



STAFF CLIMATE

NOTES

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Summary

Global investment to achieve the Paris Agreement’s temperature and adaptation goals requires immediate actions—first and foremost—on climate policies. Policies should be accompanied by commensurate financing flows to close the large financing gap globally, and in emerging market and developing economies (EMDEs) in particular. This note discusses potential ways to mobilize domestic and foreign private sector capital in climate finance, as a complement to climate-related policies, by mitigating relevant risks and constraints through public-private partnerships involving multilateral, regional, and national development banks. It also overviews the role the IMF can play in the process.

Introduction

Even with the rapid increase in private sector investments in recent years, climate finance needs remain large, notwithstanding considerable uncertainty around the size of mitigation and adaptation needs.

Estimates of global investments required to achieve the Paris Agreement’s temperature and adaptation goals range between US\$3 to \$6 trillion per year until 2050. Global climate finance currently adds to about US\$630 billion annually (Annex 1, Annex Figure 1),² with debt being the main source of funding for these investments. Green bonds represent less than 3 percent of global bond markets, and most of them are issued in developed markets and China.³ Estimates of financing needs vary because of large data gaps in the tracking of climate finance data, especially in sectors other than renewable energy, energy efficiency, and transport. In addition, data on climate finance are partial, as data collection and disclosures at present are not required in several countries.

This note discusses ways and policies for attracting domestic and foreign private sector capital in climate-related products by overcoming existing constraints. Starting from first principles, the note first draws attention to existing constraints and risks, including absence of carbon pricing and business models for infrastructure projects. Although there is no consensus that public policies would necessarily “crowd-in” private sector funds, the public funding and policies influence private sector investments. Such policies include carbon taxation, emissions trading, feebates, clean technology subsidies, and command-and-control regulations, not to

¹ This note incorporates contents from a previous internal note with contributions from Peter Breuer, Charles Cohen, and Peter Lindner.

² Climate Policy Initiative (2021), International Energy Agency (2021a), Energy Transitions Commission (2020), Duenwald and others (2022).

³ At COP26, advanced economies acknowledged that they have not met their pledges of providing US\$100 billion per year in climate finance to developing countries by 2020.

mention direct government investments in green projects, all of which should lead to a change in incentives and a shift in public and private spending toward climate goals.

Climate finance policies can complement mitigation and adaptation policies. Such policy options include (1) adopting carbon pricing paths to ensure well-functioning market and prices; (2) increasing public investment in infrastructure, R&D, and renewable energy technologies that will support and incentivize inflow of private sector climate capital; (3) implementing policies to complement carbon pricing (sectoral policies; feebates, where political support for adequate carbon pricing is lacking); (4) addressing climate data gaps, data disclosure standards, and developing taxonomies for sustainable financing; (5) elevating commitments and coordination of all participants; (6) enhancing regulations for sustainable finance; and (7) creating clear transition pathways. Regulations may encompass three areas: prudential regulation, reallocation of capital across industries, and enhancing market practices through transparency. In Europe, Asia, and parts of Latin America, all three areas are covered. Transition in this note covers mitigation and adaptation, or simply stated, the move toward a low-carbon, climate-resilient economy.

The transformation needed to limit global warming to 1.5°C requires enabling conditions that reflect links, synergies, and trade-offs among mitigation, adaptation, and sustainable development.⁴ Several constraints stand out: (1) currently, climate projects in EMDEs do not justify the risks for private sector investment flows, and (2) public sector guarantees could result in privatizing gains and socializing losses, creating moral hazard, unless the public sector could invest in project equity or equity tranches of securitized investment products. In addition, EMDEs need to reduce fossil fuel use, avoid the exploration and development of new fossil energy sources, and scale up renewable energy at high speed. These issues should be viewed in a holistic manner instead of looking at them separately, also taking into consideration the heterogeneity among EMDEs, in terms of being oil exporters vs importers, capital exporters vs importers, etc.

This note explores several solutions for attracting private sector climate finance by involving collectively multilateral and national development banks (MDBs and NDBs) and international financial institutions (IFIs), including the IMF. The desirable role of the public and private sectors in financing mitigation and adaptation investments is context specific. The role of public and private sector financing varies across countries depending on country-specific characteristics and the local economic and institutional context. Blending public and private sector finance is useful to de-risk these investments for private sector capital in general, through for example, first-loss investments or performance guarantees. The solutions are based on structuring innovative products consisting of at least two tranches, with junior/equity tranche going to the public sector and the mezzanine/senior tranches to the private sector. By doing so, the public sector can help internalize the social benefits of climate investment. The public sector needs to avoid or minimize the moral hazard and potentially large contingent liabilities associated with taking on first losses or junior/equity tranches. Strong state capacity and legal frameworks, together with mechanisms to monitor investment projects, will be helpful to ensure that de-risking does not lead to fiscal losses. This is particularly the case in smaller low-income countries (LICs), given their generally weaker state capacity.

The IMF can play a catalytic role in climate finance through its policy advice, surveillance, program lending, and capacity development. The IMF can mitigate macroeconomic risk by providing advice through bilateral and multilateral surveillance, conducting Article IV consultations, performing risk assessments in FSAPs, providing climate macro-financial country assessments, and enhancing capacity development in countries. Where countries, particularly EMDEs, have limited fiscal space, the IMF Resilience and Sustainability Trust (RST) financing could help, as it focuses on longer-term structural changes, including climate change, that entail macroeconomic risks and where policy solutions have a strong global public good nature.⁵ The RST could play a catalytic role by helping to develop a conducive investment climate through reforms that address hurdles

⁴ IPCC (2018).

⁵ IMF (2022c).

to private sector investment and improve the regulatory environment and infrastructure-resilience policies. The IMF is also playing a leading part in advocating carbon pricing and in identifying data gaps, promoting climate-related disclosures, and developing guidelines for taxonomies of sustainable finance. The measures discussed in this note are complements to carbon pricing, as they can help internalize public benefits of low-carbon climate-resilient investment—measures in addition to carbon pricing can increase societal welfare.⁶ The need for private climate financing, however, is to some extent conditional on the degree to which climate mitigation and adaptation policies are implemented.

The global macroeconomic context plays a determining role in climate finance. Higher energy prices have sparked energy security concerns, delaying efforts to spur the low-carbon transition in some countries, and exposed many EMDEs to high fossil fuel prices, and some to energy rationing. Several minerals that are critical for the transition have seen further sharp price increases since the onset of the war in Ukraine. In the context of monetary policy tightening in advanced economies (AEs), high sovereign bond yields in some EMDEs can raise hurdle rates in project finance to very high levels, jeopardizing projects with high upfront capital costs, such as solar and wind projects.

It is also important to monitor balance of payments vulnerabilities that could arise from large capital inflows associated with climate finance. If the de-risking of climate-friendly infrastructure assets is not accompanied by increased domestic capabilities in low-carbon manufacturing (for example, renewable energy technology) or large critical minerals endowments, capital inflows could drive current account deterioration, and could lead to financial imbalances if future returns are overestimated, generating macroeconomic vulnerabilities.

The note proceeds as follows. The next section discusses constraints and risks for climate finance investments. The following section focuses on the role of private sector capital⁷ in climate finance, followed by a section on MDB climate finance. The next section explores public-private risk sharing in scaling up climate finance. The fifth section discusses and proposes policy considerations. Finally, the last section highlights follow-up issues that could be explored in future policy work and analysis.

Constraints for Climate Finance

A well-designed carbon price is an indispensable part of a strategy for reducing emissions in an efficient way. Carbon prices are intended to incentivize the changes needed in investment, production, and consumption patterns, and to induce the kind of technological progress that can bring down future abatement costs.⁸ It is not the only way, and even if implemented forcefully carbon pricing needs to be complemented with other supporting sectoral policies such as regulations, standards, financial sector policies, and climate financing. Put differently, climate goals face externalities that cannot be resolved quickly and simultaneously. This justifies a complementary role for financial policies to address urgent climate goals. Such policies would help EMDEs to attract and scale up financing for mitigation and adaptation projects.

Multiple constraints preclude attracting and scaling up private sector climate finance. These include supply and demand factors, macro-financial and microeconomic impediments, unattractive risk-return profiles in unproven markets, high fossil fuel investments, and data-related constraints. Key market failures include knowledge spillovers, high risk perceptions because of uncertainties about future climate policies, technological

⁶ Stiglitz (2019).

⁷ Throughout the note, the term “private sector capital” is equivalent to “domestic and foreign private sector capital” to capture all sources of capital, domestic and foreign.

⁸ High-level Commission on Carbon Prices (2017)

costs, and the economic effects of climate impacts; and high upfront costs and risks associated with mitigation and adaptation investment projects, which imply insufficient returns given risks.⁹

High upfront costs and risks related to mitigation and adaptation investments play a major role in deterring such investments in EMDEs. The costs are related to large upfront capital expenditure, the long-time horizon of infrastructure projects, development of profitable business models, among others. Risks include: (1) currency; (2) regulatory and political (contract renegotiation, change in taxation or regulatory environment); (3) macroeconomic and business-related (volatility of demand, exchange rate fluctuations); and (4) technical (construction delays and cost overruns, technology and obsolescence, force majeure).¹⁰ As a result, climate investments could fail long before high carbon prices and associated competitiveness benefits arise—even when a government’s commitment to a path of rising carbon prices is credible, as shorter-term costs and risks can deter climate investment decisions. This underscores the role of second-best measures to further incentivize climate investments.

Several supply and demand factors affect both sustainable finance and climate finance; they can be addressed through reducing externalities. Supply-side factors include changes in energy supply, production technologies, and deployment of carbon dioxide-removal technologies that would keep demand end-user invariant. Demand-side factors revolve around modifying the demand for goods and services toward more sustainable options in consumption, behavior, lifestyle, etc.¹¹ Supply and demand factors translate into financial constraints and various risks, which are important on macro- and microeconomic levels, for countries and private sector investors.

There are significant macro-financial constraints to mobilizing private capital, particularly in EMDEs. A key constraint is the absence of adequate carbon pricing, notably in EMDEs.¹² Such pricing would help generate incentives for private investment in low-carbon projects. It would promote a more transparent market and the ability to make clear and informed investment decisions in different markets and economies. Another macroeconomic constraint is country risk, which may be difficult to price for some EMDEs, specifically for climate-related products. In addition, many EMDEs and LICs have considerable pre-existing debt vulnerabilities that could be magnified by additional borrowing, including the transfer of currency and liquidity risks from private to public sector balance sheets (Annexes 2 and 3).

Microeconomic constraints are primarily related to mitigation and adaptation investments and are specifically high in EMDEs. These include long timeframes, lack of large investment grade investments and liquid markets, high upfront capital and transaction costs, and significant project risks.

As a result of these and other constraints, difficulty remains in attracting financing to many mitigation and adaptation projects. These types of projects are most likely to attract a small pool of specialized investors demanding high returns in a developing and relatively illiquid asset class, with debt being the main instrument. This is the case for renewable energy companies, which have low liquidity and long-term financing needs. For instance, there is evidence that mainstream investors screen companies with a market capitalization of at least

⁹ Related market failures include (i) short-termism in capital allocation; (ii) low-carbon investments’ exposure to political risks, illiquidity and uncertain returns, depending on domestic approaches to mitigation policy and unpredictable technological progress; and (iii) the fact that the price signal of carbon taxes can be swamped by large price swings in high-carbon commodities (see Krogstrup and Oman 2019).

¹⁰ GCF, 2021.

¹¹ IPCC (2022a). On the supply side, the report emphasizes systems transformation—in the energy sector (reduced fossil fuel use, deployment of low-emission energy sources, energy efficiency, storage), industry (mobilizing all mitigation options across value chains), buildings, agriculture, and forestry. CO₂ removal is needed for hard-to-abate emissions but cannot replace immediate and deep emission reductions in all sectors. On the demand side, the report stresses ambitious sufficiency policies—measures and daily practices that avoid demand for energy, materials, land, and water, while delivering human well-being for all within planetary boundaries. Such policies may eliminate the need for deployment of carbon dioxide removal practices.

¹² For a proposal on an international carbon price floor among large emitters, see Parry and others (2021).

US\$200 million, a threshold that relatively few renewable energy companies clear.¹³ Discussions with large development finance institutions (DFIs) suggest that the cost of equity for climate investments for impact investors and DFIs was 12-15 percent as of June 2022 in small frontier EMDEs, suggesting that it could be even higher for commercial investors. Adaptation finance is often built into capital and operating expenditures, making it difficult to track. However, emerging sources of private adaptation financing include green, social impact and resilience bonds (although there are concerns about these instruments' additionality), dedicated investment vehicles (that is, equity funds), balance sheet finance, and insurance.¹⁴ It is not always clear how such projects generate returns, however.

Some other important impediments include unattractive risk-return profiles in unproven markets and lack of scalable quality projects. This suggests that pooling projects through structured financial instruments could help in some cases. Pooling several projects in a structured fund and creating ABS-type instruments would attract more institutional investors and large investment funds into less developed economies, which may not even have an investment grade, as well as diversify risks. This would raise global climate financial flows and bring them closer to required levels, as currently only about a half of such flows come from the private sector and only about a half goes to developing countries (Annex Figure 1). However, it is critical to address risks associated with scaling up cross-border climate finance (Annex 2), including through risk management practices (Annex 4).

