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POLICY BRIEF

23-2 Multilateral development banks are key to unlocking low-carbon investments in developing economies

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INTRODUCTION

Despite sharp cost decreases and investment increases for some low-carbon technologies in advanced economies and China, other emerging markets and developing economies (EMDEs) have yet to fully tap these investment opportunities.[1] The opportunities arise from the increasing cost competitiveness—if not cost dominance—of technologies like solar photovoltaics (PV) and wind turbines to generate electric power as well as battery electric cars and motorcycles. But so far, most investments in these technologies are in advanced economies and China. Because EMDEs are set to see significant increases in their economic activity and energy use in the coming decades, their prompt pivot to low-carbon technologies is central to both their sustainable development and a stable climate (IEA 2022a, pp. 107–10, 241–46).

Some argue that adequate carbon pricing and greater financial transparency would unlock low-carbon investments in EMDEs, but evidence points to the greater significance of other impediments. For example, barriers arise from piecemeal energy reforms, inadequate energy market designs, institutions, and infrastructure, high switching costs to new energy technologies, and domestic

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1 In this Policy Brief, low-carbon technologies are those consistent with a net zero emissions (NZE) energy system in the long run even if their current use entails some emissions. For example, battery electric vehicles (EVs) produce some emissions because the electric power to charge them is not fully decarbonized. But battery EVs charged with low-carbon power would be consistent with an NZE system.

financing constraints. Price distortions from neglected carbon emissions and fossil fuel subsidies and financial disclosures matter too, but they are not barriers to low-carbon investments that are increasingly competitive at current prices and have a track record of attracting private finance.

The multilateral development banks (MDBs) are in a unique position to decisively help lower barriers to low-carbon investments in EMDEs and unlock these sustainable development opportunities.[2] Their differentiating governance, financial and technical capabilities, and financing instruments would enable MDBs to support the necessary business environment and energy reforms and to cofinance low-carbon and energy efficiency investments alongside other investors to reduce and manage risks. Effectively applied, these complementary MDB operations would reduce required returns on low-carbon investments, improve their cost-effectiveness, accelerate sustainable development, and advance progress toward net zero emissions (NZE) and a stable climate. But the MDB approach to climate change mitigation so far is opportunistic rather than transformative.

This Policy Brief assesses how the MDBs should use their unique capabilities to support energy reforms that expand low-carbon investment opportunities and participate in complementary private and public low-carbon investments to mitigate investment risks. They include, for example, support for a two-track approach to electricity reforms—a fast track focused on contractual frameworks for power investments and a fundamental electricity system reform track. Policies to promote energy efficiency in buildings and manufacturing and the efficient growth of cities and transport systems are also pivotal.

In addition to supporting such structural reforms, the MDBs should participate directly in large private and public investment projects in electricity generation and grids and in public transport. To manage foreign exchange rate risks in investments, MDBs should raise local currency funds and both invest them directly in large-scale projects and on-lend them through domestic banks for smaller low-carbon and energy efficiency investments.

This Brief focuses on the diffusion to EMDEs of low-carbon technologies that are increasingly competitive, like renewable electric power and electrification of road transport, buildings, and manufacturing.[3] Headline figures on the investment and financing needed to decarbonize energy indicate the scale of the challenge—a four- to sevenfold increase in low-carbon and energy efficiency investments in EMDEs in the second half of this decade (IEA 2021, pp. 38–40). The question is how to effect this pivotal change.

I begin by examining global developments in low-carbon technologies and the sustainable development opportunities they create for EMDEs. I then examine barriers to these investments in EMDEs, in their business environments,

2 The MDBs considered in this Brief are the African Development Bank, Asian Development Bank, Asian Infrastructure Investment Bank, European Bank for Reconstruction and Development, European Investment Bank, Inter-American Development Bank, Islamic Development Bank, New Development Bank, and World Bank Group. The brief's assessments are also relevant to national, bilateral, and other multilateral development finance institutions that have similar financial resources, technical capabilities, and financing instruments.

3 Equally important issues in the decarbonization of heavy industry, sustainable agriculture, forestry and land use, and adaptation to climate change warrant separate consideration because their economic, social, and political contexts differ significantly from those of low-carbon alternatives that are increasingly competitive at current relative prices. For example, decarbonization of heavy industries that produce emission-intensive traded materials would require both carbon pricing and international policy coordination, which are not yet forthcoming (Fries 2022).

energy reforms, market designs, institutions and infrastructure, and domestic financial systems. Next I turn to the quantity and quality of MDBs' climate change mitigation operations and the need for a pivotal change. Finally, I consider energy reforms to expand opportunities for low-carbon and energy efficiency investments in EMDEs and how MDBs should decisively support these reforms and investments in the low-carbon opportunities they create.

ADVANCING LOW-CARBON TECHNOLOGIES—EXPANDING SUSTAINABLE DEVELOPMENT OPPORTUNITIES

Global investment in low-carbon technologies reached an estimated $1.4 trillion in 2022, up from a prepandemic $1.1 trillion in 2019 (figure 1).[4] Investments in renewable and nuclear power generation as well as electricity networks and energy storage were an estimated $0.9 trillion in 2022. Energy efficiency investments were $0.4 trillion and those in low-carbon end-use technologies, such as electric vehicles (EVs) and heat pumps, $0.2 trillion, with EV investments growing particularly rapidly (IEA 2022b, p. 153). Investments in low-carbon fuels and carbon dioxide capture, use, and storage remained limited.

Most low-carbon investments were in advanced economies ($0.7 trillion) and China ($0.4 trillion). EMDE investments were $0.2 trillion, mostly in low-carbon electricity generation and networks and energy efficiency (figure 1, lower panel). Moreover, while these investments and those in complementary energy storage increased significantly in advanced economies and China, they remained broadly stable in EMDEs, as did investments in traditional power generation (figure 2). Investments in fossil fuel generation in EMDEs continued at about 30 percent of total power sector investments over the past decade, while the share fell to below 10 percent in advanced economies and China.[5] Their earlier pivots toward low-carbon technologies reflect their early roles in pioneering them.

Having been successfully commercialized in advanced economies and China through large policy-supported investments in innovation and early deployment in these initial markets, some low-carbon technologies are increasingly cost competitive with the incumbents.[6] The new technologies include solar PV, wind turbines, lithium-ion batteries, electric drivetrains for vehicles, and electric heating technologies for buildings (e.g., heat pumps). With these advances in low-carbon technologies, energy system transformations are shifting gears—from policy-supported toward market-driven change. This shift brings into focus the diffusion of low-carbon technologies and sustainable development opportunities in EMDEs.

