologies for what constitute climate finance, as well as access to certain data, limit understanding

of climate capital flows, especially pertaining to private sector investment, domestic finance and adaptation investments. Tracking domestic finance will be particularly critical going forward as countries try to green their domestic financial systems and diversify financing beyond international public sources. Such accounting would provide a view into how governments are designing and implementing NDCs and how prioritized programs are delivering. This is especially relevant for adaptation investment, since these projects usually take the form of infrastructure or local economic development, areas where domestic budgets are critical (Allan et al., 2019).

Defining just transitions locally and building the evidence to support decision making. A just transition to a low-carbon economy will mean very different things in different places depending on a country's state of development, political economic context, and vision for the future. Priorities during the transition may be job creation, energy price stability, protections for vulnerable populations, or other areas. Researchers have an important role to play in building the evidence base that is used to debate and define what a just transition means locally and how policy and investment can be structured to enable transition scenarios. This includes examining how sectoral shifts will impact local employment and well-being, how public works or education programs could support segments of the population or bring marginalized groups—including women—into priority low-carbon sectors, identifying the skills and investments needed to support targeted sectors, modeling the trade-offs between different energy pathways, and developing the decision support tools to help evaluate tradeoffs and support regional economic planning.

This research—conducted by local researchers whenever feasible—is also critical to informing NDCs and establishing their credibility. It should be undertaken in advance of and alongside of climate policy making, as opposed to post-promulgation of NDCs, where extensive technical assistance is now deployed, often fruitlessly, to try to connect NDCs with financing.

Researchers also have an opportunity to examine the process by which climate policies are made, and how just transitions are defined. A range of approaches and platforms can support domestic dialogue and provide opportunities for leadership from critical missing voices, especially small- and mid-sized enterprises (SMEs) and women. Transparent public engagement processes and consultation can be a driver of political feasibility, which in turn drives policy durability and fuels future ambition. So, in the coming years, as countries re-visit NDCs and take stock of alignment with the evolving development finance architecture, it will be important for researchers to examine how the climate policy development and investment process relates to outcomes, both in terms of capital mobilized and well-being improved. Without local definitions of a just transition, there may be the assumption that what programming is effective in one context is appropriate for other localities.

Improve knowledge of project and firm impacts to strengthen carbon markets, prioritize impact investment, and establish the case of public-private investment. The level of ambition behind the net zero movement, in combination with data poor environments, opens opportunities for greenwashing and inefficient capital allocation. Carbon markets lack the integrity to mobilize high volumes of capital, and adaptation projects requiring public-private investment partnerships remain unrealized, in part because benefit streams remain undefined. Researchers have an enormous opportunity to facilitate investment by enhancing certainty around climate and development impacts of projects in LMICs, especially those driven by the private sector.

Many corporate carbon buyers are willing to pay a premium for high-integrity carbon credits with resilience co-benefits and other SDG-related co-benefits. However, there is not currently a strong understanding of which approaches, firms, and value chains are the most impactful in terms of delivering those impacts.

Strategically deploying impact evaluations—in a manner that balances rigor with relevance and pragmatism—can clarify the relationship between business models and climate impacts, especially related to adaptation and resilience, thus increasing confidence of investors and policymakers. Researchers can help enable better theories of change grounded in context-specific data and evidence. Once that occurs, it is possible to ask more interesting questions around what kind of businesses, at what stage and with what types of investments can total returns on investment be maximized. What combination of public and private capital is needed to capture the inevitable mix of public and private benefits flowing from scaled approaches? What type of impact metrics can be used to help identify the financial instruments, sectors, and projects that are most impactful and how must those metrics be adapted for different contexts?

Gender lens investing. Gender lens investing describes a set of practices related to channeling investment to improve gender outcomes – from targeting women-led businesses for investment to ensuring that investees embed gender equality in their own practices. However, there is limited research on the efficacy of these approaches. Since gender lens investing

can involve a range of practices – ensuring gender diversity among investment decision makers, investing in women-led businesses, understanding the gendered impacts of investee projects – it is challenging to make statements about its efficacy or compare investment strategies. More research is needed to articulate the impact of different strategies and the trade-offs that investors may encounter. This evidence can support workable approaches that pursue climate change solutions with explicit gender objectives such as women as leaders, managers, entrepreneurs, consumers, and employees.

Research that focuses on small businesses can indirectly support great clarity on gender-related investing, since women are disproportionately involved in small and informal businesses that may lack the professional networks, credit history, or investment minimums to unlock capital (Schalatek, 2020). These enterprises are often engines of innovation and can bring with them understanding of local markets, land, skills, and networks needed to overcome practical growth challenges. There are a host of challenges that all SMEs face in LMICs, from missing market functions to technical capacity, but access to capital is a key barrier that constrains the growth of many green businesses in LMICs (Phillips 2022c). Researchers can help to identify which domestic or locally-oriented finance approaches (green banking, green bonds, intermediary funds, etc.) have been most effective at channeling finance to green SMEs, why they have been successful, and how international public investment can most efficiently capitalize the sector.

Optimizing the tools of development finance. Many development finance institutions and philanthropy are reforming strategies and introducing innovative approaches to more effectively address the barriers to low-carbon transformation. Researchers have an opportunity to help these institutions redefine success so that performance indicators based on parochial operations (loan volumes, technical assistance delivered, etc.) are being replaced with metrics that orient institutions around broader transformation: aggregate investment volumes, private sector mobilization, and climate and development outcomes. As new approaches are being piloted in response to these shifting metrics, it is critical that lessons be clearly captured and distilled to support institutions in their modernization efforts. Research is needed to understand the benefits and trade-offs in new approaches and under what circumstances they should be deployed to advance national climate and development goals.