An important constraint for enhancing climate finance is high fossil fuel investments, which need to be scaled down. Phasing out fossil fuel assets to replace them with low-carbon energy sources requires managing the macro-financial consequences of asset stranding, including the reallocation of capital and labor.¹⁵ However, some international investment treaties, such as the Investor State Dispute Settlement system and the Energy Charter Treaty (ECT), which are legally binding, protect fossil fuel investments which can lock in large amounts of emissions, or alternatively expose authorities to legal action for breach of that protection when seeking to adopt regulatory measures to curtail fossil fuel activity. The European Commission is negotiating a modernization of the ECT to better enable regulatory action to be taken to address climate change, and similar steps are needed in relation to other international investment treaties. However, even under the European Commission's proposal, protection of foreign investment in certain natural gas investments is to be kept until as late as 2040. Aligning climate finance with the Paris Agreement entails a major reallocation of investments to avoid those that are inconsistent with climate goals. This includes the exploration and development of new fossil energy sources and the building of unprotected critical infrastructure in areas that are subject to climate risks.¹⁶

Beyond climate-related externalities, there are others. These include information asymmetries related to taxonomies and large data gaps, absence of common taxonomies, inadequate classifications for sustainable investment, home bias considerations, and an overlay of other risk factors and externalities.¹⁷ Among data gaps, developing weather monitoring and forecasting systems is important especially for LICs, which are heavily reliant on agriculture. Such externalities create significant barriers for private sector climate investment and effective capital reallocation. The introduction of carbon border adjustments in some countries can boost other countries' incentives to adopt similar policies and tax carbon domestically, which could accelerate the transition.

Data provision processes remain manual, cumbersome, and costly. Data quality needs to be addressed to improve transparency, verification, and reporting process. Technology could be a game changer in collecting new data in a more efficient way.¹⁸ Some examples include: (1) Application Programming Interfaces to connect

¹³ Ameli, Kothari, and Grubb (2021).

¹⁴ Intergovernmental Panel on Climate Change (2022b).

¹⁵ IMF (2021a).

¹⁶ Galindo Paliza, Hoffmann, and Vogt-Schilb (2022). See also Oil Change International (2021).

¹⁷ High-Level Commission on Carbon Prices (2017); Stern, Stiglitz, and Taylor (2022).

¹⁸ An example is the Climate Change Indicators Dashboard published by the IMF at <https://climatedata.imf.org/>.

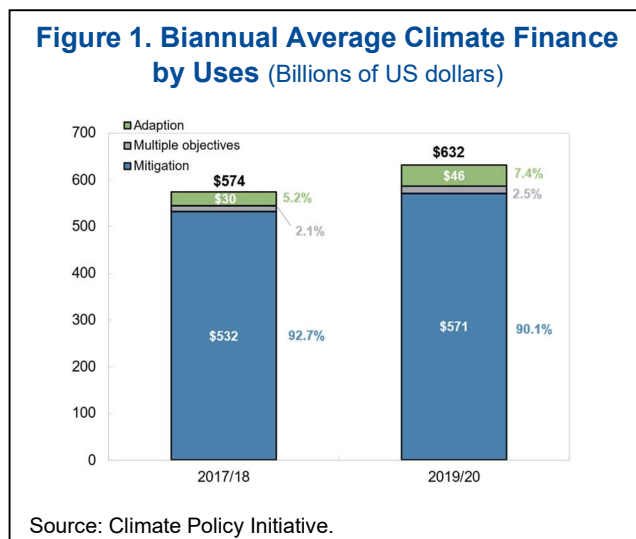
directly to infrastructure systems to retrieve directly relevant data on environmental impact and energy consumption; (2) Internet of Things (IoT) devices to measure carbon emissions and pollution levels at the source and in real time, although this may bring broader concerns about potential emission and environmental impact of IoT development; (3) blockchain platforms to ensure provenance of ESG certifications; and (4) natural language processing to analyze relevant sustainability-related information.¹⁹

There are also issues related to scaling up private sector finance. These include the size of global fixed-income and ABS markets, diversity in investor types and risk profiles, differences in investment time horizon, various climate strategies in the asset management industry, and the lack of investable projects. Institutional investors face difficulties in identifying investments in EMDEs that are relatively safe and liquid. This limits private sector exposures to only 12 to 15 investment-grade EMDEs that have large and relatively liquid bond markets, making it difficult to build diversified bond portfolios and leaving many other EMDEs without needed private sector climate funding. There is evidence that development institutions that channel subsidized public resources to private sector projects face challenges related to absorption capacity and development finance saturation, particularly in LICs and small states, including Small Island Developing States.²⁰ This points to the need to increase the supply of investable projects to avoid generating competition for a scarce pipeline of projects. Indeed, the latter could increase the cost of financing if a lack of investable projects leads to more marginal investment opportunities being financed.²¹

Pooling of projects is needed for ABS-type products to attract institutional investors. Mitigation and adaptation investment projects are often too small with respect to institutional investors' requirement of diversified asset pools. Devices that pool projects, notably those that facilitate project bundling, can help address this constraint.

Unlike fossil fuels, at present low carbon energy sources in EMDEs may not be considered attractive to private sector investors. Political, regulatory, and macroeconomic instability increase investment risks and lead investors to apply a higher premium.²² In addition, there are other constraints, including less transparent financial reporting, difficulties in evaluating projects, and other local impediments. This makes many theoretically attractive projects economically unviable and creates additional constraints and risks.

As part of the transition, adaptation finance faces larger hurdles compared with investment in mitigation (Figure 1). A major constraint is uncertainty about the economic consequences of climate impacts and the efficiency of adaptation technologies, which can hinder project-level investment.²³ Adaptation projects in particular are often unattractive to the private sector as a result of underpriced risks, a general lack of access to finance in EMDEs, and a lack of economies of scale (Box 1). Weather and climate extremes are generating cross-border economic and societal impacts through markets, natural resource flows, and supply chains that depend on key commodities and infrastructure. Changes in precipitation patterns and water availability could affect hydropower, and for countries that share river basins it can reduce productivity in the food and



¹⁹ Menon (2021).

²⁰ Kenny and Morris (2021), Kenny (2021).

²¹ Attridge and Engend (2019).

²² Ameli, Kothari, and Grubb (2021).

²³ World Bank (2020a).

energy sectors. Almost all adaptation finance is currently provided by the public sector, even though there are opportunities for private sector capital, especially in early warning systems, global mangrove protection, and climate-resilient infrastructure.²⁴

Box 1. The Role of the Private and Public Sectors in Adaptation Finance

Adaptation finance has private and public components. Private sector actors have an incentive to adapt given the local and private nature of many of the benefits of adaptation projects, limiting the extent to which coordination problems affect adaptation investments relative to mitigation investments (Bellon and Massetti 2022). The private sector should in principle be the most efficient driver of adaptation actions. The main constraints to adaptation actions are (1) uncertainty around climate risks; (2) lack of understanding about the learning cycle to approach the uncertainty issues around adaptation; (3) insufficient pricing of risks; (4) insufficient access to existing climate data and models; (5) lack of bankable projects, especially in LICs; and (6) the underapplication of taxonomies of climate resilience investments. Another potential constraint to private sector adaptation action is the expectation that the public sector will socialize reconstruction costs after climate or weather extremes.

Other market failures can further limit private adaptation. The resilience of a system often depends on networks (Feng and Li 2021). Private adaptation investment will tend to be underprovided because adaptation in components of networks affects other parts a network, implying a coordination role for government to internalize all the social benefits of adaptation. Poor countries and populations may not be able to afford adaptation projects, therefore international financial support for adaptation is needed. The high upfront costs and affordability issues that affect many adaptation projects can prevent private actors from implementing effective solutions (Hallegatte, Rentschler, and Rozenberg 2020). Widespread lack of access to financing means that hundreds of millions of people in or close to poverty cannot adapt to climate change. This creates a strong case for public financing of adaptation. Strategies to increase private sector adaptation include long-term adaptation planning support, national adaptation investment plans, market assessment and pipeline screening, project preparation support, and downstream transaction demonstration (IFC 2021). It is important to ensure that adequate fiscal, regulatory, and insurance policies are in place to incentivize adaptation and create profitable opportunities for private finance.

Countries' exposure to physical impacts of climate change and the costs of transition (mitigation and adaptation) impedes climate finance. The economic costs of physical impacts are very uncertain, and with the acceleration of climate change, the frequency and strength of physical impacts are growing. Although central banks and financial regulators are trying to sensitize various agents to these risks and developing tools to address them, climate-related financial risks remain underestimated, limiting the reallocation of capital to climate transition. This challenge is exacerbated by countries' general economic vulnerability and indebtedness. Growing fiscal costs of mitigation and adaptation also affect many developing countries, worsening their public debt levels and credit ratings and, in some cases, level of debt distress, while impacting the investment climate.

High financial project risks could be addressed. Low-carbon projects face high upfront transaction and other risks, especially in LICs and EMDEs, reflecting uncertainty about environmental regulations. Such risks include cost overruns, delays, transaction costs, permit risks, and contract renegotiation, particularly for less mature technologies.²⁵ These risks are higher for smaller projects and compounded by limited familiarity with specific geographies and markets and an uncertain governance landscape. Investments in climate projects tend to be bespoke, one-off projects, and therefore costly, time consuming, uncertain and hard to diversify.²⁶ These factors tend to limit the supply of high-quality, transparent low-carbon climate-resilient investment projects and make the cost of capital higher in LICs and EMDEs. Transparency is particularly important, as highlighted by the case

²⁴ IPCC (2022b), CPI (2021).

²⁵ GCF (2021).

²⁶ Kenny (2022).

of reported secret electricity power purchase agreement contracts, which can hinder the low-carbon transition, create contingent liabilities for the state, and undermine democratic accountability.²⁷

There are also important challenges for the green bond market. For example, as demand for green products is increasing fast, issuers may tend to “greenwash” projects that produce few real climate benefits. Thus, there is a need for independent third-party evaluation to ensure that this type of investments indeed go into green projects. Therefore, some countries and regions, such as the EU and China, are putting in place specific standards for green bonds—hence the role of taxonomies.

Because of the transformation of illiquid low-carbon assets into tradable financial securities and the development of deep and liquid local bond markets, there could be a large increase in intermediation of portfolio flows to EMDEs and the amount and share of intermediation of capital flows to EMDEs that are originated from benchmark-driven investors. In turn, this could lead to the transmission of cross-border stress and to capital outflows from EMDEs.

Private Sector Capital in Climate Finance

Private sector capital for climate finance includes the funding provided by private financial institutions, investors, and companies in climate-friendly projects and financial assets. These investments are often priced on a market basis, with financial returns measured against risks. Scaling up private sector climate finance can be enhanced if the social benefit of carbon emission reduction were internalized in the financial returns and risks were reduced. At the same time, the large uncertainties surrounding the development of climate-related technologies, the financial returns of climate projects, and future carbon policies and emission pathways, often make climate-related investments risky, which underscores bigger role of large global investment funds. Thus, to attract private sector capital in climate mitigation and adaptation investment, there is a need for innovative financial instruments in addition to those that already exist, including blended and structured financing and risk sharing, where public financial resources can partly reduce and mitigate risks for investments.²⁸ The appropriateness of such tools depends on countries’ public debt and balance sheet sustainability, given the risk of potential contingent losses and liabilities.

While it has grown rapidly in recent years, private sector climate finance remains a small share of total assets under management (AUM) globally (Figures 2 and 3). In the absence of effective carbon pricing frameworks, the social cost of carbon emissions is not directly incorporated in private investment decisions, resulting in a less attractive risk-reward profile for low-carbon relative to carbon-intensive investments. The longer payback period of low-carbon options with high upfront capital costs raises these investments’ sensitivity to uncertainty relative to energy technologies where fuel costs dominate. The high policy and technology uncertainties surrounding the low-carbon transition can further disincentivize private sector investment. It is estimated to be about US\$300 billion per year in new climate financing, still very small compared to the US\$210 trillion total private AUM.²⁹ In a large sample, analyzed by the IMF, the global total AUM for climate-labeled investment funds grew more than tenfold to US\$133 billion in 2010–20. However, the AUM for climate-labeled private investment funds in the sample represented only less than 0.3 percent of the total AUM.³⁰ Moreover, some assessments find that the 30 largest financial institutions in the world collectively provide more than US\$740 billion in primary financing of fossil fuels.³¹ This reflects the significant limitations of private capital as well as potential room for growth in climate finance. De-risking by public financial resources is likely needed to fully scale up private capital participation.

²⁷ See, for example, <https://ppawatch.org>.

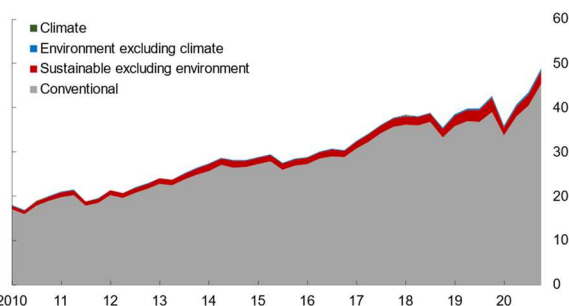
²⁸ IFC (2021).

²⁹ CPI (2021).

³⁰ IMF (2021b).

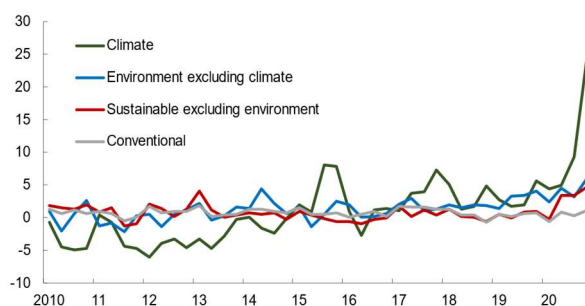
³¹ Influence Map (2022).