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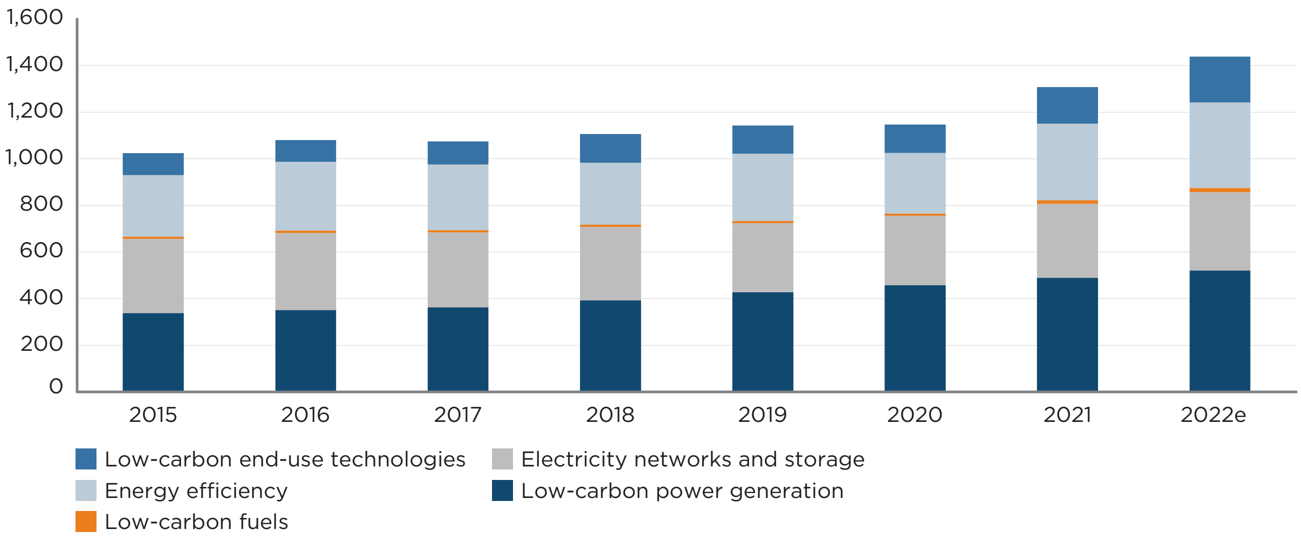
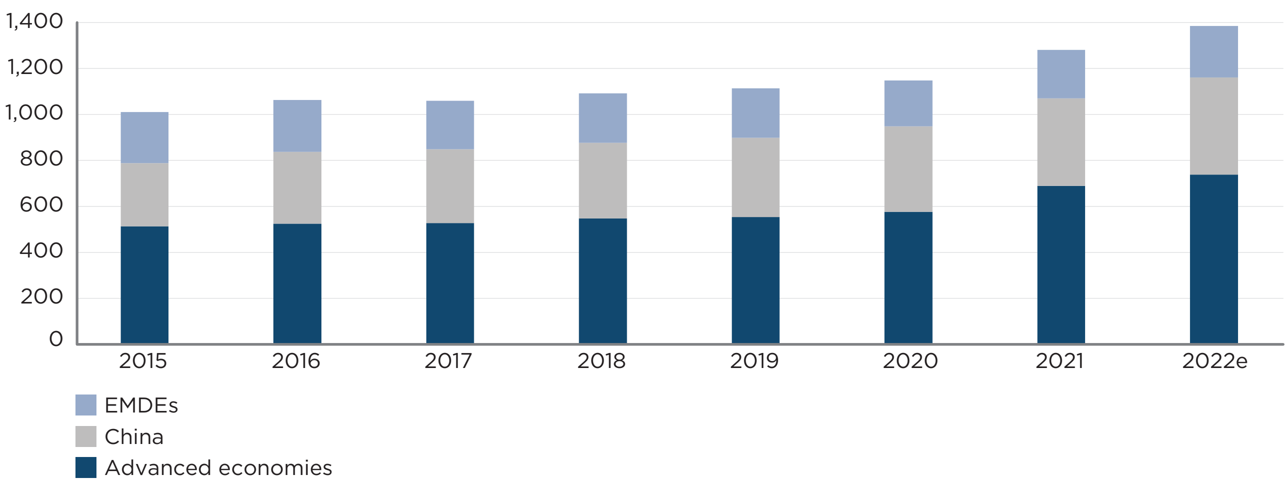
4 Low-carbon and energy efficiency investments include only those in energy systems. Investments in manufacturing these technologies are important too, and some EMDEs, such as Vietnam, are developing comparative advantages in their manufacture (ClimateWorks Australia and Vivid Economics 2019). But these investments are not included in the IEA accounting of low-carbon investments.

5 New fossil fuel generation plants use natural gas in advanced economies and mostly coal in China.

6 The estimated real resource costs of realizing scale economies and achieving commercial viability of solar PV and wind turbines is around $2 trillion (present value in 2019 dollars; Fries 2021, pp. 130–31). These resource costs were largely borne by advanced economies and China.

Figure 1
Global low-carbon investments by sector and country group, 2015–22e





e = estimate; EMDEs = emerging markets and developing economies

Note: Low-carbon power generation includes investments in renewable and nuclear plants. Electricity networks and storage comprise investments in transmission and distribution networks as well as various forms of energy storage like pumped hydroelectric and batteries. Examples of low-carbon fuels are modern biomass, biofuels, and electrolytic hydrogen. Energy efficiency covers buildings, transport, and industry. Examples of low-carbon end-use technologies are electric vehicles (battery and plug-in hybrid) and heat pumps.

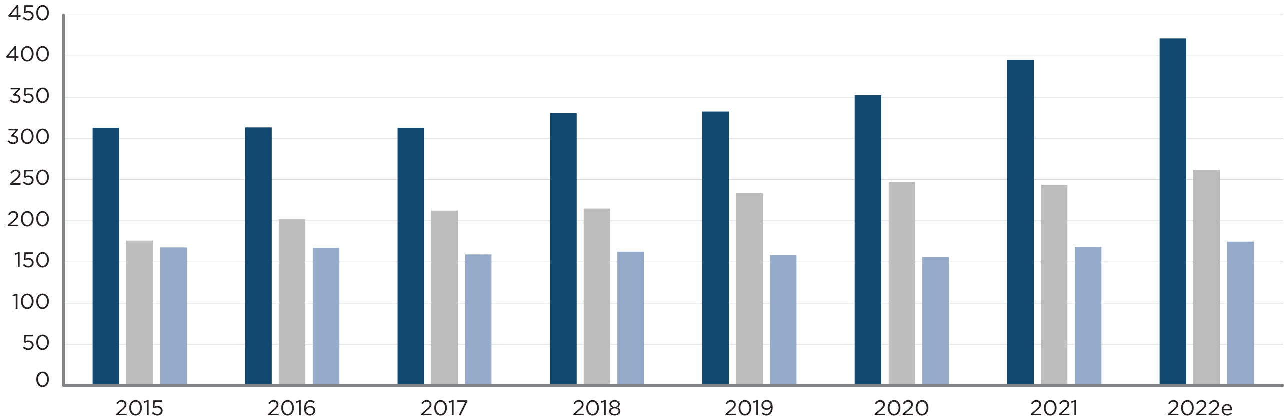
Source: IEA (2022b) dataset.

Figure 2

Annual power sector investments by country group and category, 2015–22e

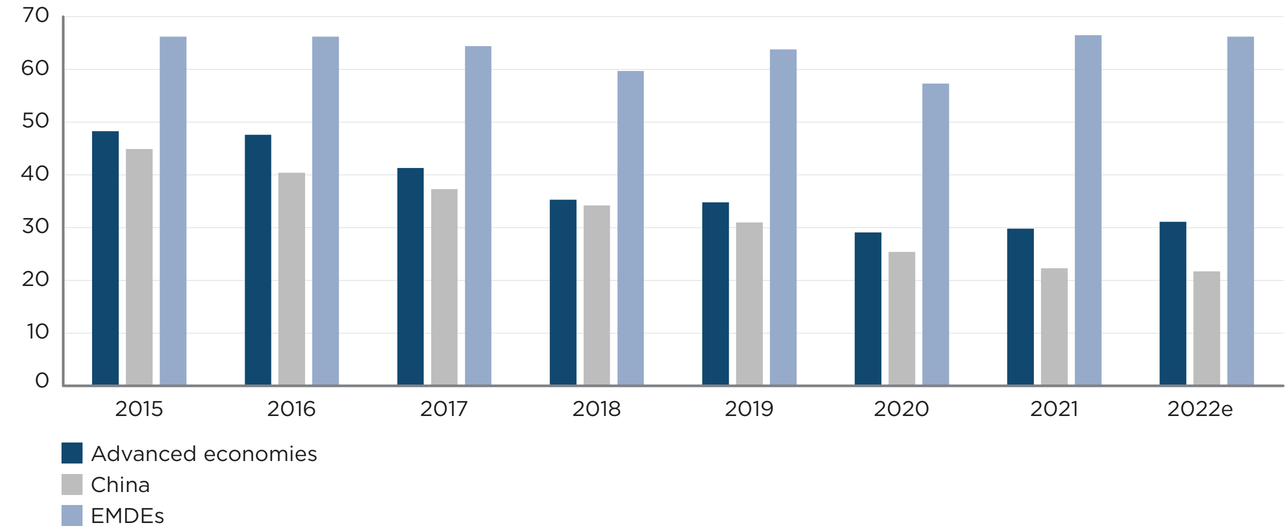
Low-carbon generation, storage and grids