Further, embedded bias in the western development finance model can favor technologies and business models developed in the advanced economies, making investment in locally developed solutions challenging. A number of platforms have identified this problem and are deliberately targeting investment to innovative, locally tailored climate solutions in LMICs, often with the type of flexible concessional capital needed to pilot higher risk/reward approaches that might never receive approval through traditional MDB and DFI investment committees. More research is needed on effective models for countering North-South tech transfer bias and supporting Global South-led innovation.

Implications of the US-China rivalry on LMIC finance. With the bulk of energy- and climate-related finance to LMICs coming from either Chinese entities or US/G7-aligned MDBs and DFIs, it will be increasingly important to understand what shifting approaches to climate and infrastructure financing mean for LMICs. Governments will need technical assistance to help them navigate their finance and policy options. Research is needed to help LMIC governments navigate this rapidly shifting landscape and align policy with financing realities, including understanding how evolving investment approaches impact the pace, inclusivity, and scale of transformation.

References

115th Congress. (2018). Better Utilization of Investments Leading to Development Act of 2018, HR 302.

Abramskiehn, D., Hallmeyer, K., Trabacchi, C., Escalante, D. (2017a). Supporting National Development Banks to Drive Investment in the Nationally Determined Contributions of Brazil, Mexico, and Chile.

Abramskiehn, D., Hallmeyer, K., Trabacchi, C., Escalante, D., Netto, M., Cabrera, M.M., Vasa, A. (2017b). Supporting National Development Banks to Drive Investment in the Nationally Determined Contributions of Brazil, Mexico, and Chile. Inter-American Development Bank. https://doi.org/10).18235/0000817

ACMI. (2022). Africa Carbon Markets Initiative (ACMI): Roadmap Report.

Adaptation Fund, n.d. Enhanced Direct Access (EDA) Projects [WWW Document]. Adaptation Fund. URL https://www.adaptation-fund.org/apply-funding/enhanced-direct-access-eda-grants/ (accessed 9.14.22).

AfDB. (2022). African Economic Outlook 2022. Abidjan, Côte d'Ivoire: African Development Bank

AfDB. (2022). Adaptation Benefit Mechanism (ABM) [WWW Document]. URL https://www.afdb.org/en/topics-and-sectors/initiatives-partnerships/adaptation-benefit-mechanism-abm (accessed 9.14.22).

AfDB, GCA, UNEP. (2021). Climate risk regulation in Africa's financial sector and related private sector initiatives.

African Development Bank Group (AfDB). (2021). COP26: African Development Bank forges ahead with new Adaptation Benefits Mechanism.

Agrawal, A., Hockerts, K. (2019). Impact Investing Strategy: Managing Conflicts between Impact Investor and Investee Social Enterprise. Sustainability 11, 4117. https://doi.org/10.3390/su11154117

Agutu, C., Egli, F., Williams, N.J., Schmidt, T.S., Steffen, B. (2022). Accounting for finance in electrification models for sub-Saharan Africa. Nat Energy 7, 631–641. https://doi.org/10.1038/s41560-022-01041-6

Alenius, R.A. (2016). Measurement Process in Impact Investing: State of Practice in Europe. Harvard University.

Allan, S., Bahadur, A.V. (2019). The Role of Domestic Budgets in Financing Climate Change Adaptation. Global Center on Adaptation.

Allan, S., Bahadur, A.V., Venkatramani, S., Soundarajan, V. (2019). The Role of Domestic Budgets in Financing Climate Change Adaptation. Oxford Policy Management.

American Enterprise Institute (AEI), n.d. China Global Investment Tracker [WWW Document]. URL https://www.aei.org/china-global-investment-tracker/ (accessed 9.14.22).

Andersen, O.W., Hansen, H., Rand, J. (2021). Evaluating financial and development additionality in blended finance operations, OECD Development Co-operation Working Papers. OECD.

Anis, A. (2021). Projecting emissions: Assessing strategies to protect the planet and the poor. International Growth Centre Blog. URL https://www.theigc.org/blog/projecting-emissions-assessing-strategies-to-protect-the-planet-and-the-poor/ (accessed 9.12.22).

Atmadja, S., Lestari, H., Djoudi, H., Liswanti, N., Tamara, A. (2020). Making climate finance

work for women and the poor (Brief).

Attridge, S., Engen, L. (2019). Blended finance in the poorest countries. Overseas Development Institute.

Bakiika, R., Mbatuusa, C., Mugeere, A., Amumpiire, A. (2020). Climate Finance Mobilization in Uganda: The most Viable Financing Option.

Banga, J. (2019). The green bond market: a potential source of climate finance for developing countries. Journal of Sustainable Finance & Investment 9, 17–32. https://doi.org/10).1080/20430795.2018).1498617

Barber, B.M., Morse, A., Yasuda, A. (2021). Impact investing. Journal of Financial Economics 139, 162–185. https://doi.org/10).1016/j.jfineco.2020).07.008

Basel Committee on Banking Supervision. (2021). Climate-related risk drivers and their transmission channels. Bank for International Settlements.