Figure 2. Assets Under Management, by Fund Label, 2010:Q1–2020:Q4



Sources: Bloomberg Finance L.P.; Lipper; Morningstar; United Nations Principles Investment; and IMF staff calculations.

Figure 3. Net Flows into Funds, by Fund Label, 2010:Q1–2020:Q4



Sources: Bloomberg Finance L.P.; Lipper; Morningstar; United Nations Principles Investment; and IMF staff calculations.

Note: This figure shows mutually exclusive fund labels.

Private sector capital may and should play a bigger role in climate finance, including with innovative financial instruments. A growing number of institutional investors, investment funds, and credit institutions have already been paying attention to climate change and sustainability. Several financial tools have been increasingly used in climate finance in recent years (Table 1). This trend provided a good incentive to private sector financial institutions to search for climate-related products and liaise with the public sector and MDBs to develop joint products and partnerships. Large global investment funds can start investing a small percentage of their capital in climate financial products in EMDEs and diversify their risk. These funds can partner with MDBs and the national public sector, by investing a small share of their portfolio in climate EMDE products/projects, thereby fulfilling their climate commitments and investors’ mandate. While private sector investors can provide a large share of financing, the public sector can underwrite more risks, take on equity/junior tranches, provide guarantees and credit enhancements, as well as help with project selection and assessment, capacity development, and diversification for the private sector. Public-private synergies in this area would provide a multiplicative effect.

Table 1. Examples of Private Sector Climate Finance Tools

Commercial bank lending with climate considerations	Conventional commercial bank lending with climate considerations is growing, driven by both commercial banks’ voluntary climate strategy and financial regulations.
Green bonds and green loans	Green bonds and loans are used to exclusively finance projects that have positive climate and environmental impacts. Some may qualify for a “green” label. Green Sukuk are also being explored in Islamic finance.
Sustainability-linked bonds and sustainability-linked loans	Sustainability-linked bonds and loans are used by corporates and sovereigns to raise capital often at lower costs, by committing to achieve predefined key performance indicators (KPIs) on sustainability.
Sustainability bonds and social bonds	Sustainability and social bonds are financing tools where the proceeds are used to finance projects that achieve positive climate and social impacts.
Green asset-backed securities (ABSs)	Green securitization can transform illiquid climate-friendly assets into tradable financial securities.
Other financial instruments	Other financial instruments are used in private climate finance, including through certain environmental, social, and governance funds (with climate considerations), as well as private equity and venture capital investments in climate-related firms. Shareholder engagement is also used to encourage companies’ green investment decisions.

Sources: World Bank, OECD, Climate Bonds Initiative, and IMF.

These are several market instruments that private sector climate finance can utilize:

- **Climate considerations in conventional commercial bank lending.** Commercial bank lending can play a significant role in climate finance. Total bank loans to the private nonfinancial sector amount to about 100 percent of the 2020 world's annual GDP.³² However, climate-related considerations are not among the key factors that currently determine bank lending decisions. With physical and transition risks becoming more prominent, some banks are starting to gain awareness of climate-related risks. Some banks are augmenting their internal credit risk models to capture climate physical risks in the credit risk assessment as well as the quality of collaterals, although it is not currently a requirement in many countries. Some banks are incorporating GHG emissions considerations in their companies' environmental, social, and governance (ESG) frameworks. However, the social benefits of climate mitigation are typically not reflected in the terms and conditions of conventional loan contracts, which continue to constitute a significant limitation of conventional bank financing. The role of ESG considerations in institutional investors' allocation strategies may also divert capital flows from EMDEs, as the latter tend to lack data or score poorly on ESG metrics.
- **Green bonds and green loans.** Green bonds are a form of financing wherein the proceeds are used to exclusively fund projects that have positive climate and environmental impacts via a use-of-proceeds approach. The Green Bond Principles introduced by the International Capital Market Association (ICMA) in 2014 provided a set of voluntary principles that promote transparent and standardized climate objectives and impacts that qualify for a green label. Increasingly originated by financial institutions, sovereigns, and nonfinancial corporates, green bond issuances have grown rapidly over the last decade, reaching more than US\$600 billion in 2021. Green bonds are one of the most important types of climate-related bonds, representing one-half of the global total issuances of climate-related bonds and about 80 percent of climate-related bond issuances in EMDEs. Despite the recent growth, green bonds constitute only 3.8 percent of all bond issuances in EMDEs (excluding China), leaving significant room for future growth.³³ Green Sukuk, Islamic bonds, that were first launched by Malaysia in 2017 and were used to exclusively finance green projects, have seen issuances in a few countries over the past few years, including Indonesia and the UAE. In addition, similar to green bonds, green loans, which are typically conducted via private transactions and are often smaller in size for each transaction than a green bond, are used to raise capital for green eligible projects. International Financial Corporation (IFC) and some other MDBs also use green loans to provide support to the low-carbon transition of developing countries. The Green Loan Principles of ICMA and other similar principles provide guidelines for the green loan market.
- **Sustainability-linked bonds (SLBs) and sustainability-linked loans (SLLs).** SLBs are used by corporates and sovereigns to raise capital often at lower costs by committing to achieve predefined key performance indicators (KPIs) on sustainability. For example, an energy company may raise capital by issuing an SLB and committing to reduce the usage of fossil fuel by a certain percentage in its power generation fleet over the next five years. A country can issue an SLB and commit to reach certain national carbon emission targets by a predefined timeline. These bonds commonly enjoy lower interest rates but will incur a jump in the coupon rates if the issuer fails to meet their sustainability targets at predefined observation dates. An important characteristic of SLBs is that the proceeds from the bonds can be used for general purposes by the issuer. SLLs are capital intermediated through banks and are similar in concept to SLBs. The markets for SLBs are still very modest, while SLLs have grown to US\$400 billion in annual issuances in 2016–21. About two-fifths of SLB issuers are in EMDE countries.³⁴ While these financial instruments are highly innovative and have gained growth momentum, their total market size remains small compared to the entire bond market and to global climate finance needs.
- **Social bonds and sustainability bonds.** Social bonds are a financing tool where proceeds are used to finance projects that achieve positive social impact. The social impact can include addressing poverty, gender, environmental issues, and racial inequalities, as well as challenges for underprivileged groups. Recently, some COVID-related social bonds have emerged with goals to address COVID-related social

³² BIS data, <https://www.bis.org/statistics/totcredit.htm>.

³³ OECD (2021).

³⁴ NGFS (2022).

issues. Sustainability bonds are a financing option where proceeds are used to finance a combination of social and green projects. Both types of bonds are useful financial instruments that can leverage private capital to address climate change. The global issuance of these bonds surpassed US\$200 billion in 2020.

- **Green asset-backed securities (ABSs).** Securitization is a tool that makes illiquid assets into tradable financial securities and is increasingly used in the green investment area. For example, loans to small and medium enterprises to invest in climate-friendly projects could be structured as collaterals for green ABSs. In some countries, home mortgages that finance energy-efficient homes could be structured into green mortgage-backed securities. Green securitization is a useful tool to increase the demand and liquidity in the secondary market, which in turn can stimulate direct financial investments in the primary market. However, despite the fact that the China, EU, and the United States, and a few other countries and regions have seen growing issuances in recent years, the overall market size for green ABSs is still small. Given the uneven regulatory landscape and data limitations, climate-related ABS would need to be closely monitored and regulated.
- **ESG funds, venture capital, and other forms of private finance.** ESG funds especially climate-labeled funds have experienced strong inflows in recent years. These funds typically have investment screening processes that account for ESG and climate considerations, although screen criteria can vary widely across funds. The rise in inflows to these funds can potentially lower the financing costs for the issuing companies that have high ESG and climate scores. Venture capital is also increasingly involved in climate finance, with estimations of more than US\$200 billion being invested in climate-related technology firms between 2013 and the first half of 2021.³⁵ Compared to other forms of private sector capital, venture capital's high appetite for risk can have an advantage in climate financing, considering potential high financial risk of climate-related projects and technologies. The limitation of venture capital is that it is mostly restricted to small-sized private companies that potentially have large commercial values but not necessarily projects that mostly have significant social and climate benefits.
- **A potential benefit for green bond issuers is to enjoy a green premium (or “greenium”) in pricing, although empirical evidence on the actual size of the pricing benefit remains mixed.**³⁶ While the greenium is still small reaching around 50 basis points at best, the margin could widen with increasing demand and credibility of green and ES-linked bonds.³⁷ Thus, ESG investors should be willing to have lower return investing in this type of products, but at the same time meeting their mandate.

MDB Climate Finance³⁸

MDBs and NDBs can play a crucial role in channeling funds to support climate issues. These banks can provide countercyclical intervention in the credit market through direct lending, provision of credit guarantees, or buying loans and securitized products. They can provide long-term or concessional resources and promote private-sector involvement (for example, on-lending scheme). Because of their financial model, MDBs' ability to leverage their capital through bond issuances is determined in part by their capital adequacy frameworks. To safeguard their ratings, MDBs have traditionally been conservative in managing their finances. Equity stakes allow the public sector to share in the upside, but they also help to leverage private capital in the largest way, and they would be particularly helpful given that most EMDEs already have too much debt. Therefore, MDBs can play an additional role to help countries structure financial products in such a way to take equity stakes and thus attract private sector capital. Public equity investments are important to help delivering on the annual \$100 billion commitment by developed countries in support of climate action in EMDEs.

³⁵ PWC (2021).

³⁶ UNDP (2022).

³⁷ Chamon and others (2022).

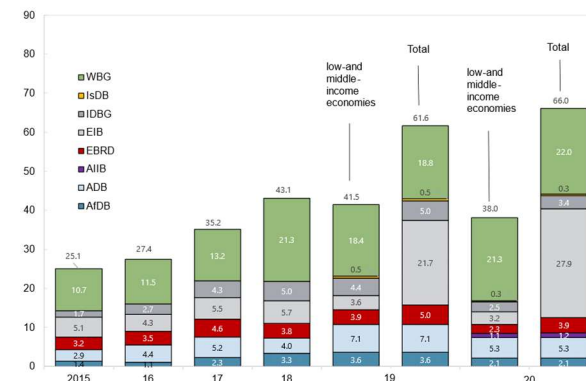
³⁸ Annex 3 provides details on MDB's climate finance instruments.

MDBs have made significant climate finance commitments (Figure 4). As of 2020, overall commitments of the five major MDBs reached US\$32 billion (Table 2). Adaptation finance and co-financing were increased to US\$18 billion and US\$110 billion, respectively, including private direct climate finance mobilization of US\$40 billion.³⁹ However, in 2020 MDBs' climate finance for developing countries fell well short of these commitments, at US\$38 billion (57 percent) most likely because of the global COVID-19 pandemic.⁴⁰ Mitigation finance dominated adaptation finance at 76 percent of the total.

MDBs have announced climate finance targets and actions for the several years ahead (Table 2). They are working together to develop the joint MDB long-term strategies (LTSs) for low-carbon and climate-resilient development. This involves providing a tailored approach to country needs through (1) partnerships and capacity building, (2) engagement and policy support (including the preparation of an LTS), and (3) support for the operationalization of an LTS.

Debt climate finance is the main type of instrument used for MDB financing, at an estimated 68 percent of the total in 2020 (US\$26 billion), of which only 12 percent is low-cost or concessional financing. It is followed by policy-based financing, grants, and guarantees at about 11.5 percent (US\$4.4 billion), 9 percent (US\$3.3 billion), and 4 percent (US\$1.5 billion), respectively (Table 2, Annex 5). Solar and onshore wind technologies attract more than 90 percent of financing, and low-carbon transportation is the fastest-growing recipient sector (Annex Figure 2). As of 2020, more than three-quarters of tracked climate finance flows were domestic.⁴¹

Figure 4. MDB's Climate Commitments
(Billions of U.S. dollars)



Source: Joint Report on Multilateral Development Banks.
Note: 2015–18: Climate finance in emerging and developing economies; 2019–20: Climate finance in all economies where the MDBs operate.

³⁹ 2020 Joint Report on Multilateral Development Banks' Climate Finance (MDBs 2021). This report covers a group of MDBs composed of the African Development Bank (AfDB), Asian Development Bank (ADB), Asian Infrastructure Investment Bank (AIIB), European Bank for Reconstruction and Development (EBRD), European Investment Bank (EIB), Inter-American Development Bank Group (IDBG), Islamic Development Bank (IsDB), New Development Bank (NDB), and World Bank Group (WBG).

⁴⁰ European Investment Bank and East African Development Bank were signatories to a pledge at COP26 to end public financing for fossil fuels in 2022, while several MDBs including the World Bank were among those who did not sign the pledge.

⁴¹ CPI (2021a).