billions of US dollars



Fossil fuel generation

billions of US dollars



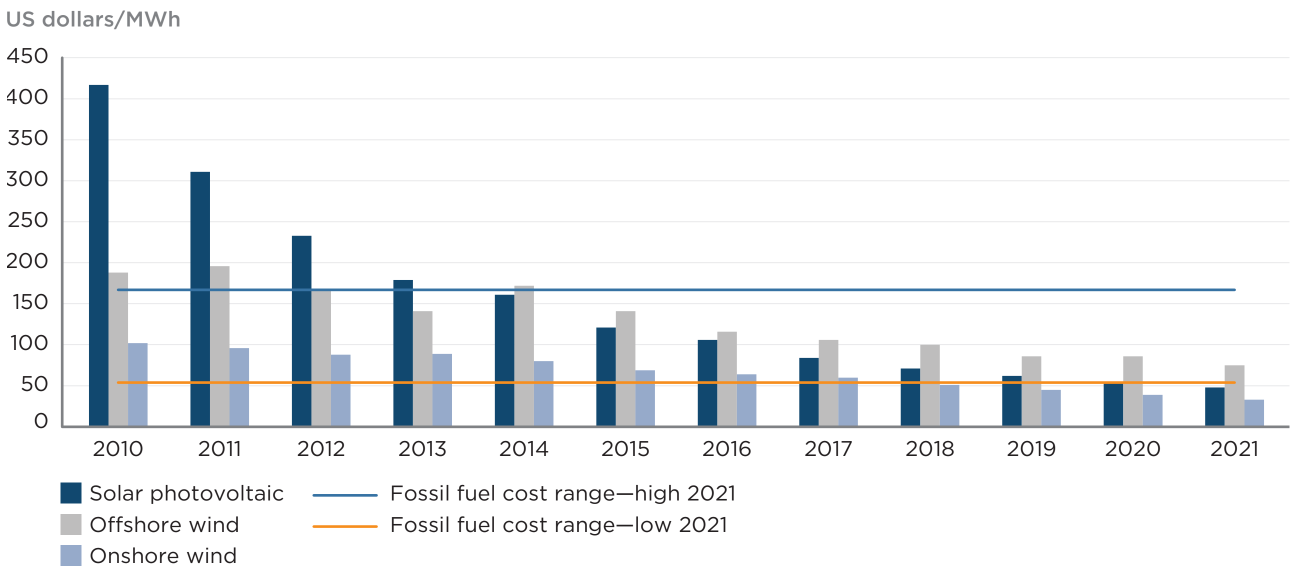
e = estimate; EMDEs = emerging markets and developing economies

Note: Low-carbon generation includes that from renewables and nuclear resources. Fossil fuel generation includes plants that use of coal, oil, and natural gas for traditional thermal power generation. In advanced economies, most investment in fossil fuel generation is in plants that use natural gas. In China and other EMDEs, most new fossil fuel plants use coal as their thermal fuel. The increase in investment in low-carbon generation over the last decade in advanced economies and China reflects both government policy supports for and increasing cost competitiveness of renewable power generation.

Source: IEA (2022b) dataset.

The sharp decline in levelized cost of electricity (LCOE) from renewable power generation illustrates part of this shift. The LCOE is the average unit cost of electricity from investments in new generation capacity given expected capital and operating costs, operating lifetimes, and capacity use factors. The LCOE of renewable power from wind and solar resources declined sharply over the past decade as their manufacturing costs fell and capacity use rose with design improvements (figure 3).[7] By 2021 the LCOE for renewables was at the lower end of the range of that for new fossil fuel generation plants.

Figure 3
Global weighted-average LCOE of new generation capacity, 2010–21



LCOE = levelized cost of electricity

Note: Average LCOE is weighted by capacity installed for the year of plant commissioning. The constant fossil fuel cost range is for plants commissioned in 2021. The low-end of the fossil fuel cost range is for so-called baseload plants. For example, the LCOE of new advanced coal plant in India is around $55/MWh, which is designed to operate at full capacity to meet a predictable baseload of power demand. At the high end of the range are fossil fuel peaking plants—natural gas combustion turbines and diesel engines—used to meet demand peaks.

Source: IRENA (2022a) dataset.

But the LCOE of renewables is only part of their whole-system cost. System integration costs arise from the need to balance profiles of power generation and demand, connect new generation capacity to transmission networks, and ensure system balancing to counter short-run uncertainties in generation and demand. Of these costs, profile costs for variable renewables are the largest because renewable generation relies on the availability of wind and solar resources, and their availability is not necessarily correlated with demand.

7 While the emphasis is on solar PV and wind turbine technologies because of their low cost and ubiquitous primary resources, other renewable technologies such as solar thermal, geothermal, and hydroelectric power can also be cost-effective low-carbon alternatives where their primary resources afford.

System integration costs tend to be small when variable renewables account for only a small share of total generation. These costs rise along with the renewables share in generation, though this increase is countered as other technologies on the systems adapt (Strbac and Aunedi 2016, pp. 11–13). Nevertheless, even allowing for their high integration costs, variable renewables are competitive with traditional technologies at current costs and generation shares in many countries.[8]

While cost and investment trends for renewable power generation point to their increasing competitiveness, it is also important to look forward to the power system and international competitiveness implications of global NZE commitments. The availability of wind and solar resources across countries would significantly influence the relative costs of low-carbon power systems, and many EMDEs are abundantly endowed with these resources (Fasihi and Breyer 2020). Their future system costs depend on cost-effective combinations of solar PV and wind turbines and flexible technologies to balance supply and demand.

Where wind resources are relatively abundant, efficient technology combinations use wind turbines more than solar PV. Similarly, solar-oriented systems are more cost effective where solar resources are relatively abundant and correlate with intraday variation in power demand. On flexible technologies, battery storage complements solar PV, for which intraday variability and battery cycling are high. Electrolytic hydrogen, hydrogen storage, and combustion turbines complement wind turbine generation, which varies significantly at frequencies over days, weeks, and seasons.

Given cost trends for solar PV, wind turbines, lithium-ion batteries, and electrolyzers, figure 4 shows how their sustained technological progress would shape projected costs of power supply from these renewable resources across regions. The projected renewable supply curves are for power that can be dispatched to meet typical demand profiles using least-cost combinations of these four low-carbon technologies. They assume that cost trends for these technologies are sustained over the next three decades.[9]

The projections show that low-carbon electric power supplies based primarily on solar and wind resources and adapted to demand profiles would be low cost in South America, Sub-Saharan Africa, and the Middle East and North Africa. North America, South Asia, Northeast Asia, and Southeast Asia would also benefit from relatively low-cost electricity; Europe and Eurasia would benefit less.