Bhandari, P., Warszawski, N., Thangata, C. (2022). The Current State of Play on Financing Loss and Damage. WRI. URL https://www.wri.org/technical-perspectives/current-state-play-financing-loss-and-damage

Bhattacharya, D., Khan, S. S. (2019). Is blended finance trending in the LDCs? Perspectives from the ground. Southern Voice.

Blaufelder, C., Levy, C., Pinner, D. (2021). A blueprint for scaling voluntary carbon markets to meet the climate challenge. McKinsey Sustainability.

Blum, M. (2020). The legitimation of contested carbon markets after Paris – empirical insights from market stakeholders. null 22, 226–238. https://doi.org/10).1080/1523908X.2019).1697658

Brest, P., Born, K. (2013). When Can Impact Investing Create Real Impact? Stanford Social Innovation Review 22–31.

Brown, L., Alayza, N. (2021). Why the Green Climate Fund Should Give Developing Countries Greater Direct Access to Finance. URL https://www.wri.org/insights/why-green-climate-fund-should-give-developing-countries-greater-direct-access-finance (accessed 9.14).22).

Burnham, M., Radel, C., Ma, Z., Laudati, A. (2013). Extending a Geographic Lens Towards Climate Justice, Part 2: Climate Action. Geography Compass 7, 228–238. https://doi.org/10.1111/gec3.12033

Byrne, P.D., Chana, S. (2021). Green Liquidity Moves Mainstream. S&P Global. URL https://www.spglobal.com/en/research-insights/featured/special-editorial/green-liquidity-moves-mainstream

Caldwell, M., Larsen, G. (2021). Improving Access to the Green Climate Fund: How the Fund Can Better Support Developing Country Institutions. World Resources Institute.

Callahan, C.W., Mankin, J.S. (2022). National attribution of historical climate damages. Climatic Change 172, 40.

Calvert, n.d. Gender Equity [WWW Document]. Calvert. URL http://www.example.com/ (accessed 9.18.22).

Carbon Offsets: Last Week Tonight with John Oliver (HBO). (2022).

Cárdenas, M., Bonilla, J.P., Brusa, F. (2021). CLIMATE POLICIES IN LATIN AMERICA AND THE CARIBBEAN. IDB.

Carney, M. (2021). CLEAN AND GREEN FINANCE. URL https://www.imf.org/en/Publications/fandd/issues/2021/09/mark-carney-net-zero-climate-change (accessed 9.12.22).

Carroll, A. (2021). Impact Investment's Role in Fight Against Climate Change. URL https://www.privateequityinternational.com/impact-investments-role-in-the-fight-against-climate-change/

(accessed 9.9.22).

Carter, P., Van de Sijpe, N., Calel, R. (2021). The elusive quest for additionality. World Development 141, 105393. https://doi.org/10).1016/j.worlddev.2021).105393

CBI. (2022). Climate Bonds Initiative Interactive Data Platform [WWW Document]. URL https://www.climatebonds.net/market/data/ (accessed 3.17.23).

Central Bank of Kenya. (2021). Guidance on Climate-Related Risk Management.

Chestney, N. (2022). Global Carbon Markets Value Surged to Record $851 Billion Last Year-Refinitiv.

Chiriac, D., Naran, B. (2020). Examining the Climate Finance Gap for Small-Scale Agriculture. CPI & IFAD.

Chowdhury, A., Jomo, K.S. (2022). The Climate Finance Conundrum. Development 65, 29–41. https://doi.org/10).1057/s41301-022-00329-0

Clarke, D. (2022). Sarb tells banks to step up climate action. URL https:// greencentralbanking.com/2022/08/11/south-africa-sarb-banks-climate-action/

Climate Bonds Initiative. (2022). China Green Finance Policy Analysis Report 2021).

Climate Bonds Initiative. (2020). Green Infrastructure Investment Opportunities Philippines 2020).

Climate Bonds Initiative. (2017). Bonds and Climate Change: The State of the Market / update 2017 India.

Club de Paris. (2022). 2ND MEETING OF THE CREDITOR COMMITTEE FOR ZAMBIA UNDER THE COMMON FRAMEWORK.

Coalition for Green Capital. (2017). National Green Banks in Developing Countries: Scaling Up Private Finance to Achieve Paris Climate Goals. Coalition for Green Capital.

Congressional Research Service. (2022). U.S. International Development Finance Corporation: Overview and Issues.

Convergence. (2021). The State of Blended Finance 2021). Convergence.

Convergence, n.d. Convergence Blended Finance Primer [WWW Document]. URL https://www.convergence.finance/blended-finance (accessed 9.9.22).

Cooke, K., Gogoi, E., Petrarulo, L. (2018). Overcoming the NDC implementation gap lessons from experience.

CPI. (2022). Landscape of Climate Finance in Africa.

CPI. (2021a. Global Landscape of Climate Finance 2021).

CPI. (2021b). Global Landscape of Climate Finance 2021 - Methodology.

Crook, J., Dufrasne, G. (2021). FAQ: Deciphering Article 6 of the Paris Agreement.

Donofrio, S., Maguire, P., Myers, K., Daley, C., Lin, K. (2021). State of the Voluntary Carbon Markets 2021. Ecosystem Marketplace, Washington DC.

Donofrio, S., Maguire, P., Zwick, S., William Merry. (2020). State of the Voluntary Carbon Markets 2020). Ecosystem Marketplace, Washington DC.