Table 2. MDB’s Climate Finance Commitments, 2015–20

	World Bank Group	European Investment Bank	Inter-American Development Bank	European Bank for Reconstruction and Development	African Development Bank
Climate finance commitment for LICs/EMDES as of 2020 (USD billions)	22	3.2	2.5	2.3	2
Climate finance commitments in LICs/EMDEs as share of total financing	96	N/A	73	59	N/A
Climate finance in LICs/EMDEs as share of total climate finance commitments	N/A	N/A	15	11	34
Co-finance for LICs/EMDEs as of 2020 (USD billions)	17.9	1.3	3	N/A	7.2
Climate finance goals	In 2021-25, the IFC aims to reach 35 percent of climate finance in the total portfolio. Moreover, the IFC has committed to align 85 percent of its real sector operations with the goals of the Paris Agreement starting in mid-2023, reaching 100 percent in mid-2025.	The EIB plans to gradually raise the share of financing allocated to climate and environmental sustainability to over 50 percent of its operations in 2025. The EIB has also announced that it will restrict almost all oil and gas finance from 2022 onward. From 2021, the bank aims to have a target that comprises both climate finance and environmental sustainability finance, with the former expected to account for 85 percent of the total.	The IDB aims for climate finance in total financing to be at least 30 percent for 2020-23.	The EBRD aims for green finance to account for over 50 percent of its total annual investment by 2025, and to set a date when all projects must be aligned with the Paris Agreement. Under the “Green Economy Transition” approach, the bank uses many instruments, including direct finance (debt, equity, and quasi-equity), intermediated finance through local financial institutions or through non-financial intermediaries (e.g., utilities, energy service companies, and supply chains), large-scale PPPs, and performance-based finance.	The bank planned to double its climate finance to US\$25 billion in 2020-25, prioritizing adaptation finance.
Other climate finance initiatives	In addition to green loans and green bonds, the IFC is developing sustainable finance products, including blue bonds and blue loans, sustainability-linked finance, and climate transition products. It is also developing debt products aligned with the ICMA Climate Transition Finance Handbook to assist carbon-intensive companies with the low-carbon transition.	In 2021, the EIB developed a product that links the loan’s interest rate to emission reductions, rewarding the company, if it reduces its emissions to a specified level and penalizing it if it fails to do so.	N/A	N/A	N/A

Source: MDBs (2021).

Note: Climate finance resources for the International Financial Corporation (IFC), Multilateral Investment Guarantee Agency (MIGA), and the World Bank (WB) stood at US\$3.5 billion, US\$23 million, and US\$17.7 billion, correspondingly, with shares of climate finance in the total financing reaching up to 30 percent.

MDBs have agreed on “enhanced principles” to govern the allocation of blended concessional finance.

These principles include not crowding out the private sector, minimizing the subsidies, having a goal of commercial viability, addressing market failures, avoiding market distortions, and promoting higher standards.⁴² In addition, MDBs have preferred creditor status in some cases, which can affect underlying credit risk.⁴³ In some cases, this can have a powerful effect, as syndicated lending by MDBs has been shown to attract 7 dollars of private sector credit for every dollar of public sector credit.⁴⁴ Discussions with DFIs suggest that EMDEs face a high cost of capital for climate investments in the private sector. MDBs, by contrast, require much lower financial returns—on the order of 1 to 2 percent. This suggests that MDBs could play an important role in filling the investment gap.⁴⁵

MDBs and other IFIs can play an important role in supporting the mobilization of climate finance. Their expertise can contribute to selecting projects, monitoring, and ensuring adequate progress towards meeting the Paris Agreement objectives. In addition, IFIs, donors, and domestic financial institutions could support national development banks (NDBs) by strengthening their capacity, easing access to climate finance funds, channeling most international climate finance directly through national institutions, and helping climate funds understand how NDBs operate to facilitate access to more funding sources.⁴⁶ MDBs can help stabilize financing through policy consultations and direct financing when volatility and uncertainty in financial markets are high, as in the current context of monetary policy tightening in AEs. More climate financing resources could be channeled through MDBs by increasing their capital base and reconsidering their approaches to risk appetite through partnerships with the private sector supported by governance and management oversight.

MDBs can facilitate to tailor debt issuance to local contexts, ensure country ownership, and support development of local bond markets.⁴⁷ In assisting countries to issue green, social, and sustainability (GSS) bonds and SLBs, MDBs should explore the opportunity to align them with local climate transition paths. SLBs can contribute to enhance the role debt markets play in encouraging companies to participate in sustainability investments. Sovereign issuers can also issue green, social, sustainability, and sustainability-linked (GSSS) bonds partnering with MDBs. In addition, MDBs can support the development of local bond market infrastructure to provide a foundation for capital market depth and liquidity, and thus encourage further issuance of GSSS bonds and other debt instruments.⁴⁸

The low-carbon transition requires the transformation of urban, transport, and infrastructure systems.

Such large-scale transformations would likely involve a variety of financial instruments, including equity investment, policy-based financing, early-stage risk capital, and guarantees, as well as capacity development. The World Bank has identified some levers to deploy climate finance, including financial sector reform to “green” capital allocation (for example, regulations for green bonds and loans), sectoral policies (such as energy efficiency standards, building codes), and innovation and technology transfer (for example, R&D support).⁴⁹

⁴² World Bank (2020b).

⁴³ Carter (2021).

⁴⁴ Broccolini and others (2021). On the other hand, some studies find that, on average, one US dollar of MDB and DFI investment mobilizes US\$0.75 of private finance, falling to US\$0.37 in LICs (Attridge and Engend 2019).

⁴⁵ Kenny (2022).

⁴⁶ Griffith-Jones, Attridge, and Gouett (2020).

⁴⁷ OECD (2021).

⁴⁸ The IMF has played an important role in helping EMDEs develop local bond markets. It has helped developed a diagnostic framework to identify enabling conditions, key components, and constraints for successful local currency bond market development in EMDEs, provided technical assistance to EMDEs to support capital markets, and published a guidance note on challenges and bottlenecks in developing deep local bond markets and overcoming difficulties in implementing best practices. MDBs could play a catalytic role by issuing local currency bonds in domestic and international capital markets, which could help establish a benchmark for lower-rated issuers.

⁴⁹ World Bank (2020a).

These levers require managing political economy challenges, with an emphasis on just-transition issues, such as mitigating adverse distributional consequences of the net-zero transition.

MDB support for NDBs could play an important role in scaling up climate finance. In many EMDEs, insurance and capital markets are thin or do not exist, making the coverage of key risks expensive. Hedging instruments typically have short tenors in many EMDEs, making hedging of a project over its lifetime difficult and costly during crises, in part because of procyclicality in the financial system. MDBs could help manage domestic systemic risks that are likely idiosyncratic from a global perspective, including political, currency, and natural disaster risks. This approach should in principle enable the diversification and thus risk insurance.

MDBs could also help to address governance and fiscal risks associated with the provision of financing by NDBs. For instance, to address fiscal risks from the allocation of excessive subsidies, MDBs could require that NDBs use auctions in which quantities are set and contracts awarded to the lowest bidder and strengthen governance by benchmarking financing to projects in similar countries and industries. In addition, MDBs could create portfolios of short-maturity projects from a range of countries, which could be securitized and sold to international investors to diversify risk internationally. MDBs could provide insurance, as they have a greater ability to diversify risks. Finally, increased provision of funds from MDBs to NDBs could increase NDBs' ability to use a wider range of instruments and lend to sectors that are considered riskier.⁵⁰

Public-Private Risk Sharing in Scaling up Climate Finance

The public sector could play a powerful role in reducing constraints and catalyzing private sector climate financing. The public sector can align incentives with climate objectives through regulations, taxations, guarantees, subsidies, and disclosure requirements, thereby helping induce collective action, including from other stakeholders. Addressing climate change requires many changes in the economy, requiring close coordination across stakeholders and sectors, especially in EMDEs, with a wide range of market failures beyond the climate externalities. Without pricing mechanisms for climate externalities, under-investment in climate infrastructure would likely persist, placing achievement of the Paris Agreement temperature objectives at risk.

Project-based funding channeling public and private financial resources to infrastructure projects can bring positive climate impacts. Often, blending public finance with private sector capital, as discussed above, is useful to de-risk these investments for the private sector investors. By doing so, investments that benefit from public sector support essentially help internalize the social benefits of climate investment. Project-based financing can also target investments that are especially under-provided or have important positive spillover effects. However, limited public financial resources together with the financial constraints faced by many private sector investors may limit rapid scaling up globally for project-based financing.⁵¹

Potential ways for the public sector to reduce investment costs include the following:

- **Providing public equity capital** in combination with private sector debt investment can reduce the total cost of borrowing and give the public sector control over investment decisions, although this would not necessarily be the case if the public sector holds an equity stake in a private asset. The MDBs have a potential role to play as intermediaries for providing public equity.
- **Establishing public-private partnership investment** can take down the total cost of borrowing to allow the private sector to make better investment decisions and avoid loss-making projects, taking advantage of public sector expertise in project selection, monitoring, evaluation, and capacity development.
- **Improving information asymmetry** can allow the private sector to have better project evaluation and thus improve project selection and monitoring costs. The public sector and MDBs could leverage their expertise in these areas, as well as provide capacity development.

⁵⁰ Griffith-Jones, Attridge, and Gouett (2020), Ketterer and Powell (2018).

⁵¹ See also Annex 5 on risk management.

- **Underwriting specific risks**, such as project completion or political instability can ease high-risk premiums for the private sector.
- **Providing multi-sovereign guarantees** can help achieve higher leverage ratios, for example, through multi-country sovereign-backed guarantee funds.⁵²
- **Public investment management and procurement policies** for supporting private sector climate finance can help to attract additional capital. Wind and solar technologies benefited from early public investments and technology diffusion that enhanced technology maturity. Frontloaded public finance can help minimize risks for future private investment.

Public equity capital provision and public-private partnership investment imply potentially large public debt increases through the crystallization of contingent liabilities. To address this risk, hard limits on the state’s contingent exposure could be considered. For instance, Uruguay’s public–private partnership (PPP) law caps the state’s total PPP liabilities and fiscal transfers to private operators to 7 percent and 0.5 percent, respectively, of the preceding year’s GDP.

Several specialized facilities have been established to provide funding for climate-related projects in EMDEs. These financing facilities often receive funding resources from governments and provide financing options at concessional terms. A few prominent examples include the Climate Investment Funds (CIF), the Green Growth Equity Fund, the Green Climate Fund (GCF), and IFC’s Managed Co-Lending Portfolio Program (Box 2).

The public sector could take equity tranches, which may result in first-loss positions, or provide credit enhancements that would lower the cost of investment by reducing risk to the private sector. By taking an equity position in climate investments, the public sector would bear most of the investment risk, but it would realize gains if investments were successful. A good example of such an arrangement is the Amundi Planet Emerging Green One (EGO) Fund (Box 3). The public sector could choose to accept below-market returns for the risk it takes in return for positive climate outcomes, thereby significantly lowering the cost of capital to potential borrowers. This in turn would allow investments to rise closer to an efficient level. Such an arrangement might also attract additional private sector capital with a lower risk appetite. This would obviate the need for direct private sector subsidies if risks were priced appropriately, and if funds were managed by well-equipped fund managers who are able to avoid credit defaults thereby preserving the first-loss protection provided by the public sector.

A fund structured with public sector equity and private sector debt provides further scale and diversification benefits.⁵³ The riskiest first loss (or equity) tranche would typically be held by public sector investors, junior debt (mezzanine tranche) by public and private sector investors, while the lower-risk senior (investment grade) and super-senior (AAA-rated) debt tranches would be targeted at private sector investors. It is this risk transfer that would allow the fund to attract private sector participants who are seeking high credit quality investments. A pooled structure allows investments at scale by eliminating the need for costly risk-sharing arrangements in individual investments (as may be seen in typical public-private partnerships arranged at individual debt transaction levels). Another good example of this arrangement is the Green Credit Continuum (GRECO) program (Box 4), which focuses on channeling capital to underdeveloped segments in the European green fixed-income market. How sensible an equity tranche held by the public sector is and how much risk the public sector would accept again depends critically on the degree of carbon pricing and other mitigation policies. If these variables are not in place, the “public tranche” would be the equivalent on a nontransparent, inefficient public transfer—the type of fiscal transfer that we advise against elsewhere.⁵⁴

⁵² GCF (2021).

⁵³ Examples are the [Global Climate Partnership Fund](#), the [Green for Growth Fund](#), and the [European Energy Efficiency Fund](#).

⁵⁴ IMF (2020).

Box 2. Public-Private Partnership for Scaling up Private Climate Financing

To facilitate private climate investment, a few large-scale private-public partnerships have been established to leverage public financial resources. Challenges with some partnerships, such as the Green Climate Fund, include low accreditation rates and slow disbursements, reflecting lengthy and complex processes (Fouad and others 2021). This underscores the importance of capacity building for EMDEs that lack capacity to leverage such partnerships.

Established by global leaders in 2008, **Climate Investment Funds (CIF)** is an US\$8.5 billion multi-donor trust fund that provides support to climate investment in developing and middle-income countries. Working in partnership with the private sector, governments, and six MDBs, the fund offers a platform to pool and leverage financial resources from partners while de-risking investments through providing concessional financing and other financing products. As of end-2020, the fund had channeled over US\$60 billion from its global partners to co-finance green projects. CIF investments cover a wide range of projects ranging from climate technology and sustainable forests to climate-smart cities and renewable energy integration. In 2021, the G7 committed additional resources of up to US\$2 billion to further boost its role in financing climate investment in developing and middle-income countries.

In 2010, the **Green Climate Fund (GCF)** was established under the UNFCCC framework at COP15 in Copenhagen, with a goal to mobilize US\$100 billion per year by 2020. The fund accepts contributions from developed countries in the form of grants, loans, or capital as well as from private sector and other sources. During its initial resource mobilization period in 2014, the fund quickly raised US\$8.3 billion. It has raised more than US\$10 billion from 34 contributors in the fund's first replenishment (2020–23) as of September 2021. The GCF catalyzes private sector investment through its Private Sector Facility, which provides concessional loans, lines of credit to banks, equity investments, guarantees, and first-loss protection among other financing instruments. Covering both climate adaptation and mitigation projects during 2015–20, the fund co-financed or directly financed climate investments with a total value of US\$23.4 billion in 117 developing countries.