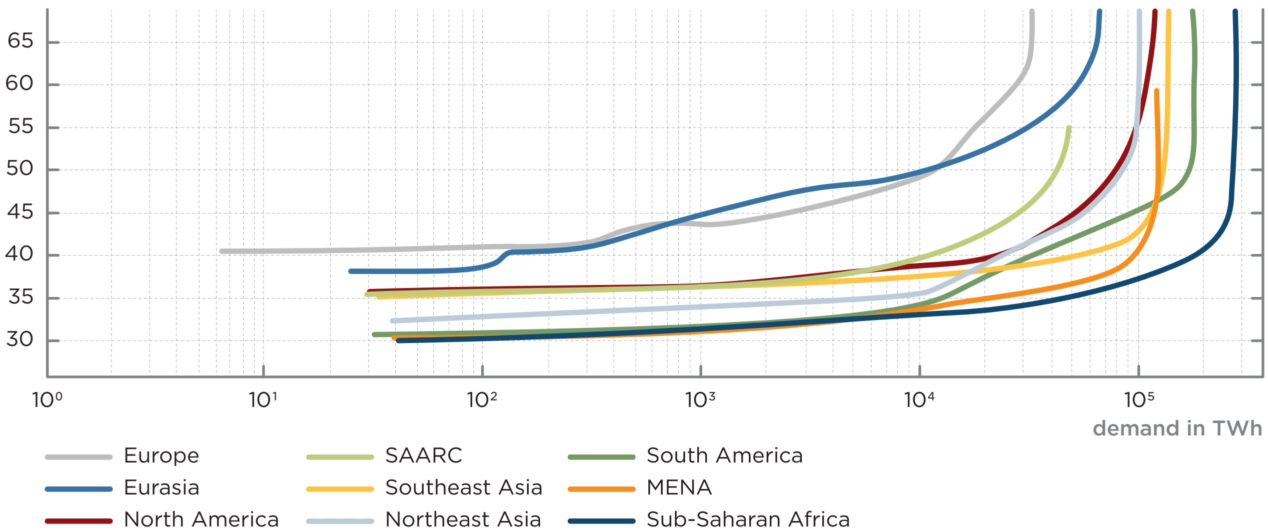
These technology developments thus create for many developing countries the potential for new sources of sustainable growth and comparative advantages in a global context of NZE and a stable climate. In most regions, the projected long-run cost of dispatchable renewable power is less than the current LCOE of traditional thermal generation. The sustainable development potentials thus arise

8 For example, wind turbines and solar PV account for about 10% of total power generation worldwide, and integration costs at this share of total generation are about $10/MWh (IRENA 2022b, Strbac and Aunedi 2016). At a renewable generation share of 50 percent, modelled system integration costs for additional renewable capacity in a typical current system rise to $50/MWh (OECD/NEA 2019, pp. 19–20). But only Denmark has reached this share of wind and solar PV power in total generation, and other technologies on its system have adapted to their variable output, including system interconnections. Traditional power technologies also have integration costs, but they are low because existing system technologies are designed around how they perform.

9 See also Way et al. (2022) on predictability of low-carbon technology cost trends.

from abundant and affordable domestic energy supplies and export of electricity intensive goods and services, including low-carbon fuels produced from electricity such as hydrogen and synthetic hydrocarbon fuels. Electric power itself is largely nontradable because of its high transportation and storage costs.

Figure 4
Projected supply curves for electric power from cost-optimized hybrid plants that match demand profiles, nine regions, 2050



LCOE = levelized cost of electricity; SAARC = South Asian Association for Regional Cooperation countries; MENA = Middle East and North African countries

Note: Electric power supply curves are based on cost-optimized combinations of solar photovoltaics (PV), onshore wind, battery storage, and electrolytic hydrogen production and its conversion into electric power with combustion turbines. These hybrid-plant configurations are optimized to renewable resource availability by geographic location—primarily solar-PV-based, wind-based or mixed plants. To aid interpretation of the supply curves, note that the assumed exchange rate is \$1.35/€1, so an LCOE of €40/MWh equals \$55/MWh, about the current LCOE from an advanced coal plant in India. The IEA (2022b) projects in its sustainable development scenario total electricity demand in 2050 to be less than 1 TWh x 10^5 in each of these regions, so relatively flat parts of the supply curves would fulfil most projected power demands. The projected electric power supply curves based on this limited set of technologies show the potential useful energy from renewable resources they would create. Moreover, more diversified systems that include hydroelectric, biomass, solar thermal, and nuclear generation could afford lower power supply curves in regions with access to these resources and technologies.

Source: Fasihi and Breyer (2020). CC BY 4.0.

While renewable power and complementary flexible technologies will be central to low-carbon energy supply, energy end-use technologies must also change. They include alternative drive trains for vehicles, heating systems for buildings and improvements to their fabrics, and manufacturing technologies.

Like renewable electric power, electric vehicles are rapidly gaining market shares—at least in advanced economies and China. Worldwide sales of electric cars (battery electric and plug-in hybrid) reached 6.6 million in 2021, about 9 percent of total sales (IEA 2022c, pp. 16–18). In Europe and China, their largest markets, sales exceeded a 15 percent share, despite declining unit subsidies. US sales also increased, albeit from a lower market share, as did sales in EMDEs, though their total was less than 0.1 million.

In EMDEs, two- and three-wheeled EVs are the affordable market entry point, and their sales are accelerating. They now have adequate range for daily commutes and total ownership costs below those of traditional motorcycles (IEA 2022c, p. 29). Their total sales reached 10 million in 2021, primarily in China and other Asian countries. In China, their largest market, these EVs have a 50 percent share of the two- and three-wheeled vehicle market.

Eurasia and China aside, energy supplied to buildings in EMDEs is primarily electricity and biomass (Fries 2021, pp. 43–46). There is relatively little use in buildings of fossil fuels for heating and hot water. Electric heating and cooling systems are typically less expensive than modern fuel-based systems in many EMDEs. Key challenges in building energy use relate to thermal efficiency, airtightness of building fabrics, and the performance of passive and powered heating, cooling, and ventilation systems.

There is, however, extensive household use of traditional biomass fuels in Sub-Saharan Africa and South Asia. In these countries, expanding access to modern energy—electricity and clean cooking fuels—is the imperative for improving living standards (IEA et al. 2022).

BARRIERS TO LOW-CARBON AND ENERGY EFFICIENCY INVESTMENTS IN EMDEs

While declining costs of some low-carbon technologies are important, so too are the overall business environments for investment in EMDEs. Macroeconomic conditions, investor confidence, regulatory frameworks, and policy uncertainties all influence country-specific business environments and investment opportunities (Ameli et al. 2021, Prasad et al. 2022). These environments have added significance for low-carbon investments because of their high capital intensity relative to incumbent technologies (Hirth and Steckel 2016; AfDB 2021, p. 68), and evidence shows that variation in business environments among EMDEs does have a significant impact on their low-carbon investments (Ragosa and Warren 2019).

Domestic financing conditions in EMDEs matter too. They are important because many low-carbon investment projects generate local currency revenue streams (electric power and public transport) or rely on local currency incomes and revenues to service their financing (e.g., for motorcycles, cars, and buildings). These investments are better financed with local rather than foreign currency loans to avoid foreign exchange risk. But development of domestic financial systems varies widely among EMDEs, and this variation significantly affects financing availability and terms, investment, and growth (Hassan, Sanchez, and Yu 2011).

There are, moreover, barriers to low-carbon investments specific to EMDE energy sectors, as in electricity sectors, which are affected by the following (AfDB 2021):

- limited institutional capacity to develop and implement strategic plans for system expansion and integrate variable renewables into system operations
- weak governance of electricity sector institutions and public utilities and lack of transparency in government interventions in the sector

- lack of cost-reflective tariffs and commercial viability of power utilities, with governments directly or indirectly funding system operations and expansion
- significant nontechnical and technical losses from transmission and distribution grids and insufficient ongoing investment to maintain their reliability
- poor system reliability and customer recourse to behind-the-meter diesel generators to manage system availability.

Because of uncertain and sometimes arbitrary changes to energy policies, long-term contracts with creditworthy counterparties support power system investments in many countries—advanced economies and EMDEs alike (Blackmon and Zeckhauser 1992). Long-term power purchase agreements (PPAs) have long seen widespread use in wholesale power markets to provide investors in new generation capacity greater revenue certainty. And contracts with "feed-in" tariffs are used to create investment incentives for renewable generation projects in many countries to counter shortcomings in climate change mitigation policies (Newbery 2016).