Ecosystem MarketPlace. (2020). State of the Voluntary Carbon Markets.

EEP Africa. (2020). New Portfolio Advances Women in Leadership.

EIB. (2021). Finance in Africa: For Green, Smart and Inclusive Private Sector Development. European Investment Bank, Luxembourg.

Environmental Defense Fund. (2022). Chile, New Zealand Representatives Express Support for Potential Collaboration in Climate Action Teams. URL https://www.edf.org/media/chile-new-zealand-representatives-express-support-potential-collaboration-climate-action (accessed 9.5.22).

Escalante, D., Choi, J., Chin, N., Cui, Y., Larsen, M.L. (2020). Green Bonds in China: The State and Effectiveness of the Market. CPI.

EU REDD Facility, Climate Policy Initiative. (2019). Domestic Climate Finance Mapping and Planning: Challenges and Opportunities. Presented at the COP25, Madrid, Spain.

EU REDD Facility, CPI, n.d. Land-use Finance Tool [WWW Document]. URL https://landusefinance.org/about/ (accessed 9.9.22).

European Commission. (2021a). Global Gateway. URL https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/stronger-europe-world/global-gateway_en

European Commission. (2021b). France, Germany, UK, US and EU launch ground-breaking International Just Energy Transition Partnership with South Africa.

European Forest Institute, Climate Policy Initiative, UNDP. (2021). Domestic Climate Finance Mapping and Planning: Virtual Workshop. (2021 – Summary.

Ewing, J. (2019). China's foreign energy investments can swing coal and climate future.

Fatica, S., Panzica, R., Rancan, M. (2021). The pricing of green bonds: Are financial institutions special? Journal of Financial Stability 54, 100873. https://doi.org/10).1016/j.jfs.2021).100873

Forest Trends' Ecosystem Marketplace. (2021). ECOSYSTEM MARKETPLACE INSIGHTS REPORT Markets in Motion State of the Voluntar y Carbon Mar ket s 2021 Ins tal lment 1.

Fowlie, M. (2021). Carbon Offsets Get a Green Light in Glasgow. Energy Institute Blog. URL https://energyathaas.wordpress.com/2021/11/22/carbon-offsets-get-a-green-light-in-glasgow/ (accessed 9.18).22).

Franks, M., Lessmann, K., Jakob, M., Steckel, J.C., Edenhofer, O. (2018). Mobilizing domestic resources for the Agenda 2030 via carbon pricing. Nature Sustainability 1, 350–357.

G7 Foreign Ministers. (2022). G7 foreign ministers' meeting in Germany. (2022: communiqué.

Gallagher, K.P. (2018). China's global energy finance: Poised to lead. Energy Research & Social Science.

GCA. (2019). Global Leaders Call for Urgent Action on Climate Adaptation; Commission Finds Adaptation Can Deliver $7.1 Trillion in Benefits. Global Commission on Adaptation. URL https://gca.org/news/global-leaders-call-for-urgent-action-on-climate-adaptation-commission-finds-adaptation-can-deliver-7-1-trillion-in-benefits/

GEMS Risk Database, n.d. GEMS [WWW Document]. URL https://www.gemsriskdatabase.org/ (accessed 9.5.22).

GFMA & BCG. (2021). Unlocking the Potential of Carbon Markets to Achieve Global Net Zero.

GIIN. (2017). GENDER LENS INVESTING INITIATIVE [WWW Document]. Global Impact Investing Network. URL https://thegiin.org/gender-lens-investing-initiative/ (accessed 9.9.22).

GIIN, n.d. GIIN Case Studies [WWW Document]. Global Impact Investing Network.

URL https://thegiin.org/case-studies/ (accessed 9.9.22).

Global Environment Facility. (2013). GEF Grants Conservation International and World Wildlife Fund-US Direct Access to Environmental Funding.

Global Impact Investing Network. (2017). THE STATE OF IMPACT MEASUREMENT AND MANAGEMENT PRACTICE (Executive Summary). Global Impact Investing Network (GIIN).

Gold Standard, n.d. CERTIFIED SDG IMPACTS for results based finance [WWW Document]. Certified SDG Impacts. URL https://www.goldstandard.org/impact-quantification/certified-sdg-impacts (accessed 9.14.22).

Green Climate Fund (GCF). (2021). Enhancing Direct Access Guidelines (Publication Guides). GREEN CLIMATE FUND, Incheon.

Green Climate Fund (GCF). (2019). Gender Policy.

Green Climate Fund (GCF), n.d. FP098 [WWW Document]. Green Climate Fund. URL https://www.greenclimate.fund/project/fp098 (accessed 9.14).22).

Greenfield, P. (2023). Revealed: more than 90% of rainforest carbon offsets by biggest certifier are worthless, analysis shows. The Guardian.

G-SEARCh. (2022). Business and Social Outcomes of Gender-Smart Technical Assistance Activities in Small and Medium Enterprises.

G-SEARCh, n.d. Gender Lens [WWW Document]. alphamundi. URL https://www.alphamundi.ch/copy-of-impact (accessed 9.18).22a).

G-SEARCh, n.d. G-SEARCh: Building Evidence for Gender Lens Investing. William Davidson Institute. URL https://wdi.umich.edu/programs-projects/g-search-building-evidence-for-gender-lens-investing/ (accessed 9.18).22b).