The **Green Growth Equity Fund (GGEF)** is a recently launched initiative aimed at transferring and replicating technologies. The GGEF, anchored by India's National Investment and Infrastructure Fund (NIIF) and the UK Foreign, Commonwealth, and Development Office (FCDO), and managed by EverSource (Mumbai), is a fund-of-funds structure that aims to raise US\$900 million from a mix of institutional investors and development financial institutions (DFIs), supported by concessional funds in the form of subordinated equity from the GCF (via Dutch development bank FMO). GGEF plans to invest equity capital through sectoral platforms in climate technology growth firms in renewable energy, e-mobility, energy services, and resource efficiency projects with strong innovation potential.

The **IFC Managed Co-Lending Portfolio Program (MCPP)** provides funding for infrastructure projects, facilitating flow of private capital to emerging market infrastructure projects. The program provides an innovative model to mobilize financing for development that combines financing from insurance companies, project origination and credit enhancement from IFC, and support from public sector donors. In each MCPP Infrastructure facility, a portfolio syndication process provides investors with a diversified portfolio of loans that mirrors the IFC's portfolio, and an IFC investment in the first-loss tranche that provide the private investors with an investment-grade profile. The logic for creating a portfolio that mirrors the IFC's portfolio is to offer MCPP investors the opportunity to co-lend in every new loan that IFC originates that fits the investor's criteria (allowing investors to benefit from the IFC's country and sectoral diversification), and to allow IFC and MCPP investors to invest in equal amounts.

The **Multilateral Investment Guarantee Agency (MIGA)**, a member of the World Bank Group, provides support for private-sector green investment by leveraging the use of its guarantees. For example, in the 2021 financial year, the agency issued US\$1.35 billion of guarantees, or 26 percent of its total new business volume, to support climate adaptation and mitigation projects in 22 countries. These green investments include renewable energy, infrastructure, and agricultural projects among other climate-friendly investments. The guarantees issued by MIGA facilitate cross-border green investment by providing political risk insurance and credit enhancement to investors and lenders. MIGA protects cross-border investments from sovereign risk, but not from project risks.

Box 3. Amundi Planet Emerging Green One (EGO) Fund

Building on a concept developed by the IFC, in February 2018 Amundi launched in partnership with the IFC the **Amundi Planet (AP) Emerging Green One (EGO) Fund** that targets green investments in public debt markets in EMDEs. The EGO Fund started with a net asset value of US\$1.42 billion, including IFC's US\$256 million stake, and is expected to reach US\$2 billion and be fully invested in green bonds issued by emerging market (EM) banks by year seven. Based on the credit enhancement model, the fund is structured along the lines of a collateralized debt obligation wherein the riskier junior tranches are to be invested by IFIs and the mezzanine and senior tranches by IFIs and private sector investors, leaving private investors with more senior, less risky tranches. Importantly, the fund is also supported by IFC Green Bond Technical Assistance Program, which was created to stimulate the development of green bonds issuances for local financial institutions. The EGO Fund aims to stimulate private investment in the needed green infrastructure area while fully leveraging public sector expertise at the same time. Several challenges are to be tackled in this market. There is still a large gap to be filled to properly factor in the climate externalities associated with each project. The lack of information and the informational asymmetries faced by the end investors are mitigated by the original funding of green projects being conducted by EM-based banks. The EGO Fund is only exposed to the credit risk of each individual bank whose green bonds it has acquired. Going forward, an investment vehicle building on lessons learned with the EGO fund and with flexible capital as well as project expertise that facilitates these transactions is likely needed.

As of end-2020, the AP EGO fund has invested in green bonds issued by financial institutions that are headquartered in nine countries. The use of proceeds is concentrated in renewable energy, green building, clean transportation, and water and waste management, among other sectors.

Box 4. Amundi's Green Credit Continuum

Launched in 2019 by Amundi and the European Investment Bank (EIB), the Green Credit Continuum (GRECO) program aims to channel capital to underdeveloped segments in the European green fixed-income market. These target segments include green high-yield bonds, private debt, and securitized credit. The goal is to reach and further develop these segments to deepen access to green financing for less-mature issuers, such as small- and medium-sized enterprises (SMEs), and at the same time provide higher yields and additionality to investors. At the launch of the GRECO program, a scientific committee was set up to provide guidelines for these new segments of investment opportunities, while the EIB also participates in defining the green standards and acts as a cornerstone investor.

The program raised its first EUR253 million vintage from public and private institutional investors in Europe and seeks raise up to EUR1 billion in total over the next decade. The fund first invests in available green bond instruments and makes another capital call once investments in the target segments reach 75 percent. As of the end of 2020, about 50 percent of the first capital call was invested in the target segments for a total market value of EUR43 million. Transactions cover several sectors, including energy-efficient building, sustainable forest management, and green transportation.

In addition, public development banks could invest more and help mobilize private sector capital into climate finance. These institutions collectively disburse about US\$2 trillion per year—about 10 percent of global public and private investment, according to some estimates.⁵⁵ NDBs' comparative advantages include knowledge of the local investment landscape, long-term relationships with the local private and public sectors, sectoral and project expertise, knowledge of domestic development needs, and in some cases the ability to fund non-transformative projects.⁵⁶ Thus, NDBs and MDBs could take on the role of catalyzing private sector finance

⁵⁵ Espagne (2021).

⁵⁶ Griffith-Jones, Attridge, and Gouett (2020).

through strengthening five mutually reinforcing capacities: (1) financing low-carbon and climate-resilient development, (2) mobilizing external finance, (3) blending international climate and public development finance with their own resources to scale up private sector investment, (4) influencing policies to help shape policy frameworks to attract green private investment, (5) developing pipelines of projects and new technologies to demonstrate commercial viability, and (6) providing capacity development and project monitoring. A concrete example of how NDBs and MDBs could take on the role of catalyzing private finance for low-carbon development is provided in a case study offering economic justifications for and quantitative estimates of the climate financing needed to replace the most polluting fossil fuel, coal, with renewables (Box 5).⁵⁷

Existing initiatives need to be scaled up to significantly shift capital allocation towards green projects.

Specialized funds using public money in high-risk positions, including Amundi EGO Fund, the Climate Investment Funds, and the Green Climate Fund added up to less than US\$20 billion in investments in 2021. Although somewhat larger in scope, green bond issuance at US\$100 billion in EMDEs in 2021 remains particularly small compared to investment needs. Moreover, most financial flows are not “green,” implying an overall inconsistency between financial flows and the goals of the Paris Agreement and thereby contradicting Article 2 of the Paris Agreement, which calls for “making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.” As the market size for climate and sustainable finance remains small, recent growth in green finance may largely reflect the green labeling of existing projects. Therefore, the link between the development of climate and sustainable finance and growth in activities that are actually aligned with the temperature and adaptation goals of the Paris Agreement should become stronger if financial flows become consistent with a pathway towards low-carbon, climate-resilient development.

Debt relief could create policy space for climate related investments, and thus enhance the credibility of EMDEs’ mitigation plans, but must focus on restoring a sustainable position.

Debt distress can indirectly lead to the entrenchment of extractive growth models and the lock-in of emissions. For instance, some Latin American economies faced with external debt pressures and large hard currency needs have resorted to opening foreign direct investment inflows into extractive sectors, undermining their mitigation efforts. With about 60 percent of the 73 countries eligible for the G20 Debt Service Suspension Initiative (DSSI) in 2020–21 at high risk of or already in debt distress,⁵⁸ linking fiscal space to carbon lock-in poses a risk to the credibility of climate finance ambitions in these countries. However, debt relief should focus on restoring a sustainable public debt position. The Intergovernmental Panel on Climate Change (IPCC) has noted that to ensure fiscal space for climate action and reduce dependency on capital markets, debt relief, deferrals of liabilities, new solidarity structures and higher levels of bilateral and multilateral lending need to be considered.⁵⁹ The possibility to link the extent of debt relief to climate achievements or commitments of indebted countries could be explored.

Where countries, particularly EMDEs, have limited fiscal space, the IMF Resilience and Sustainability Trust (RST) financing could help play a catalytic role to attract private investments.

The IMF’s engagement could help improve countries’ policy frameworks and allow them to access other sources of climate finance in equity and debt. The RST extends the IMF’s existing lending toolkit to longer-term lending programs associated with climate change. There is potential to leverage the RST loans to catalyze private sector investments for climate-related finance.

⁵⁷ Adrian, Bolton, and Kleinnijenhuis (2022). Quantitative estimates of climate financing needed for phasing out coal are provided here.

⁵⁸ Chabert, Cerisola, and Hakura (2022).

⁵⁹ IPCC (2022a).

Box 5. Case Study on Climate Financing for Replacing Coal with Renewables

The study titled “The Great Carbon Arbitrage” (Adrian, Bolton, and Kleinnijenhuis, 2022) asks what the world would gain by phasing out coal while phasing in renewable energy. By comparing the present value of the gain of avoided emissions and the present value of costs of phasing out coal and replacing it with renewable energy, a conservative baseline estimate is that the world can realize a net gain of around US\$ 78 trillion.

The costs of replacing coal with renewable energy include at a minimum the capital expenditure costs of building a renewable energy capacity that is equivalent to that from burning coal, as well as the costs of compensating coal companies for their lost future earnings when they are shut down early. Compensation for the opportunity costs of coal could be expanded to include costs of retraining workers who have been laid off from the coal industry and unemployment benefits during the retraining period. Capital expenditure costs must further account for the investments in energy storage and the extension of the electricity grid and its flexibility. The benefits from phasing out coal are related to the lower expected future damages from climate change and harm to people’s health. The present value of these benefits is calculated by estimating the size of avoided emissions from phasing out coal and by applying a carbon price to those emissions. Economic efficiency stipulates that the carbon price should be set equal to the social cost of carbon (SCC), which is taken to be the (conservative) IMF estimate of 75 dollars per ton of CO₂. Benefits from reduced pollution to people’s health are not explicitly captured in the study at present resulting in a conservative estimate of the benefits of phasing out coal.

By subtracting the costs from the benefits, an estimate is obtained of the net economic gain from phasing out coal. The net gain from phasing out coal depends on the energy mix with which coal is replaced – in particular, the installation costs and emissions of the replacement energy mix. As a baseline, coal is taken to be replaced with solar and wind energy, as these are most cost-efficient and scalable at present. In principle, coal could be replaced with other types of low-emission energy such as hydro and nuclear, and even natural gas. Replacing coal with natural gas is shown to result in a net economic gain that is at least two magnitudes in size smaller, due to the higher emissions and higher levelized cost of energy of gas plants relative to solar and wind farms. Hence, gas is best minimized in its usage as transition fuel.

The net gain from replacing coal with renewables results in a Pareto improving deal where every country is made better off. In the absence of global carbon taxation at the social cost of carbon, which we view as a first-best solution, a way to reap this Coasian bargain is to offer climate financing for phasing in renewables (and compensating for the opportunity costs of coal), made conditional on the commitment to phase out coal. The global requisite amount of such climate financing is estimated to be around \$29 trillion, of which 46 percent is in Asia, 18 percent in Europe, 13 percent in North America, 13 percent in Australia and New Zealand, 8 percent in Africa, and 2 percent in Latin America and the Caribbean (find a computational tool with quantitative estimates of climate financing across the world here). Notably, climate financing is thus not only needed in EMDEs and LICs, but also in the developed world.

Under the Coasian approach (which seeks an efficient social outcome through bargaining and contracting), it is sound economic logic to pay the polluter to stop polluting if this generates a net gain for the parties who pay. The minimum payment to end coal consists of the investment costs in replacement renewable energy, in order to maintain sufficient energy supply, and compensation for the localized costs of phasing out coal, which disproportionately impact some segments of society and regions. Such payments help make phasing out coal politically feasible.

The net gain from phasing out coal is to be reaped in large part by governments, who will face fewer costs to repair climate damages (e.g., repair flooded cities), to adapt to climate change (e.g., building stronger dykes), and to cure health issues from pollution. Governments reap this net gain because their replacing of coal with renewables results in emission reductions that avoid pollution and prevent global warming. The net economic gain an individual country reaps from phasing out coal domestically is not nullified by carbon leakage abroad, since renewables are phased in while phasing out coal, thereby ensuring that domestic energy demand is met with domestic renewable energy supply rather than with more coal production abroad. The Coasian bargain countries grasp when replacing coal with renewables provides a novel economic justification for climate finance.

While governments gain economic benefits from phasing out coal, they are unlikely to be able to finance the transition away from coal by themselves. Public-private partnerships (PPPs) for climate financing could help. Using the Amundi Planet Emerging Green One Fund as a representative deal, the study estimates the size of public funding required if for every dollar of public funds nine dollars of de-risked private financing can be tapped through blended finance arrangements. The study finds that governments would have to invest \$2.9 trillion and the private sector the remaining \$26 trillion to collectively phase out coal.

It can be argued that it is in the interest of a government to finance 10 percent of its country's total costs to replace coal with renewables if this is less than the resulting social benefits (smaller climate damages and harm to human health). A back-of-the-envelope calculation suggests this holds true for nearly all countries. The net gain individual countries reap from replacing coal with renewables would only disappear if their country-specific social cost of carbon (SCC) is less than US\$2 per ton of CO₂. Most countries' SCC is much higher, especially when the possibility of crossing climate tipping points is considered, which puts the planet's habitability at risk.