In many EMDEs, poor financial and operational performance of public utilities also contributes to extensive use of long-term PPAs backed by governments to support investments in both traditional and low-carbon power. Establishing contracting frameworks along with the fundamental energy market design, legal and regulatory institutions, financial, and operational conditions for long-term investment in any power sector is challenging, and especially so in EMDEs.

World Bank assessment of the contracting frameworks for renewable generation investments highlights several specific challenges (figure 5). Most EMDEs, especially those in Europe, Central and East Asia, the Middle East and North Africa, and Latin America, have made progress over the past decade in reforms that support renewable investments, especially in enacting legal frameworks and adopting targets and plans for renewables expansion.

But China aside, other EMDEs lag well behind advanced economies in overall reforms. The relative reform shortcomings of these EMDEs are especially significant for (i) creating incentives for and managing the counterparty risks of renewable investments, (ii) enabling network connections for renewables, and (iii) providing high-quality forecasting of renewable generation for system reliability. The main gaps thus relate not to laws on the books and sector plans but to their delivery and investment.

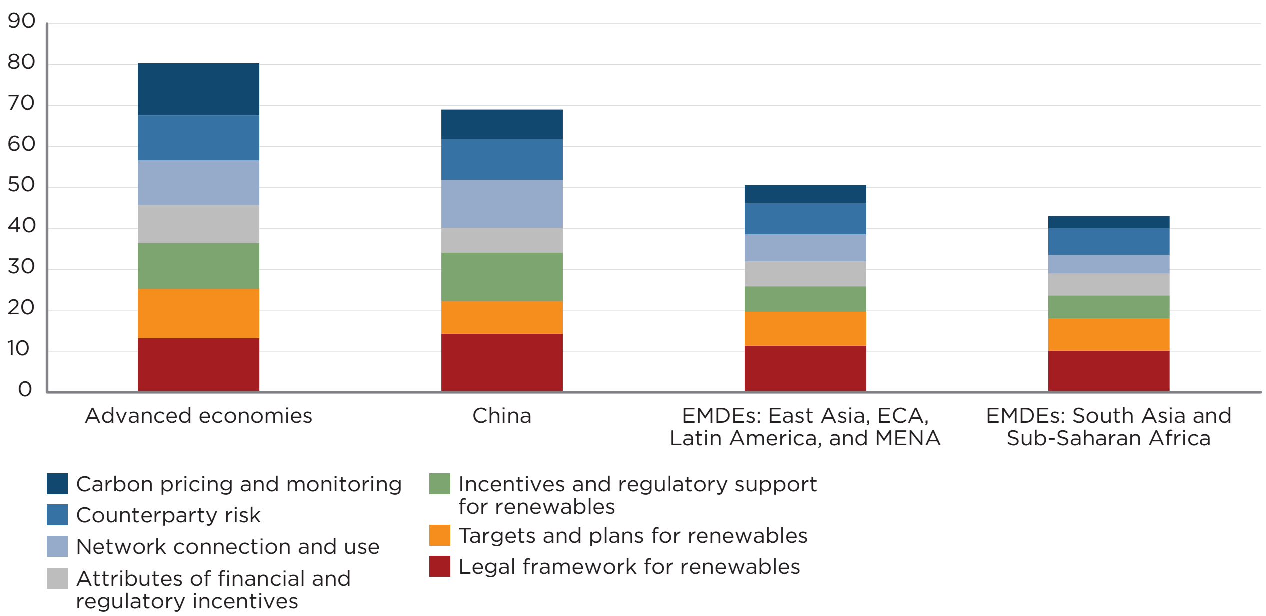
On energy efficiency, most EMDEs also lag well behind advanced economies in minimum efficiency standards for appliances and cars, effective building codes, and energy labelling to promote efficiency in buildings and transport (World Bank 2020, pp. 30–34).[10] As might be expected, progress with these policies tends to be associated with higher per capita incomes and larger expenditure shares of these goods (World Bank 2020, p. 32).

10 For evidence on the economic case for energy efficiency regulation and effectiveness of regulatory interventions, see Fries (2021, pp. 175–87).

As important as buildings' quality and energy efficiency is their spatial layout in cities. Urban areas use most of the world's energy, and how they develop is central to efficient energy use (United Nations Department of Economic and Social Affairs 2019, p. 4). For example, safe and affordable housing in cities should link efficiently with transport corridors and easy connections between jobs and housing (Bertaud 2015). This requires integration of transport system and urban land-use planning, including an efficient mix of public transport and private car use. But urban planning and transport systems in EMDEs often fall short of this goal (Glaeser and Joshi-Ghani 2015, pp. xv–xvii).

Figure 5
Index of enabling conditions for renewable energy investment by region, 2019

index: 0 to 100



EMDEs = emerging markets and developing economies; ECA = Europe and Central Asia; MENA = Middle East and North Africa

Note: Each country in the country groups has an equal index weight. Among EMDEs, regions with predominantly middle-income countries (East Asia, ECA, Latin America, and MENA) are separate from those with mostly lower-income countries (South Asia and Sub-Saharan Africa) because energy reform priorities and capacities differ among them. The enabling conditions index consists of standardized policy assessments along seven dimensions: legal framework for renewables; targets and plans for renewables expansion; incentives and regulatory support for renewables; attributes of financial and regulatory incentives; network connection and use; counterparty risks; and carbon pricing and monitoring. Each dimension is scored by World Bank experts on a scale of 0–100 and given equal weight in the overall index. However, with growing cost competitiveness of renewable generation, the significance of carbon pricing as a necessary investment incentive for renewable generation is diminishing.

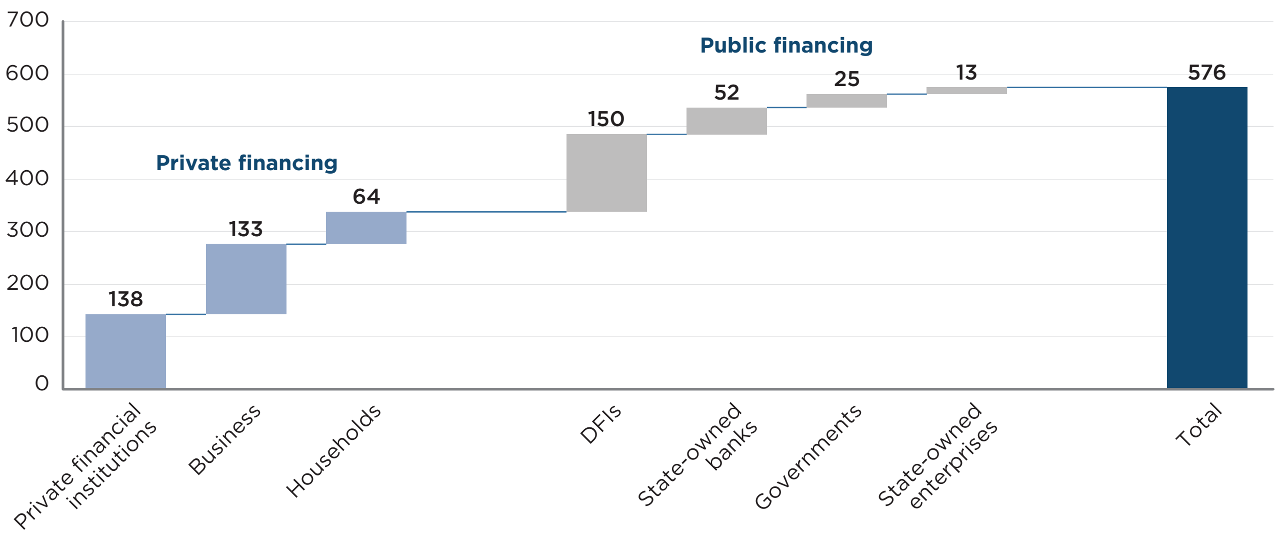
Source: World Bank (2020) database.