Hainaut, H., Cochran, I., Gouiffes, L., Deschamps, J., Robinet, A.. (2018). Landscape of domestic climate finance: Low-carbon investment 2011 - 2017).

Halimanjaya, A. (2015). Climate mitigation finance across developing countries: what are the major determinants? null 15, 223–252. https://doi.org/10).1080/14693062.2014).912978

Hand, D., Bass, R., Sunderji, S., Ringel, B. (2021a. Understanding Impact Performance: Climate Change Mitigation Investments. Global Impact Investing Network (GIIN).

Hand, D., Dithrich, H., Sunderji, S., Nova, N. (2020). 2020 Annual Impact Investor Survey. Global Impact Investing Network (GIIN).

Hand, D., Sunderji, S., Nova, N., De, I. (2021b. IMPACT INVESTING DECISION-MAKING: INSIGHTS ON FINANCIAL PERFORMANCE. Global Impact Investing Network.

Hattle, A., Nordbo, J., n.d. That's Not New Money: Assessing how much public climate finance has been "new and additional" to support for development. Care International.

Hodgson, C., Williams, A. (2022). US Treasury takes aim at World Bank over climate change inaction.

ICMA. (2021). Green Bond Principles. ICMA Paris.

IFC. (2021a. China Country Progress Report.

IFC. (2021b. Vietnam Country Progress Report.

IFC. (2017). MSME FINANCE GAP.

IFC, Amundi Asset Management. (2021). Emerging Market Green Bonds Report 2020: On the Road to Green Recovery.

Increasing Financial Action for Green and Sustainable Development. (2022). Stockholm.

Innovate4Climate. (2022). The Contribution of National Development Banks to Low-Carbon, Climate-Resilient Development.

International Federation of Red Cross and Red Crescent Societies. (2013). Accessing climate finance: An overview. International Federation of Red Cross and Red Crescent Societies.

Islam, S. (2021). Impact Investing in Social Sector Organizations: A Systematic Review and Research Agenda. https://doi.org/10).2139/ssrn.3850532

IUCN. (2021). Gender and national climate planning: Gender integration in the revised Nationally Determined Contributions.

James, R.A., Jones, R.G., Boyd, E., Young, H.R., Otto, F.E., Huggel, C., Fuglestvedt, J.S. (2019). Attribution: how is it relevant for loss and damage policy and practice? Loss and damage from climate change: Concepts, methods and policy options 113–154.

Jaramillo, M., Saavedra, V. (2021). NDC Invest: Supporting Transformational Climate Policy and Finance. Inter-American Development Bank (IDB).

Kalimunjaye, S., Olobo, M., Kyakulumbye, S. (2012). Carbon trade financing strategies and opportunities for competitiveness of private sector SMEs in Uganda.

Kattumuri, R., Nair, U., Jena, L., Lee-Emery, A. (2022). Loss and Damage Fund - Size, design and agility are essential. The Commonwealth. URL https://thecommonwealth.org/news/blog-loss-and-damage-fund-size-design-and-agility-are-essential

Khan, M., Mfitumukiza, D., Huq, S. (2020). Capacity building for implementation of nationally determined contributions under the Paris Agreement. Climate Policy 20, 499–510). https://doi.org/10).1080/14693062.2019).1675577

Kirchherr, J., Urban, F. (2018). Technology transfer and cooperation for low carbon energy technology: Analysing 30 years of scholarship and proposing a research agenda. Energy policy 119, 600–609.

Klaczynska Lewis, K., Burzec, M. (2021). After COP26: The interplay between Article 6 of the Paris Agreement and the Voluntary Carbon Market (Brief). EY Poland.

Kumleben, N. (2021). South Africa's Coal Deal Is a New Model for Climate Progress. Foreign Policy.

Kurukulasuriya, P., Jackson, R., Kammila, S., Abidoye, B., Jegillos, S., Chachibaia, K. (2022). What the new "loss and damage" fund needs for success. UNDP. URL https://www.undp.org/blog/what-new-loss-and-damage-fund-needs-success

Landers, C., Morris, S., Kenny, C., Lee, N., Estes, J. (2021). Is DFC Going To Be a Development Finance Institution or a Foreign Policy Bank? CGD. URL https://www.cgdev.org/blog/dfc-going-be-development-finance-institution-or-foreign-policy-bank

Lee, N., Forster, G., Paxton, S. (2021). MDBs Could Do More to Build Markets Just By Releasing More Data. Center fpr Global Development. URL https://www.cgdev.org/blog/mdbs-could-do-more-build-markets-just-releasing-more-data

Liberati, D., Marinelli, G. (2021). Everything you always wanted to know about green bonds (but were afraid to ask). Bank of Italy.

Loveridge, D. (2016). Results Measurement in Impact Investing: A Preliminary Review. The Donor Committee for Enterprise Development (DCED).

MacGregor, S., Arora-Jonsson, S., Cohen, M. (2022). Caring in a changing climate: Centering care work in climate action, Oxfam Research Backgrounder.

Marbuah, G. (2021). Scoping the green bond landscape in Africa. SEI.

Masterson, V. (2023). The Bridgetown Initiative: here's everything you need to know. World Economic Forum. URL https://www.weforum.org/agenda/2023/01/barbados-bridgetown-initiative-climate-change/

Masullo, I., Larsen, G., Brown, L. (2015). "Direct Access" to Climate Finance: Lessons Learned by National Institutions (Working Paper). World Resources Institute.