As a baseline, individual countries would pay 10 percent of their domestic costs to replace coal with renewables. Considerations of fairness, a country's fiscal position, or both, may in certain cases call for foreign contributions to help finance 10 percent of a country's costs to phase out coal. It is in the interest of wealthy countries to contribute to foreign climate financing if the sum of their domestic and foreign financing remains less than the domestic economic benefits they derive from the domestic and foreign emissions they helped to avoid with their financing.

Blended financing structures, such as asset back securities (ABSs), could be used to leverage public money. The \$2.9 trillion of government investments in the junior/equity tranches of ABSs bring down the risk of the roughly \$26 trillion worth of senior tranches in which the private sector can then invest. The de-risked senior tranches can then obtain investment grade ratings, making them attractive to a wide range of investors, including institutional investors. Such an arrangement would create a new green asset class dedicated to phasing out coal and replacing it with renewables. Unlike many ESG investments, whose impact on reducing emissions is often dubitable, investments in this asset class explicitly bring down emissions.

The size of the structured finance market is currently around \$2 trillion globally, and ESG assets under management are around \$3 trillion. Hence, a significant scaling of capital markets is needed over the next decades to enable a PPP to finance the phase out of coal. The magnitude of the assets under management by investors who signed up to the Glasgow Financial Alliance for Net Zero (GFANZ), at \$130 trillion, suggests an appetite by investors to fund the green transition.

Public development banks collectively disburse about \$2 trillion per year. To replace coal with renewables across the world, the study estimates that annual climate financing by public development banks would need to be between \$0.05 trillion and \$0.2 trillion, with a front-loaded investment this decade of \$0.3 trillion. Since climate financing for phasing out coal represents only a subset of the necessary climate mitigation financing for decarbonizing the world economy, governments must likely increase their contributions to public development banks. It is in their interest to do so, since the domestic economic benefits from phasing out coal are bigger than the costs countries incur by increasing funding for public development banks. Capital markets would have to finance the remaining 90%, amounting to an annual investment between \$0.45 trillion and \$1.8 trillion, with a front-loaded investment this decade of \$2.7 trillion.

Investments by countries to establish a PPP for climate financing the replacement coal with renewables could be ironed out in an international Coasian agreement. Regional or bilateral agreements to finance the phase out of coal could alternatively be struck. By phasing out coal while phasing in renewables, such agreements would avoid emissions and deliver local economic benefits, irrespective of whether the rest of the world also does so. Given the huge economic gains from phasing out coal, it is in our collective interest to seek to overcome hurdles to Coasian bargaining that prevent the establishment of a PPP to provide climate financing to phase out coal.

The public sector can play other meaningful roles.

- **Through regulation of the sustainable finance bond market**, the public sector can help better standardize the public debt market. Well-crafted standardization will enable lowering sustainable bond transaction costs for issuers and investors and facilitate the creation of specialized data bases, which can guide investors through better quality publicly available information dissemination.
- **The public sector can disseminate sustainable finance best market practices** through case studies, release research as a public good, and provide training curriculum adapted to EMDEs' needs.
- **Large global institutions like the World Bank and the IMF can partner with global data base providers** to supply them with regularly updated macroeconomic and climate-related data, adapting the data and make them accessible by the public in a well-packaged manner. The IMF already started publishing the Climate Change Indicators Dashboard that includes some indicators related to climate financing.
- **The public sector can play a role in sustainable finance information quality verification**, for example by supervising second opinion providers on GSS bonds use of proceeds (as is already being done in China) and monitoring of impact indicators on the step up/stop down of SLBs.
- **MDBs could design and monitor KPIs in collaboration with national authorities and/or civil society.** For instance, a proposal from Finance for Biodiversity Initiative (F4B) is to develop a Nature and Climate Sovereign Bond Facility hosted by international institutions.

Policy Considerations

There are several climate finance policy levers that government can use to help attract private sector capital in climate investment. The IMF can play an important role in this regard through its instruments, including surveillance, capacity development, risk assessments, and climate diagnostic tools. In addition, the RST can act as a catalyst in leveraging private sector financing, although its implementation will be gradual with a few pilot cases to begin with. For example, advanced economies can underscore the importance of public equity investments as a way of delivering on their annual US\$100 billion commitment to EMDEs. Equity stakes allow the public sector to share in the upside, but they also help to leverage private capital in the largest way. This would be particularly helpful given that most EMDEs already have too much debt.

Announcing and implementing policies, including carbon pricing paths, can be important government objectives. First-order policy objectives can include closing climate-related data gaps, improving data disclosures, overcoming various externalities, incentivizing R&D, and addressing carbon pricing gaps. Many sectors are characterized by a low responsiveness of emissions to carbon prices. In these cases, carbon pricing needs to be complemented by other policies, for example supporting sectoral policies (for example, building standards), as well as large-scale public investments.

An important role for the public sector is to invest in infrastructure that will support and incentivize low-carbon private sector investments. There are widespread coordination failures associated with multiple complex systems from the part of the private sector, especially in LICs and EMDEs.⁶⁰ Public investment in infrastructure could support the integration of new technologies, including in electricity grids, charging stations, public transport, broadband, and urban planning, as in many countries utilities are mostly public-sector owned, emphasizing the importance of public investment in low-carbon infrastructure.

The public sector could provide leadership in improving data quality, closing data gaps, fostering data disclosure standards, and developing relevant taxonomies. A strong climate information architecture should comprise of high-quality, reliable, and comparable data; a globally harmonized and consistent set of climate disclosure standards; and globally agreed principles for climate finance taxonomies and other taxonomy approaches to align investments with climate goals. This could facilitate more accurate market pricing of risks,

⁶⁰ Stern, Stiglitz, and Taylor (2022).

enable more informed investment decisions, and foster the growth of climate finance.⁶¹ In the absence of harmonized data, based on internationally accepted methodologies, information asymmetries among investors would continue to impede the allocation of risks. However, better disclosures may not be sufficient to ensure that financial flows are consistent with climate goals.⁶²

Developing a robust greenhouse gas (GHG) accounting methodology based on gross emissions is critical to ensure the environmental integrity of impact reporting. Accounting methodology and standards can be developed by financial reporting standard setting bodies, such as for example International Accounting Standards Board or its equivalent, in collaboration with the IFIs. The ICMA Climate Finance Transition Handbook is an important reference for climate finance for MDBs to help carbon-intensive companies with their low-carbon transition.⁶³ To generate globally consistent climate disclosure standards, it will be desirable to develop a standardized GHG accounting methodology based on gross (absolute) emissions, as what matters from a climate and tipping point perspective is absolute emissions, rather than avoided emissions.⁶⁴

The public sector could elevate commitments and coordination with the private sector. Immediate, credible, and verifiable commitments, as underlined in proposals from the Framework for Sustainable Finance Integrity, are essential to the achievement of real economy impacts.⁶⁵ Coordination across public and private financial institutions could help ensure coherence and impact on mitigation and adaptation goals and alignment with the science. Government collaboration with other stakeholders could help by setting roadmaps, developing strategies, and convening stakeholders.⁶⁶

EMDEs need to achieve high-quality, low-carbon, and climate-resilient economic development through mitigation and adaptation transition. The next decade will be crucial for EMDEs investment in urban, energy, transport and other systems.⁶⁷ Even if private sector climate finance flows rose rapidly and reached desirable levels, political economy factors could translate into an increase in rent-seeking and “white elephant” projects, rather than climate-compatible investments.⁶⁸ Redirecting spending and foreign investment to climate-compatible solutions would require governments to reform policies and regulations in all sectors.⁶⁹ Therefore, political economy considerations could be considered in policy strategies and the climate finance agenda to reach desired climate goals. Depending on a country’s political and institutional context, building new institutions, creating bespoke institutions, or revamping existing ones could be required.⁷⁰

To make climate finance effective, country authorities could pay attention to social implications. The transition from business-as-usual pathways to deep decarbonization pathways would most likely generate localized costs, which can be large, and which could disproportionately impact some segments of society, industries, workers, communities, and regions. These impacts underscore the importance of “just transition” policies. Climate finance can help create an enabling environment for smoothing the transition and supporting essential policies. For instance, data on localized climate impacts and opportunities can help compensate adversely affected segments and population groups.⁷¹ It is also important to design redistribution measures to

⁶¹ Ferreira and others (2021).

⁶² Ameli, Kothari, and Grubb (2021).

⁶³ ICMA (2021).

⁶⁴ As noted by the French financial market regulator, carbon neutrality “involves principally and above all a reduction in absolute terms in green gas emissions by the company throughout its value chain, based on regularly revised objectives in line with scientific knowledge” (Autorité des Marchés Financiers (2021).

⁶⁵ CPI (2021).

⁶⁶ McKinsey Global Institute (2022).

⁶⁷ Bhattacharya and others (2022a).

⁶⁸ Khan and others (forthcoming).

⁶⁹ Galindo Paliza, Hoffmann, and Vogt-Schilb (2022).

⁷⁰ Bhattacharya and others (2022b).

⁷¹ World Bank (2020a).

address the social and labor market impacts of mitigation policies and strengthen financial regulations to contain risks from stranded assets.⁷²

Thoughts on Future Policy Work and Analysis

As noted above, there are several constraints to private sector climate finance for mitigation and adaptation. It would benefit policymakers, researchers, and financial sector participants to focus on key constraints and reasons for high investment risks and risk premiums identified for mitigation and adaptation projects, as well as overall scarcity of investable projects with a view to finding solutions to overcoming them. These include (1) long investment time frames; (2) high upfront capital and transaction costs; (3) significant project and/or country risk; (4) limited familiarity with specific geographies; (5) lack of formalized and specialized investment channels because of political, regulatory, and macroeconomic instability; (6) physical climate-related financial risks; and (7) an uncertain governance landscape.

There are also multiple economic and non-economic risks highlighted in the note whose materialization could significantly hinder the scaling up of private climate financing. Policymakers and financial industry practitioners should discuss such risks and come up with a mutually beneficial strategy to mitigate and reduce them. Solid and scalable investment ideas are as important as important as de-risking. In this regard, a program of proven investment ideas could be one of the potential answers.

Private sector involvement in adaptation finance has been low. Granularity in identifying specific constraints to mobilizing private sector finance for adaptation would help evolve specific solutions. It would be good to identify and segregate specific adaptation projects that are suitable for large-scale private sector investments, and those projects of public good nature meant largely to be financed by the public sector.

The private sector could help the public sector make the politically difficult case for carbon pricing. For example, the transparency, accountability, and credibility of net zero commitments by the financial sector could be strengthened by the clear articulation of their commitments with regard to, for example, portfolio objectives, specific financing goals, interim target, and how they are planning to operationalize and meet their commitments.

ESG investing may become more effective in supporting decarbonization, but significant hurdles remain. However, we should ensure mechanisms to avoid “greenwashing” and make a significant shift in investment and financing allocation towards the substantial reduction of greenhouse gas emissions. A question that remains open is whether the mixing of E, S, and G criteria poses structural and/or insurmountable issues for effectively driving decarbonization. The E component is central to the deployment of ESG strategies in a world facing planetary boundaries. ESG scores—overall, as well as on the environment components—do not reflect differences in firms’ contributions to climate change.⁷³ High-quality data, disclosures, and interoperable taxonomies can play a crucial role.

Public-private risk sharing can become more attractive to the private sector, possibly including through an ABS-type vehicle. An important question is what mechanisms to use—credit enhancements versus coinvesting versus specific risk guarantees. Public-private sector synergy should develop the best way to structure risk sharing in an ABS-type instrument. For example, a public co-investor in the equity tranche could improve private sector confidence and potentially investment outcomes. A question here is whether there would be significant market demand for private sector mezzanine/senior tranches if the public sector provided only

⁷² IMF (2021a).

⁷³ Elmall, Igan, and Kirti (2021).

equity/junior funding. In addition, it would be important to develop pricing mechanisms for first loss guarantees by the public sector.

Expectations of the size of availability of private sector funding need to be managed, given the nonlinearities in size among private investors. There could be risks that scaling up private sector funding at a global level may not be possible to operationalize. Therefore, it is possible that, to be more realistic, the scaling up of private sector funding should be managed at the country or sub-country specific project or portfolio of projects-level through pilot programs.