GLOBAL FINANCING OF LOW-CARBON AND ENERGY EFFICIENCY INVESTMENTS

Private financing provided 58 percent of identified global funding for climate mitigation (low-carbon and energy efficiency) investments in 2020, and public financing 42 percent (figure 6).[11] Of the $335 billion in private financing, businesses provided $133 billion, mostly as balance sheet financing and some project-sponsor equity, and households $64 billion (CPI 2021). Private financial institutions, funds, and institutional investors provided $138 billion in funding largely as debt financing for business and household balance sheets and some debt and equity for stand-alone investment projects.

Figure 6
Global financing of investments in climate mitigation by source, 2020

billions of US dollars



DFIs = national, bilateral, and multilateral development finance institutions

Notes: Climate mitigation investments include low-carbon and energy efficiency investments, such as those shown in figure 1. The CPI data on identified financing flows for climate mitigation are less comprehensive in coverage than data on investments in low-carbon technologies and energy efficiency in IEA (2022b). Not all financing flows are identifiable.

Source: CPI (2021) dataset.

Of the $241 billion in public financing, national, bilateral, and multilateral development finance institutions (DFIs) and multilateral climate funds provided $151 billion, mostly as project-level debt at market interest rates. The bilateral and multilateral DFIs and multilateral climate funds also provided some project debt on concessional terms. State-owned financial institutions and enterprises provided $52 billion and $13 billion, respectively, primarily as balance sheet financing, and governments $25 billion largely as grants.

11 Coverage of identified financing flows is comprehensive for investments in energy supply—low-carbon power and fuels as well as electricity networks and energy storage—and transport. But there are significant data gaps in investment financing for buildings, infrastructure, and industry (CPI 2021, pp. 8–9).

There is, however, wide variation in financing of low-carbon investments among countries, reflecting primarily differences in development and structure of domestic financial systems and ways governments support low-carbon investments. In the advanced economies in Europe and North America, the private financing share is 70 percent and 100 percent, respectively (CPI 2021 dataset). Moreover, in Europe, much of the public financing is from DFIs (like the European Investment Bank), which provide financing on largely market terms. European governments also provide some direct grant funding.

In China and other EMDEs in aggregate, public rather than private financing plays the larger role (CPI 2021 dataset). Businesses, households, and private financial institutions contribute less than half of total financing for low-carbon investments. In China the main public funding sources are the national DFIs, state-owned banks, and government (CPI 2021, p. 30). Financing in other EMDEs is like that in China, but with a much more significant role for bilateral and multilateral DFIs—including the MDBs—and international financing.

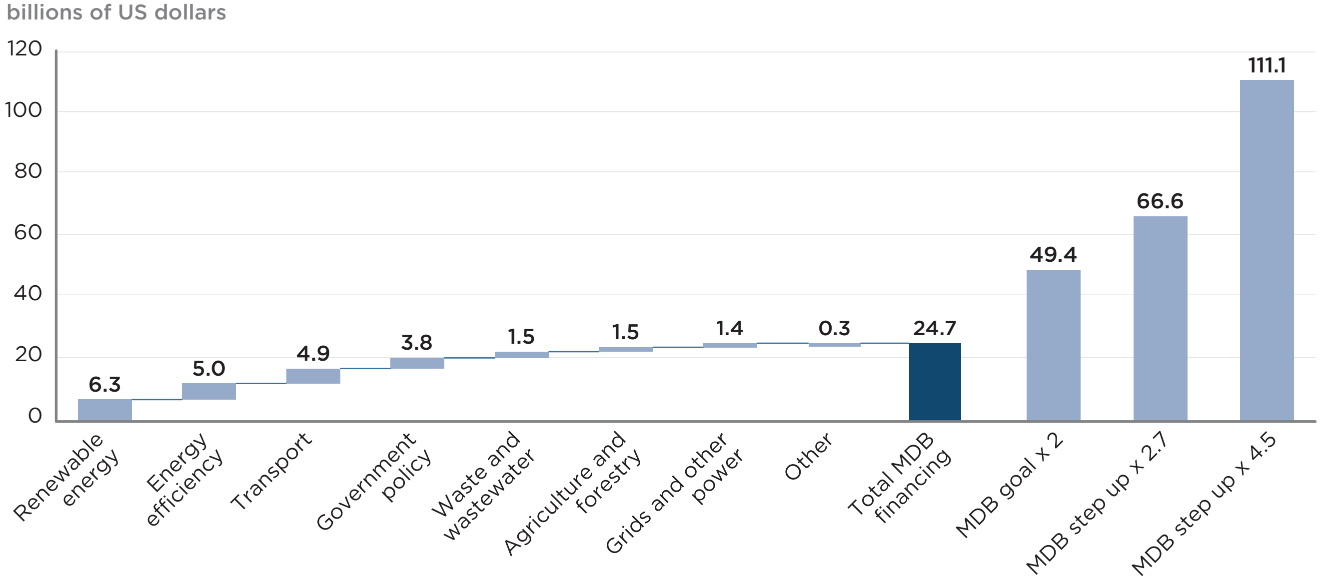
Financing for low-carbon investments thus broadly mirrors investment finance in general, with variations among countries reflecting differences in development and structure of domestic financial systems. Where adequate energy and climate policy frameworks are in place, as in Europe and North America for some energy sectors (electric power and EVs), and financial systems well developed, private investment and financing largely transform energy. There is also significant evidence that portfolio investors are informed about and consider the risks and opportunities of high- and low-carbon investments in their asset valuations (Bolton and Kacperczyk 2021; Bolton, Halem, and Kacperczyk 2022). In contrast, EMDEs clearly face domestic financing constraints for low-carbon investments.

WHAT HAVE MDBs DONE TO SUPPORT LOW-CARBON INVESTMENTS IN EMDEs?

In 2020 the MDBs provided $25 billion in climate change mitigation financing in EMDEs (figure 7). The main sectors attracting this support were renewable energy, energy efficiency, and public transport, along with lending for government policy development and implementation for climate change mitigation. MDBs also financed investments in waste and wastewater management, agriculture and forestry, and grids and other low-carbon generation. Most MDB financing—73 percent—was investment loans (AfDB et al. 2021). This was complemented with some policy-based lending and grants. Almost three-quarters of financing was to the public sector. The MDBs mobilized a further $22 billion in public and private cofinancing—a cofinancing ratio of about 1:1.

The MDBs have also committed to doubling their climate mitigation financing by 2025 and increasing their cofinancing ratio from 1:1 to 1:2, especially with the private sector (AfDB et al. 2021, p. 3). But total climate mitigation investment and financing must increase by much more if the climate stabilization goals of the Paris Agreement are to be achieved.

Figure 7
MDB financing of EMDE climate mitigation in 2020 by sector and overall targets



MDB= multilateral development bank; EMDE = emerging market and developing economy

Note: Renewable energy includes renewable power generation and heat as well as measures to facilitate integration of renewable energy into power grids. Energy efficiency comprises improvements to industrial facilities, commercial, public, and residential buildings, and vehicle fleet efficiency and low-carbon fuels. Transport includes urban mass transport and nonmotorized transport, higher-density urban development, intercity rail transport, and EV charging infrastructure. Government policy covers technical assistance and policy lending for national planning on climate mitigation and energy sector policies. Mitigation financing targets of the MDBs include their own and the author's projections to maintain the share of MDB financing and cofinancing in overall climate mitigation finance necessary to limit global warming to well below 2°C and 1.5°C, respectively.

Source: AfDB et al. (2021).

AND HOW MUCH MORE DO THEY NEED TO DO?