Mbeva, K.L., Pauw, P. (2016a. Self-differentiation of countries' responsibilities: Addressing climate change through intended nationally determined contributions. Discussion paper.

Mbeva, K.L., Pauw, P. (2016b. Self-differentiation of countries' responsibilities: addressing climate change through intended nationally determined contributions, Discussion paper / Deutsches Institut für Entwicklungspolitik. Deutsches Institut für Entwicklungspolitik, Bonn.

Michaelowa, A., Hoch, S., Weber, A.-K., Kassaye, R., Hailu, T. (2021). Mobilising private climate finance for sustainable energy access and climate change mitigation in Sub-Saharan Africa. null 21, 47–62. https://doi.org/10).1080/14693062.2020).1796568

Mills-Novoa, M., Liverman, D. (2019). Nationally Determined Contributions: Material climate commitments and discursive positioning in the NDCs. Wiley Interdisciplinary Reviews: Climate Change 10). https://doi.org/10).1002/wcc.589

Mills-Novoa, M., Liverman, D.M. (2019). Nationally determined contributions: material climate commitments and discursive positioning in the NDCs. Wiley Interdisciplinary Reviews: Climate Change 10, e589.

Min of Foreign Affairs, China. (2022). Jointly Advancing the Global Development Initiative and Writing a New Chapter for Common Development. URL https://www.fmprc.gov.cn/eng/zxxx_662805/202209/t20220922_10769721).html

Ministry of Commerce, PRC, n.d. 2020年1-11月我对"一带一路"沿线国家投资合作情况 [WWW Document]. URL http://fec.mofcom.gov.cn/article/fwydyl/tjsj/202012/20201203027821).shtml (accessed 9.14).22).

Ministry of Foreign Affairs and Foreign Trade, Barbados. (2022). The 2022 Bridgetown Initiative.

Mutiso, R.M. (2022). Net-zero plans exclude Africa. Nature 611, 10–10). https://doi.org/10).1038/d41586-022-03475-0

Nakhooda, S., Fransen, T., Kuramochi, T., Caravani, A., Prizzon, A., Shimizu, N., Tilley, H., Halimanjaya, A., Welham, B. (2015). Mobilising International Climate Finance: Lessons from the Fast-Start Finance Period.

NAP Global Network, n.d. Trends in NAP Documents | Enabling Factors [WWW Document]. URL https://trends.napglobalnetwork.org/search-by-trend/enabling-factors (accessed 9.14).22).

NDC Partnership. (2021). COP26: Members of the NDC Partnership announce the Partnership Action Fund with at-launch commitments of $33million to help developing countries implement their NDCs | NDC Partnership [WWW Document]. URL https://ndcpartnership.org/news/cop26-members-ndc-partnership-announce-partnership-action-fund-launch-commitments-33million (accessed 9.18).22).

NDC Support Programme, UNDP, n.d. CLIMATE FINANCE AND INVESTMENT

[WWW Document]. URL https://www.ndcs.undp.org/content/ndc-support-programme/en/home/our-work/focal/ndc-finance-and-investment.html (accessed 9.14).22).

Nordeng, A. (2022). Carbon trading: exponential growth on record high. Refinitiv Perspectives. URL https://www.refinitiv.com/perspectives/market-insights/carbon-trading-exponential-growth-on-record-high/ (accessed 9.12).22).

Ockwell, D., Ely, A., Mallett, A., Johnson, O., Watson, J.. (2009. Low carbon development: The role of local innovative capabilities.

OECD. (2022a). Aggregate Trends of Climate Finance Provided and Mobilised by Developed Countries in 2013-2020).

OECD. (2022b). Climate Finance Provided and Mobilised by Developed Countries in 2016-2020: Insights from Disaggregated Analysis, Climate Finance and the USD 100 Billion Goal. OECD. https://doi.org/10).1787/286dae5d-en

OECD. (2021). Climate Finance Provided and Mobilised by Developed Countries: Aggregate Trends Updated with 2019 Data, Climate Finance and the USD 100 Billion Goal.

OECD. (2020). Climate Finance Provided and Mobilised by Developed Countries in 2013-2018, Climate Finance and the USD 100 Billion Goal.

OECD. (2019). Blended finance in fragile contexts, OECD Development Co-operation Working Papers. OECD.

OECD. (2016). Making climate finance work for women: Overview of bilateral ODA to gender and climate change (Brief). OECD DAC NETWORK ON GENDER EQUALITY (GENDERNET).

Osborn, C. (2022). The Barbadian Proposal Turning Heads at COP27. Foreign Policy. URL https://foreignpolicy.com/2022/11/11/cop27-un-climate-barbados-mottley-climate-finance-imf/

Owen, R., Brennan, G., Lyon, F. (2018). Enabling investment for the transition to a low carbon economy: Government policy to finance early stage green innovation. Current opinion in environmental sustainability 31, 137–145.

Oxfam. (2020). Climate Finance Shadow Report 2020).

Park, H., Kim, J.D. (2020). Transition towards green banking: role of financial regulators and financial institutions. AJSSR 5, 5. https://doi.org/10).1186/s41180-020-00034-3

Patamar Capital. (2017). Investing in Women: Closing the Gender Capital Gap in Southeast Asia - Patamar Capital [WWW Document]. URL https://patamar.com/investing-women-closing-gender-capital-gap-southeast-asia/ (accessed 9.18).22).