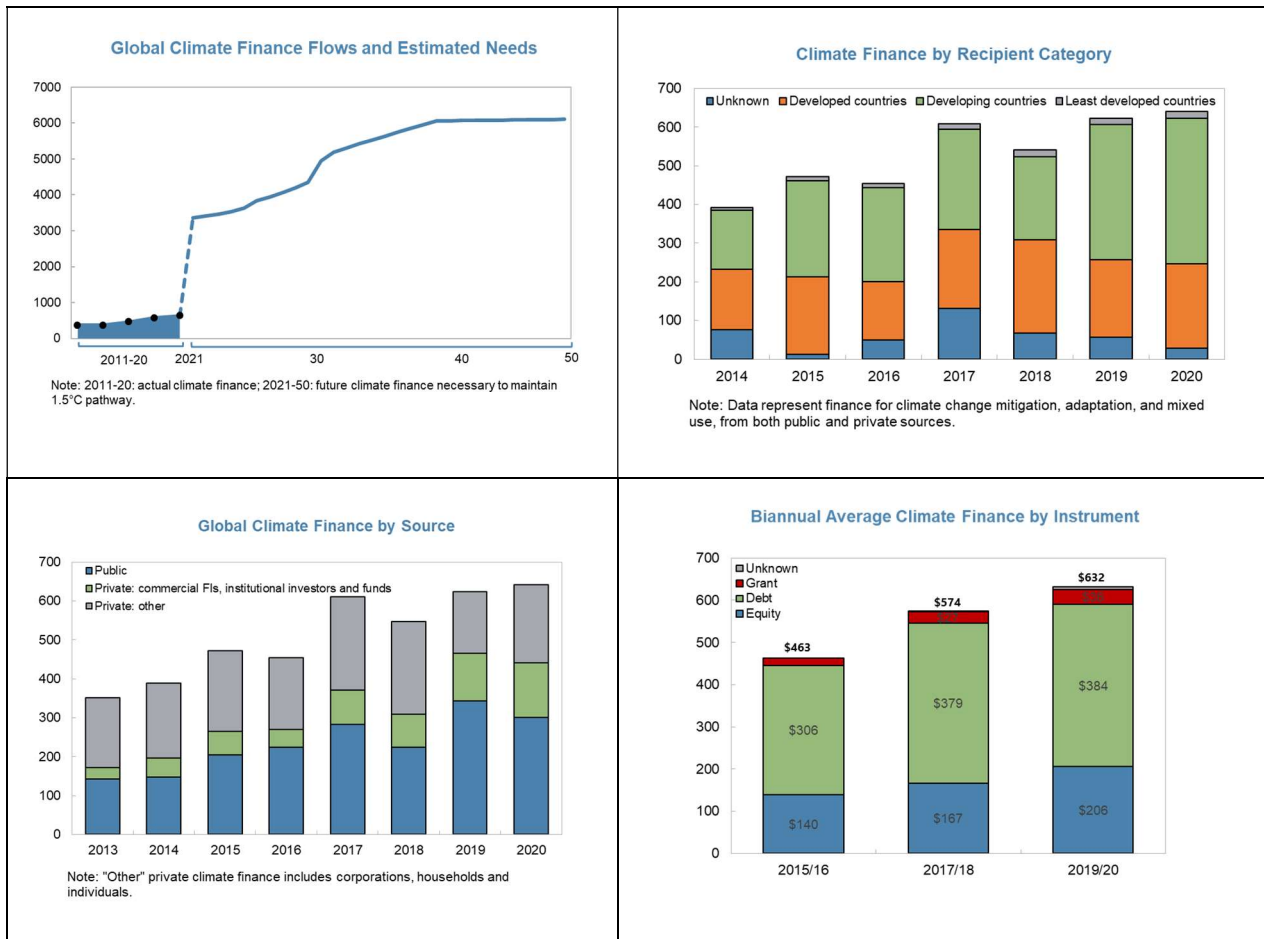
Public sector governance structure and policies need to be strong to get the private sector to participate in climate finance more actively. In particular, the private sector would need to have confidence in risk management, particularly in complex financial structures. Specific public policies should be developed to generate the needed trust and confidence for the scaling up of private sector climate financing.

MBDs can support NDBs in scaling up climate financing in EMDEs and LICs, in addition to country authorities. Given the lack of investable projects, it would be important to develop pipelines of projects, demonstration projects, and new technologies to demonstrate commercial viability.

Several financial issues remain relevant: (1) What is the appropriate duration for public sector funding? Will the long-term capital lockups that may be necessary to match project duration deter private investment at scale? (2) While public credit enhancements might be necessary to overcome externalities, are they necessary to attract private sector investors? (3) How can liquidity be built in this space, and is it important and/or does liquidity generate its own set of risks, such as volatility and capital flight? Would ratings be challenging to conduct given the desire for untested scale? Are multiple vehicles necessary? (4) What are policymakers and financial practitioners' views on the "greenium"? Can a "greenium" enhance investment returns? What should be done to make it happen?

Annex Figure 1. Climate Finance: Flows, Needs, Recipients, Sources, and Instruments

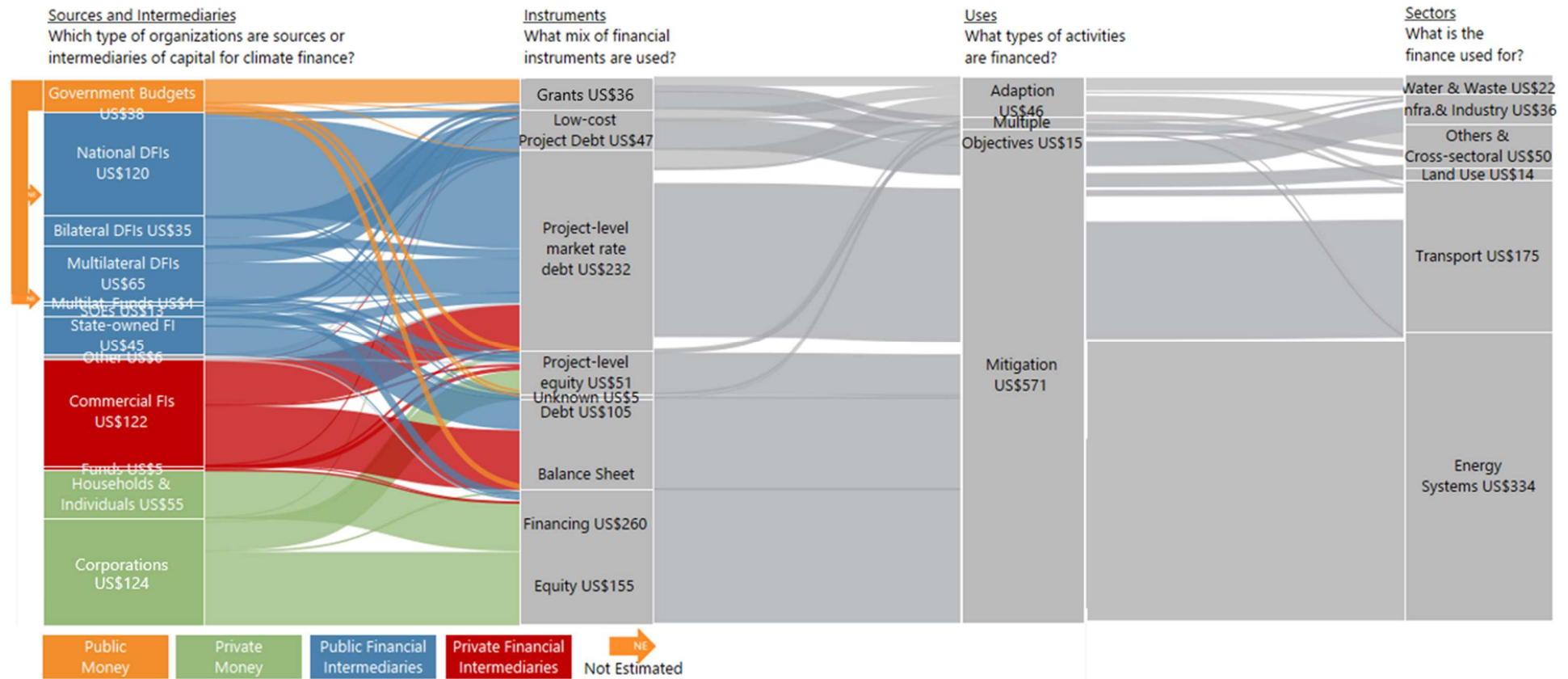
(Billions of US dollars)



Source: Climate Policy Initiative.

Annex Figure 2. Climate Finance in 2019/2020

(Billions of US dollars)



Sources: Climate Policy Initiative; and IMF staff calculations.

Note: Global climate finance flows along their life cycle in 2019 and 2020. Values are averages of two years' data, in billions of U.S. dollars, total is US\$632 billion. The flows from adaption to infrastructure and industry and energy systems, and from mitigation to infrastructure and industry and energy systems are estimated.

Annex 1. Climate Financing Gap Estimates for 2022–50

There are two main sources of considerable uncertainty around the size of mitigation and adaptation investment needs. The first concerns mitigation investments and includes uncertainty around (1) economic and population growth projections, partly reflecting the uncertainty on the economic impact of climate change beyond a certain threshold of impacts that are very likely to materialize; (2) the rate of decoupling between GDP growth and energy demand; (3) potential limits to the decoupling between GDP growth, use of biophysical resources (raw materials, energy), and emissions; (4) the future evolution of the cost of low-carbon and technologies; (5) the economic and financial strategies of fossil fuel producers; and (6) the degree of integration of climate policies into general economic policies.¹ To the extent that global investment needs take into account the large global infrastructure investment gap, they may capture spending that would also help achieve the UN Sustainable Development Goals. The second source of uncertainty is related to adaptation investments, which are difficult to quantify given their synergies with investments to achieve broader development goals. For example, some estimates find that new infrastructure, including for adaptation, could cost low- and middle-income countries 2 to 8 percent of GDP per year until 2030, depending on spending efficiency and the quality and quantity of service targeted.²

In EMDEs, the low-carbon infrastructure investment gap is estimated to reach US\$15–30 trillion by 2040.³ In this scenario, global warming would be limited to 1.5°C. This estimate corresponds to the required infrastructure investments to foster low-emission, climate-resilient pathways in EMDEs. For energy-related investments alone, the IMF estimates that the world will require about US\$3.3 trillion per year until 2030 to achieve net zero by 2050.⁴ Some estimates put needed investment, on average, from 2021 to 2050 to achieve net zero emissions by 2050 at \$4.5 trillion per year—composed of an annual increase of US\$3.5 trillion compared to the present and US\$1 trillion annually in spending reallocated from high- to low-emission assets.⁵ However, incremental investment relative to a baseline scenario is only US\$0.9 trillion per year, and does not factor in savings from fossil fuel rents, which some observers estimate at about US\$2 trillion per year. In addition, the transition can result in a loss of 185 million and a gain of 200 million direct and indirect jobs globally by 2050, causing a massive need for supporting, training, reskilling, and reallocating work force throughout the transition.⁶ Current annual global spending on clean energy, at US\$750 billion, is a fraction of what is needed, and is especially insufficient in EMDEs excluding China, at about US\$150 billion (see Annex Figure 1.1).⁷ Investment in renewable energies needs to average about US\$1 trillion per year between 2021 and 2030, compared to annual investment in total power generating capacity of less than US\$500 billion between 2016 and 2020.⁸

At the same time, high-emissions investment flows remain substantial, undermining climate finance. Fossil fuel investments stand at US\$850 billion per year. EMDEs account for only 20 percent of global clean energy investment despite accounting for about 60 percent of global GDP and having massive clean energy investment needs. Large fossil fuel investments continue to be substantial even though, according to the

¹ IPCC (2022a).

² Rozenberg and Fay (2019). The report finds that, with the right policies enabling the achievement of universal access to water, sanitation and electricity, greater mobility, improved food security and flood protection, and eventually full decarbonization, investments of 4.5 percent of GDP per year would enable low- and middle-income countries to achieve infrastructure-related SDGs while staying on track to limit climate change to 2°C.

³ GCF (2020).

⁴ IMF (2022b).

⁵ McKinsey Global Institute (2022).

⁶ McKinsey Global Institute (2022).

⁷ IEA (2021b).

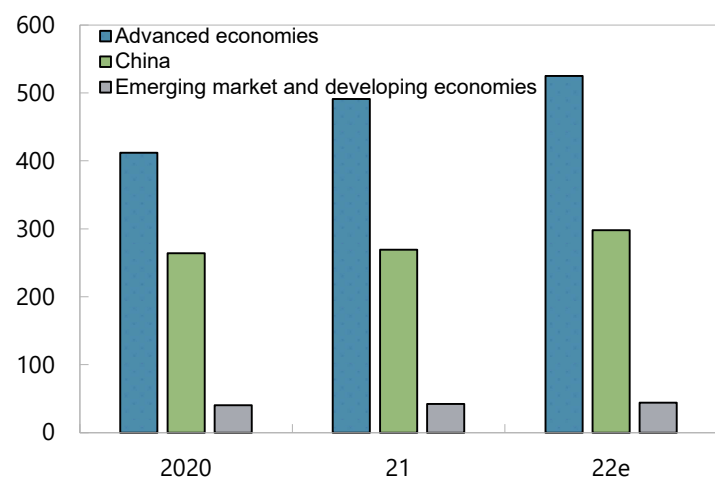
⁸ International Energy Agency, 2021a.

International Energy Agency, all regions of the world need to decrease fossil fuel investments and the addition of new fossil fuel supply will put limiting global warming to 1.5°C out of reach.⁹ There is evidence of still significant fossil fuel financing by DFIs and MDBs, estimated by some at \$16 billion and \$6.4 billion per year, respectively, over 2018–20.¹⁰

Climate financing is much smaller than what is needed,

at US\$632 billion in 2019–20 compared to an estimated need of US\$4–5 trillion, according to Climate Policy Initiative. The IPCC notes that annual climate finance flows need to increase by 4 to 8 times in developing countries until 2030.¹¹ Climate finance needs cover total gross mitigation and adaptation investments for the world economy. Estimated needs are endogenous and depend, among other factors, on the strength of mitigation policies. About half of climate financing comes from public sources and half from private sources, without COVID-19 impact on climate finance, and some estimates of the needed increase in annual climate finance stand at about 600 percent by 2030. As of 2020, three-quarters of tracked climate investments were domestic.¹² According to the IPCC, this underscores the role of national policies. Financial institutions and funds provided only 41 percent of private-sector climate finance, although secrecy and financing through green bonds may lead to under-reporting. The increase in climate finance flows has slowed in recent years from 24 percent in 2017–18 to 10 percent in 2019–20. Adaptation finance is far below what is needed. Most climate finance from public actors comes from NDBs, and it is considered market-level debt. International public climate finance was estimated at US\$58 billion in 2017, with almost all of it provided as development finance with climate co-benefits. An estimated US\$4.5–5 trillion of infrastructure investments are needed each year till 2030 to meet climate objectives.¹³ Climate Islamic finance (in the form of green Sukuk issuance) stood at US\$2.56 billion in 2020. It fell to US\$869 million in 2021, even as global green bond issuance rose to US\$517 billion in 2021 from US\$297 billion in 2020.