A projected sevenfold rise in low-carbon investments in EMDEs is necessary to stabilize the climate and limit average global temperature change to 1.5°C (IEA 2021, pp. 38–40). A fourfold increase would be consistent with limiting global warming to 1.65°C. The Paris Agreement goals are to limit global average temperature change to well below 2°C, with a stretch ambition of 1.5°C. If the MDBs and their cofinancers are to maintain their 33 percent share of climate mitigation financing in such a step up in effort, they would need to increase investment on their own account by 2.7- to 4.5-fold and double their cofinancing ratio (figure 7).

Such a boost to climate mitigation financing, including by the private sector, would require substantial improvements in EMDEs' enabling environments for investment in low-carbon technologies and energy efficiency. The MDBs are uniquely placed to support such improvements, but their approach so far is opportunistic rather than transformative.

MDB operations are opportunistic from a climate mitigation perspective because they focus on cost-effective investment opportunities in renewable power generation, energy efficiency, and public transport that readily intersect with the MDBs' core development mandates. There was over the last decade, in comparison, less focus in the MDBs on strengthening EMDE business environments and energy policies to support low-carbon investments, such as fundamental electricity sector reforms and enhanced energy efficiency standards for buildings. Electricity reforms in EMDEs, for example, slowed sharply over the last decade—just as the role of low-carbon electric power in transforming energy systems came to the fore (Foster and Rana 2020, pp. 60–61). This pause reflected in part a poor track record of prior EMDE electricity reforms supported by the MDBs.

HOW SHOULD MDBs SUPPORT LOW-CARBON ENERGY IN EMDEs?

In their recent climate-related strategies, MDBs have committed not only to increase their climate-related financing but also to prioritize support for climate change mitigation policies and low-carbon and energy efficiency investments in key energy-related sectors: energy, agriculture and land use, cities and buildings, transport, and manufacturing (table 1). These strategies largely tick the right climate-related strategic themes consistent with each MDB's existing financial resources, technical and financial capabilities, and operational instruments like technical assistance and debt and equity financing.

The challenge for the MDBs is to deliver their strategies working with their countries of operations at the required scale. This requires country-specific strategies to engage with the reform and investment opportunities at hand, assess their social and distributional impacts, and manage the social and political aspects of change. MDBs should support development of country-owned strategies to reach net zero emissions with evidence and insight on suitable technologies and reform pathways, such as the recently introduced World Bank Country Climate and Development Reports (CCDR).[12]

But the more important role for MDBs is to use their unique capabilities and exploit the complementarities between their public and private operations (Buiter and Fries 2002).[13] These operations, which involve both technical assistance and financing, can improve policy frameworks and business environments for low-carbon investments and mitigate investment risks to reduce required investment returns. If implemented well, they will expand investment opportunities and unlock further low-carbon investments in EMDEs.

One approach to improving the business environment for low-carbon investments is to impose carbon pricing and cut fossil fuel subsidies. Such reforms are seen as a priority for EMDEs (Stern 2021, Bhattacharya et al. 2022). But the more immediate policy priority for these countries is to accelerate diffusion of low-carbon technologies that are increasingly cost competitive at current prices, such as renewable power, EVs, and energy-efficient and electrified

12 See the World Bank CCDR website for the reports.

13 The differentiating characteristics of MDBs relate to how they select and monitor investments, agree on terms, create incentives for fulfilling financing agreements, and allocate subsidies. See Rodrik (1995) on an MDB advantage in monitoring relative private lenders; Hainz and Kleimeier (2012) on policy commitment effects from repeated interactions between MDBs and their countries of operations; Gurara, Presbitero, and Sarmiento (2020) on the MDB preferred creditor status; and Lankes (2021) on MDB blended finance using concessional funds.

buildings and manufacturing.[14] Significant impediments to the diffusion of low-carbon technologies arise from nonprice barriers—energy policies, energy market designs, regulations, and infrastructures (Ameli et al. 2020, Fries 2022). Well-designed business environment and energy reforms lower such barriers.

For example, electric power is destined to play the core role in low-carbon energy systems, and a two-track reform approach to electricity systems in EMDEs is necessary to put them on sound operational and financial footing (Foster and Rana 2020, pp. 24–26): The fast track focuses on improving contractual frameworks to expand immediate investment opportunities for renewable generation and complementary technologies like battery storage. The fundamental track focuses on reforms that improve the long-run operational and financial performance of electricity systems.

The Climate Finance Leadership Initiative (CFLI) Investment Readiness Guidelines highlight immediate reform priorities for long-run investment contracts for renewable power (CFLI 2019, p. 47):

- cost-reflective electricity prices,
- power purchase agreements with necessary protections for international investors that are consistent with efficient system expansion and operation,[15]
- creditworthy or credit-enhanced offtakers for power,
- clear and predictable licensing and permitting procedures for new plants,
- predictable enforcement of contracts, and
- power grid stability and ability to handle variable renewable generation.

Sustained investment in renewable power generation, however, requires fundamental reforms that go beyond narrow reliance on long-run, government-backed investment contracts and improve the underlying performance of electric power systems. They not only enable governments to manage contingent liabilities from their contractual guarantees but also strengthen operational and financial performance and cut system costs for renewables.

14 Carbon pricing is important, especially in heavy industries that produce emission-intensive and tradable materials, but its implementation requires coordination across countries. For example, among major industrial emitters, only the European Union and United Kingdom impose a purposeful carbon price on industrial emissions (~$100 per metric ton), and they plan carbon border adjustments to curb emission-intensive imports. The United States, China, Japan, and South Korea have yet to impose a purposeful carbon price in the industrial sector.

15 This includes PPAs that facilitate flexible use of conventional thermal generation plants in balancing power supply and demand profiles as the share of variable renewable generation increases. Many PPA contracts for conventional plants have take-or-pay provisions that lower the unit cost of electric power but impose a financial cost on the PPA counterparty (typically the government or state-backed utility) for their flexible operation, creating a financial barrier to more renewable generation and “locking in” fossil fuel plants.

Table 1
Climate-related financing goals and mitigation operations of multilateral development banks

Multilateral development bank	Climate-related financing goals	Policy analysis and lending		Sector priorities for low-carbon and energy efficiency investments					Local currency financing
		Country strategy	*Sector reforms*	*Energy*	*Agriculture and land use*	*Cities and buildings*	*Transport*	*Manufacturing*	
African Development Bank	40% share of its annual financing by 2020and align operations with the Paris Agreement goals by 2025	✓	✓	✓	✓	✓	✓	✓	
Asian Development Bank	$80 billion in cumulative climate-related finance from 2019 to 2030	✓	✓	✓	✓	✓	✓		
Asian Infrastructure Investment Bank	50% share of its annual financing by 2025 and align operations with the Paris Agreement goals by mid-2023			✓		✓	✓		
European Bank for Reconstruction and Development	50% share of annual financing by 2025 and align operations with the Paris Agreement goals	✓	✓	✓	✓	✓	✓	✓	✓
European Investment Bank	Exceed 50% share of its annual financing by 2025 and align operations with the Paris Agreement goals			✓	✓	✓	✓	✓	✓

table continues

Multilateral development bank	Climate-related financing goals	Policy analysis and lending		Sector priorities for low-carbon and energy efficiency investments					Local currency financing
		Country strategy	*Sector reforms*	*Energy*	*Agriculture and land use*	*Cities and buildings*	*Transport*	*Manufacturing*	
Inter-American Development Bank	30% share of its annual financing from 2020 to 2023	✓	✓	✓		✓	✓		
Islamic Development Bank	35% share of its annual lending by 2025	✓	✓	✓	✓	✓	✓	✓	
New Development Bank	40% share of its total financing from 2022 to 2026			✓		✓			✓
World Bank Group	35% share of total financing from 2021 to 2025	✓	✓	✓	✓	✓	✓	✓	✓

Note: Climate-related financing goals include both climate change mitigation and adaptation. The operational priorities for energy-related sectors are for climate change mitigation.