Pauw, W.P., Castro, P., Pickering, J., Bhasin, S. (2020a. Conditional nationally determined contributions in the Paris Agreement: foothold for equity or Achilles heel? null 20, 468–484. https://doi.org/10).1080/14693062.2019).1635874

Pauw, W.P., Castro, P., Pickering, J., Bhasin, S. (2020b. Conditional nationally determined contributions in the Paris Agreement: foothold for equity or Achilles heel? null 20, 468–484. https://doi.org/10).1080/14693062.2019).1635874

Peng, R., Chang, L., Liwen, Z. (2017). China's Involvement in Coal-Fired Power Projects along the Belt and Road. Global Environmental Institute.

PEREIRA, J. (2017). BLENDED FINANCE: What it is, how it works and how it is used. Oxfam.

Phillips, J. (2021). Net Zero may be coming. But America is a fossil fuel bank to the developing world today. James E. Rogers Energy Access Project. URL https://energyaccess.duke.edu/net-zero-may-be-coming-but-america-is-a-fossil-fuel-bank-to-the-developing-world-today/

Phillips, J., Ewing, J., Rao, A., Teji, L., Plutshack, V., Jeuland, M. (2022a. Climate Finance for Just Transitions 19).

Phillips, J., Jeuland, M., Plutshack, V. (2023). Proceedings: Climate Adaptation and Resilience Investment Virtual Roundtable. James E. Rogers Energy Access Project.

Phillips, J., Plutshack, V., Fetter, R., Jeuland, M., Elisha, F., Vanover, A., Yoder, E. (2022b. Catalyzing Climate Finance for Low-Carbon Agriculture Enterprises. James E. Rogers Energy Access Project, Duke University.

Phillips, J., Plutshack, V., Fetter, T.R., Jeuland, M., Elisha, F., Vanover, A., Yoder, E. (2022c. Catalyzing Climate Finance for Low-Carbon Agriculture Enterprises.

Pontecorvo, E. (2021). Countries finally agreed to create an international carbon market. Here's why it's controversial. Grist.

PWC, n.d. Global Assets under Management set to rise to $145.4 trillion by 2025.

Rai, V., Funkhouser, E. (2015). Emerging insights on the dynamic drivers of international low-carbon technology transfer. Renewable and Sustainable Energy Reviews 49, 350–364.

RIGHTS AND RESOURCES INITIATIVE & MCGILL UNIVERSITY. (2021). New analysis reveals risks of investment in carbon offsets without community rights [WWW Document]. Rights + Resources. URL https://rightsandresources.org/blog/new-analysis-reveals-risks-of-investment-in-carbon-offsets-without-community-rights/ (accessed 9.18).22).

Root Capital. (2021). Root Capital Announces New Initiative to Strengthen Gender Lens Investing in Agriculture [WWW Document]. Root Capital. URL https://rootcapital.org/root-capital-announces-new-initiative-to-strengthen-gender-lens-investing-in-agriculture/ (accessed 9.18).22).

Rübbelke, D. (2011). International support of climate change policies in developing countries: Strategic, moral and fairness aspects. Ecological Economics 70, 1470–1480.

Sachs, J.D., Woo, W.T., Yoshino, N., Taghizadeh-Hesary, F. (2019). Importance of Green Finance for Achieving Sustainable Development Goals and Energy Security 3–12). https://doi.org/10).1007/978-981-13-0227-5_13

Santoso, M., Lath, V., Agarwal, V. (2022). How Voluntary Carbon Markets can Help Indonesia Meet its Climate Goals.

Sarkar, S. (2016). Beyond the "digital divide": the "computer girls" of Seelampur. Feminist Media Studies 16, 968–983. https://doi.org/10).1080/14680777.2016.1169207

Schalatek, L. (2022). Climate finance fundamentals 10: gender and climate finance.

Schalatek, L. (2020). Gender and Climate Finance. Heinrich Böll Stiftung.

SIMS GALLAGHER, K.. (2022). The Coming Carbon Tsunami Developing Countries Need a New Growth Model—Before It's Too Late. Foreign Affairs.

Smallridge, D., Becker, M., Henderson, J., Sider, M.. (2019). Build or Renovate? The decision to establish a new Green Bank, or "green" an existing National Development Bank. Green Finance LAC. URL https://greenfinancelac.org/resources/publications/build-or-renovate-the-decision-to-establish-a-new-green-bank-or-green-an-existing-

national-development-bank/ (accessed 3.19.23).

Smith, P., Bustamante, M.. (2018). Chapter 11: Agriculture, Forestry and Other Land Use (AFOLU). IPCC.

So, I., Staskevicius, A. (2015). Measuring the "impact" in impact investing. Harvard Business School.

Sovacool, B.K., Baker, L., Martiskainen, M., Hook, A. (2019). Processes of elite power and low-carbon pathways: Experimentation, financialisation, and dispossession. Global Environmental Change 59, 101985.

Stern, N. (2021). G7 leadership for sustainable,resilient and inclusive economic recovery and growth. Grantham Research Institute on Climate Change and the Environment at the London School of Economics and Political Science.

Stockholm 50. (2022). Increasing Financial Action for Green and Sustainable Development [WWW Document]. Stockholm 50. URL https://www.stockholm50.global/events/increasing-financial-action-green-and-sustainable-development (accessed 9.9.22).