Annex Figure 1.1. Per Capita Clean Energy Investment in Selected Regions, 2020-22 (U.S. dollars, 2021)



Source: International Energy Agency.

⁹ IEA (2021a, 2021c).

¹⁰ Oil Change International (2021).

¹¹ IPCC (2022a).

¹² CPI (2021a).

¹³ CPI (2021), Griffith-Jones, Attridge, and Gouett (2020), IPCC (2022b), World Bank (2020a), and Menon (2021).

Annex 2. Macro-Financial Risks

Greater exposure to the global financial system could increase capital outflow risks in EMDEs, potentially adversely impacting green infrastructure financing over time. De-risking may increase the amount and share of intermediation of capital flows to EMDEs that originate from benchmark-driven investors. The latter—as well as portfolio flows in general—can transmit cross-border stress, which can exacerbate preexisting vulnerabilities in recipient EMDEs and lead to capital outflows.¹⁴

Increased reliance on local currency bond markets in EMDEs to de-risk climate finance, coupled with significant presence of foreign investors, may increase exposure to the global financial cycles. In this case, it could weaken monetary policy autonomy, as cross-border capital flows would transmit global monetary conditions, thus affecting local currency climate finance instruments. Borrowing in local currency from foreign investors also exposes EMDEs to foreign currency funding conditions, exchange rate volatility, and portfolio procyclicality, whereby local currency depreciation accelerates capital outflows.¹⁵ More reliance on market-based finance could also increase liquidity risks in local bond markets. An alternative policy approach would be to rely on taxation and sovereign debt issuance to institutional investors to finance large-scale public investment in sustainable public infrastructure, which could be used to provide free or low-cost services to the population. Hard-currency indebtedness comes with its own set of risks, however.

Public guarantees could generate macro-financial risks. Some proposals involve both guarantees and securitization. As guarantees are often linked to market prices, with haircuts based on external ratings (which tend to be pro-cyclical), countries could be exposed to collateral and currency risks.

Official sector capital or guarantees can be provided by IFIs and advanced economies or by local governments, with possible implications for EMDE public balance sheets. Some proposals focus on IFIs and advanced economies (for example, Green Climate Fund 2020). Credit enhancement by the sovereign is also a possibility.

High debt distress in LICs magnifies macro-financial risks. With about 60 percent of the 73 countries that were eligible for the G20 DSSI in 2020–21 already in, or at high risk of, debt distress,¹⁶ a concern is the potential socialization of losses. Lack of fiscal space in many LICs magnifies concerns about the transfer of liquidity and currency risks to the economy, which underscores the need to minimize contingent liability risks and long-term fiscal risks. The economic risks associated with high sovereign debt, lack of legal protection, as well as political and currency volatility will lead investors to demand high-risk premiums when providing credit, potentially undermining the economic feasibility of the projects in need of funding. These factors imply a significant role for IFIs and advanced economy countries in the provision of the risk capital.

¹⁴ Garcia Pascual and others (2021), Miranda-Agrippino and Rey (2022).

¹⁵ Gabor (2021), Hördahl and Shim (2020).

¹⁶ Chabert, Cerisola, and Hakura (2022).

Annex 3. Risks in Scaling up Private Climate Finance

There are multiple risks related to climate finance, for the global financial system, developing countries, and the private sector. For developing countries and the global financial system, macro-financial risks include debt sustainability; currency, liquidity, and market risks; balance of payments risks, risks related to social disruptions; and creation of new, volatile asset classes related to climate financing. For the private sector, micro-financial risks include vulnerability of investing in high-return projects, especially in EMDEs and LICs, as well as securitization products.

Macro-financial risks from using public resources to mobilize private finance for investments in EMDEs are of particular concern. Many EMDE have large pre-existing debt vulnerabilities that could be magnified by additional borrowing, particularly if invested in highly risky equity-like structures.¹⁷ Other risks include the transfer of currency, liquidity, and market risks from private sector to public sector balance sheets, potentially leading to adverse impacts on climate financing on a sustainable basis. The way private climate investments in EMDEs are de-risked could lead to the privatization of gains and socialization of losses, potentially causing social and political instability. Finally, capital flows associated with de-risking infrastructure assets could create balance of payments vulnerabilities by increasing current account deficits.

Creating a new asset class based on the securitization of climate investments in EMDEs could result in a more fragile global financial system. Indeed, the introduction of a new asset class that is cyclically vulnerable to sudden swings in security prices, notably because of changing risk appetite of global institutional investors, could make the global financial system more susceptible to boom-bust cycles.

An additional risk is leverage risk. Given the low financial returns inherent in most infrastructure and climate-related investments, private sector investors tend to rely on financial leverage to raise expected returns. They thus become exposed to a sudden tightening in global financial conditions and sharp increases in the cost of debt. This issue is particularly relevant in the current environment of rising global interest rates.

One of the micro-financial risks facing climate finance is not investing low-cost capital in the highest-return projects. The supply of capital should be matched with appropriate projects that provide a commensurate financial return and adequate progress toward achieving the Paris Agreement goals. However, this risk has been featured in the past for infrastructure spending, as measured in financial terms and effectiveness in mitigating climate change. Nationally determined contributions (NDCs) prepared by many EMDEs have helped to prepare “shovel-ready” projects, but these need to be appropriately vetted to avoid “white elephant” projects. For instance, projects of low-cost capital and high returns could include low-emission, resilient infrastructure, such as solar, wind, and hydropower projects.¹⁸ In most LICs and EDMs, NDCs focus mainly on infrastructure projects.¹⁹ Nevertheless, some observers see a large gap between climate spending needs and the availability of shovel-ready projects.²⁰

¹⁷ As noted above, about 60 percent of the 73 countries that were eligible for the G20 Debt Service Suspension Initiative in 2020–21 are at high risk of debt distress or already in debt distress.

¹⁸ GFF (2021).

¹⁹ Hepburn and others (2020).

²⁰ Hillman and Tippet 2021.

Annex 4. Risk Management²¹

Downside risks under high-default scenarios are significant. As was seen in the subprime crisis in the United States, rapidly scaling up investments in risky sectors may lead to portfolios with much larger and/or more highly correlated risks than were anticipated prior to the bust. Large-scale defaults of infrastructure projects could lead to the providers of the subordinated capital, and the investors taking significant losses.

Therefore, it is crucial that financing structures align the incentives of risk capital providers, the owners and operators of the projects, and their host governments. Projects should be appropriately selected and planned to increase their chance of success. The financial vehicles through which the funding is provided must provide diversification for investors while allowing for swift project approval. The AP EGO Fund does this through the purchase of green bonds issued by banks. The bank intermediaries provide a level of safety, relieving the fund managers from devoting too many resources to credit analysis. Diversification across countries could provide additional diversification benefits but could make the investment vehicles less transparent and thus riskier.

Significant buy-in in the countries where the investments will take place is important. EMDEs with relatively strong state capacity, at or close to middle-income level, and with market access, could benefit from private capital mobilization, while smaller LICs with weaker capacity should prioritize improved public investment efficiency and official aid.

Greater private finance for infrastructure exposes poor households to higher costs for services. In the past, many reforms failed because of a lack of social consensus and an inability to share gains broadly. Measures should compensate those who are adversely affected, especially those whose utility costs increase because of the private sector delivery of infrastructure services.

Making sure projects are effective. In-depth public-private dialogue is key to getting buy-in from stakeholders and the broader population. Likewise, the Public Investment Management Assessment framework can play an important role in helping countries evaluate the effectiveness of their PPPs. Design principles can also help ensure the effectiveness of projects. For PPPs, principles include identifying a clear market failure, displaying additionality, leaving sufficient risk and control with the private sector, and minimizing contingent liability risks for the state.

²¹ Eyraud and others (2021).

Annex 5. MDB Climate Finance Instruments²²

New developments in MDB climate finance include the development by the EIB of a product that links the loan's interest rate to emission reductions, as well the finalization, by the MDB Climate Change Mitigation Working Group, of the tracking methodology for climate mitigation finance. As a result of the latter, MDBs started tracking the use of the new methodology in 2021. The new methodology includes a more granular breakdown of the types of eligible activity, clear criteria that must be met, and additional guidance to facilitate the application of the criteria. MDBs have stated that they intend to ensure the consistency of the activities they report as climate finance with countries' long-term, low-carbon, and climate-resilient pathways to meet the goals of the Paris Agreement.

The *Joint Report on Multilateral Development Banks' Climate Finance* includes the following typology of financial instruments containing climate finance that were reported by MDBs for 2020.

- **Advisory services.** MDB advisory services include advising national and local governments as well as private sector actors on a variety of topics, for instance how to improve their investment climate and strengthen basic infrastructure. The MDB tracks and reports the costs of managing advisory programs, which may consist of staff time, studies, and training with clients. Similar to investments, some programs are 100 percent climate-related, and some have a climate component tracked in the overall program budget.
- **Equity.** Ownership interest in an enterprise that represents a claim on the assets of the entity in proportion to the number and class of shares owned.
- **Grants.** Transfers made in cash, goods, or services for which no repayment is required. Grants are provided for investment support, policy-based support and/or technical assistance and advice.
- **Bond.** A type of bond, the issuance of which is done by a client and supported by an MDB, where the proceeds are applied exclusively to financing or refinancing, in part or in full, new and/or existing climate projects. Only the percentage of proceeds that are used for activities included in the joint MDB methodology for tracking climate finance count as climate finance.
- **Guarantees** are instruments provided by an MDB to cover commercial and non-commercial risk. Guarantees support private sector investments, commercial borrowing by sovereign or state-owned enterprises, and/or commercial borrowing by the sovereign for budget financing and to support reform programs. Guarantees are extended for eligible projects that enable financing partners to transfer certain risks that they cannot easily absorb or manage on their own. Guarantees cover equity and a wide variety of debt instruments and support financial sector projects (including those of capital market investments and trade financiers and nonfinancial-sector business activities corresponding to activities across sectors).
- **Investment loans** are transfers for which repayment is required. Investment loans can be used for any development activity that has the overall objective of promoting sustainable social and/or economic development, in line with the MDBs' mandates. Proceeds used for activities included in the joint MDB methodology for tracking climate finance count as climate finance.
- **Refinancing.** Refinancing is the replacement of an existing debt obligation with another debt obligation under different terms. Refinancing can be classified as climate finance subject to the following terms:
 - ◆ Refinancing of assets that have reached financial closure for the entire term of the project or that have passed the break-even point, provided that the client commits to originating new climate deals for that amount within the next 24 months.
 - ◆ Refinancing of assets where financial closure has not yet taken place, or the project has not yet been fully constructed and is not yet operational.
 - ◆ Bringing in additional long-term funds to replace short-term bridge loans or strengthening the financial terms of the climate-related asset through long-term loans with better terms than those of previous loans (for

²² This typology is extracted from the [2020 Joint Report on Multilateral Development Banks' Climate Finance](#) (MDBs, 2021; pp 46–47: Annex E: Types of Instrument).

example, they correct a mismatch of maturity, adjust the costs of asset construction, reduce exchange rate impact, replace expensive debt, and so on).

- ◆ Refinancing climate finance projects that have already been constructed or are already operational but have not passed the breakeven point (for example, recently built solar projects). The break-even conditions are confirmed by the investment team.
- **Working capital.** Working capital is finance provided for operational expenditures. Working capital is climate finance if it leads to, enables, or supports the implementation and operation of activities included in the joint MDB methodology for tracking climate finance.
- **Lines of credit** provide a guarantee that funds will be made available, but no financial asset exists until funds have been advanced. Climate finance is the proportion of the credit line that is committed to activities defined as eligible in the MDBs' climate finance tracking methodologies.
- **Policy-based financing.** Financing for a public borrower that helps the borrower to address actual or anticipated requirements for development finance of domestic or external origins. Policy-based financing supports a program of policy and institutional actions for a particular theme or sector of national policy. While it does not use the cost estimation approach for each policy action, disbursements of PBF are conditional on the borrower fulfilling their policy commitments in the lending agreement. The proportion of this public financing that is reported as climate finance is the same as the proportion of the climate-related "prior actions" agreed to allow the policy-based financing to proceed. For example, if one in three prior actions are climate-related, one-third of the resulting policy-based financing would be counted as climate finance.
- **Results-based financing** directly links the disbursement of funds to measurable results in a government-owned program. RBF aims to increase accountability and incentives for delivering and sustaining results, improve the effectiveness and efficiency of government-owned sector programs, promote institutional development, and enhance the effectiveness of development. Proceeds used for activities included in the joint MDB methodology for tracking climate finance count as climate finance.

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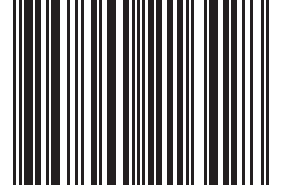


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