THE EM INSIGHTS TEAM. (2021). Voluntary Carbon Markets Top $1 Billion in 2021 with Newly Reported Trades, a Special Ecosystem Marketplace COP26 Bulletin. URL https://www.ecosystemmarketplace.com/articles/voluntary-carbon-markets-top-1-billion-in-2021-with-newly-reported-trades-special-ecosystem-marketplace-cop26-bulletin/ (accessed 9.12).22).

Timperley, J. (2021a. The broken $100-billion promise of climate finance — and how to fix it. Nature.

Timperley, J. (2021b. The broken $100-billion promise of climate finance — and how to fix it. Nature.

Tinker, C., Alvarenga, R.K. (2018). Gender equality in climate finance: progress and aspirations. Seton Hall Journal of Diplomacy and International Relations. URL http://blogs.shu.edu/journalofdiplomacy/files/2019/08/Tinker-and-Koch-Alvarenga-Gender-Equality-in-Climate-Finance_Progress-and-Aspirations.pdf

UK Government. (2021). Principles and Recommendations on Access to Climate Finance. UK Government.

UNDP. (2015). Private Climate Expenditure and Institutional Review (PCEIR) [WWW Document]. URL https://www.ndcs.undp.org/content/ndc-support-programme/en/home/impact-and-learning/library/methodology-for-tracking-national-private-climate-finance-flows-.html (accessed 9.9.22).

UNEP. (2020). How banks incorporate climate change in their risk management – 1st survey in Latin America & the Caribbean.

UNEP FI, Global Commission on Adaptation, Climate Finance Advisors. (2019). Driving Finance Today for the Climate Resilient Society of Tomorrow. UN Environment Finance Initiative.

UNFCCC. (2022a). Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its third session, held in Glasgow from 31 October to 13 November 2021; Part two: Action taken by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement at its third session.

UNFCCC. (2022b). Sharm el-Sheikh Implementation Plan, Decision -/CP.27.

UNFCCC. (2022c). NDC Registry [WWW Document]. URL https://unfccc.int/NDCREG (accessed 9.14).22).

UNFCCC. (2021). The Climate Finance Question. URL https://unfccc.int/blog/the-climate-finance-question (accessed 9.9.22).

UNFCCC. (2015). Paris Agreement.

UNFCCC. (2009). Copenhagen Climate Change Conference - December 2009 [WWW Document]. URL https://unfccc.int/process-and-meetings/conferences/past-conferences/copenhagen-climate-change-conference-december-2009/copenhagen-climate-change-conference-december-2009

United Nations, n.d. Climate Adaptation [WWW Document]. URL https://www.un.org/en/climatechange/climate-adaptation?gclid=CjwKCAjwrfCRBhAXEiwAnkmKmQfzZ5KhDKpGRxM8aYLqyi7-A0dpXoONIoxOAIP8-z7LCWhlujvn9hoCzdQQAvD_BwE (accessed 9.5.22).

Uzsoki, D.. (2021). Integrating a Gender Lens in Sustainable Investing. International Institute for Sustainable Development (IISD).

Vanek, M.. (2021). South Africa's Jobless Rate Rises to New High in Third Quarter. Bloomberg.

Verra, n.d. The Sustainable Development Verified Impact Standard (SD VISta) Program [WWW Document]. URL https://verra.org/project/sd-vista/ (accessed 9.12.22).

Vivid Economics. (2020). Transformative Climate Finance. Vivid Economics.

Volz, U. (2018). Fostering Green Finance for Sustainable Development in Asia. SSRN Journal. https://doi.org/10).2139/ssrn.3198680

Wass, S. (2021). Green bond premium justified by strong secondary market performance, flexibility. S&P Global. URL https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/green-bond-premium-justified-by-strong-secondary-market-performance-flexibility-66696509

WEDO. (2020). SPOTLIGHT ON GENDER IN NDCS.

Weiler, F., Klöck, C., Dornan, M. (2018). Vulnerability, good governance, or donor interests? The allocation of aid for climate change adaptation. World Development 104, 65–77. https://doi.org/10).1016/j.worlddev.2017.11.001

Winckler Andersen, O., Basile, I., de Kemp, A., Gotz, G., Lundsgaarde, E., Orth, M. (2019). Blended Finance Evaluation. OECD.

Wong, S. (2016). Can climate finance contribute to gender equity in developing countries? Journal of International Development 28, 428–444.

World Bank. (2022). What You Need to Know About Article 6 of the Paris Agreement. URL https://www.worldbank.org/en/news/feature/2022/05/17/what-you-need-to-know-about-article-6-of-the-paris-agreement

World Bank. (2021a. Climate Change Budget Tagging: A Review of International Experience, Equitable Growth, Finance and Institutions Insight - Governance. World Bank, Washington DC.

World Bank. (2021b. State and Trends of Carbon Pricing 2021).

World Resources Institute (WRI). (2021). South Africa: Strong Foundations for a Just Transition. URL https://www.wri.org/update/south-africa-strong-foundations-just-transition (accessed 9.5.22).

World Resources Institute (WRI), n.d. Locally Led Adaptation [WWW Document]. URL https://www.wri.org/initiatives/locally-led-adaptation/principles-locally-led-adaptation (accessed 9.14).22).

Zhang, W., Pan, X. (2016). Study on the demand of climate finance for developing countries based on submitted INDC. Advances in Climate Change Research 7, 99–104.