Sources: Author's interpretation of African Development Bank, Climate and Green Growth Strategic Framework, Projecting Africa's Voice, Strategy 2021–2030, October 2021. Asian Development Bank, Strategy 2030 Operational Plan for Priority 3: Tackling Climate Change, Building Climate and Disaster Resilience and Enhancing Environmental Sustainability, 2019–2024, September 2019. Asian Infrastructure Investment Bank, AIIB to Fully Align with Paris Agreement Goals by Mid-2023, October 2021, and Energy Sector Strategy: Sustainable Energy for Tomorrow, November 2022. European Bank for Reconstruction and Development, Green Economy Transition Approach, July 2020. European Investment Bank Group, Climate Bank Roadmap 2020–2025, November 2020. Inter-American Development Bank, Climate Change Action Plan 2021–2025, March 2021. Islamic Development Bank, 2020–2025 Climate Action Plan, January 2020. New Development Bank, General Strategy for 2022–2026: Scaling Up Development Finance for a Sustainable Future, 2022. World Bank Group, Climate Action Plan 2021–2025: Supporting Inclusive, Clean and Resilient Development, 2021.

Drawing on lessons from past EMDE reform experiences, common elements in effective electricity reforms include the following (Foster and Rana 2020, pp. 23–35):

- reforms informed by the enabling conditions in the sector and grounded in the political conditions of the country
- a focus on building institutional capacity for power sector planning and operation
- procurement of generation plants through a transparent and competitive process, with as much contractual flexibility as the context allows
- financial viability and transparency in governance prioritized over the unbundling of vertically integrated public utilities (generation, transmission, and distribution)
- strengthened corporate governance and managerial practices of state-owned utilities
- introduction of wholesale power markets where countries have established the necessary foundational measures like system financial viability
- regulatory frameworks adapted to the institutional context and low-carbon technological trends.

These reforms should be tailored to not only country contexts but also the performance characteristics of variable renewables to promote their effectiveness (Schmalensee 2021).

While energy reforms expand investment opportunities, project finance is the key funding source for long-term investments in EMDEs. MDB participation in project structures brings several benefits.[16] The banks provide valuable country and sector expertise—especially where access to private financing is limited. Their participation as debt and minority equity investors strengthens project risk allocation and mitigation. And wider country engagement by MDBs helps align investment projects with sector reforms.

For example, MDBs should, through complementary operations, support electricity system reforms and participate in power sector investment opportunities. They should provide technical assistance and financing for development and implementation of electricity system reforms, help adapt them to country contexts and renewable technologies, and support affordable access to basic service levels.[17] MDBs should also participate in financing complementary public investments in power grid infrastructure, and private and public

16 These structures use project-specific assets and revenues to mobilize cofinancing rather than corporate balance sheets of project sponsors. Project finance helps to establish the creditworthiness and financial viability of specific investments. Coinvestors typically include private financial institutions as well as public DFIs and the MDBs. Project structures also separate balance sheets of project sponsors from project liabilities, helping sponsors to manage risks.

17 Support for communities that face job losses (e.g., from coal mine closures) as electricity systems decarbonize is also necessary to manage distributional impacts of reform (Spencer et al. 2018). MDB-supported regional development programs help such regions adapt to economic changes. Laws and institutions related to energy supply chains can also create barriers to change, such as land acquisition laws for coal mining in India (Srivastav and Singh 2022).

investment in renewable power generation to demonstrate reform effectiveness and sound investments and thereby catalyze further investments.[18] This participation should extend to support for regional power transmission networks that extend across developing country borders so that renewable-based systems can operate efficiently.

This core example of complementary MDB operations to support electricity reforms and low-carbon power investments illustrates the general approach that can be applied to other energy-related sectors. They include urban and transport development as well as energy efficiency policies for buildings and manufacturing. MDB participation in these sectors through complementary support for reforms and participation in investment projects is key.

In addition to their international project financing, MDB local currency operations both support development of domestic financial systems and improve access to and terms of domestic currency lending to businesses and households. Some MDBs issue local currency bonds and other instruments that serve to lengthen maturities of domestic financing for long term investments, and this on-lending also reduces financing risks for domestic businesses and households by avoiding foreign exchange exposures. This approach is important for many low-carbon and energy efficiency investments because they generate mostly local currency revenues or rely on domestic incomes for debt service.

MDBs that operate in local currencies should use the long-term local currency funds that they raise to finance domestic infrastructure projects and on-lend to businesses and households via local banks. These projects and on-lending programs should target low-carbon and energy efficiency investments, including in power and public transport, buildings, and EVs and their charging networks.[19]

A further financing instrument of all MDBs is blended finance, which uses concessional funds to subsidize finance and investments where appropriate (Lankes 2021). For private low-carbon investments, for example, these subsidies can aim at country and sector contexts that pioneer change and lower costs for subsequent investments. These cost declines can arise through scale economies external to individual firms and households, such as learning-by-doing and direct or indirect network effects as energy systems transform from incumbent technologies to low-carbon alternatives (Fries 2022).[20]

THE PIVOTAL WAY FORWARD FOR EMDEs AND MDBs

Over the next three decades, EMDEs, and especially middle-income countries, are projected to account for much of the absolute growth in global economic activity and energy use. While pivoting decisively toward low-carbon technologies and energy efficiency would advance both the development goals of EMDEs and a

18 Performance of private investments in EMDE power networks is mixed (Foster and Rana 2020, pp. 155–61).

19 Low-carbon manufacturing of tradable goods would warrant MDB hard-currency lending facilities if not otherwise available from private sources.

20 Indirect network effects are sometimes characterized as “chicken and egg” problems between investments in complementary goods (e.g., EVs and their charging networks). While markets provide many complementary investments without government support, they may warrant support if indirect network effects entail significant real resource costs and are external to individual investments, as with direct network effects through physical infrastructures.

stable climate, the countries have yet to fully tap this opportunity. Moreover, MDB support for climate mitigation has yet to reach the quantity and quality that the Paris Agreement goals require.

The shareholder governments of the MDBs should give them a clear mandate to deliver both climate and development outcomes, including in middle-income countries (Ahmed et al. 2022).[21] MDB policy programs and financings that can contribute to such mitigation outcomes include the following:

- analysis, technical, and financial assistance for a two-track approach to electricity reforms—a fast track to improve contracting frameworks and a fundamental track;
- support for low-carbon public transport and urban planning, building efficiency, and declining sectors (e.g., coal) and vulnerable regions;
- public sector financing for low-carbon investments in power grids and public transport, including coordination of regional infrastructure networks;
- project structuring and financing for private and public investments in network infrastructure, renewable power generation, and complementary flexible technologies like battery storage;
- local currency operations to fund investments in infrastructure projects as well as on-lending to domestic businesses and households for investments in energy-efficient and low-carbon buildings and local manufacturing as well as EVs and their charging networks; and
- blended finance for pioneering low-carbon investments in country and sector contexts to kickstart change.

To chart the way forward, shareholder governments should direct the MDBs to make more efficient use of their existing capital resources while managing associated risks (Boosting MDBs' Investing Capacity 2022). This additional financing capacity should be used to demonstrate approaches to low-carbon development in EMDEs, with a stronger focus on energy system reforms to expand low-carbon and energy efficiency investment opportunities and mobilization of cofinancing, especially from the private sector (AfDB 2019). EMDEs that are more advantaged by the advance of low-carbon technologies can, with MDB support, demonstrate low-carbon growth pathways that others can follow. This approach would accelerate diffusion of these new technologies across countries.

For MDBs that demonstrate the governance, technical capacities, and financing instruments to deliver for these operations, their shareholder governments should provide a climate-related capital increase to provide them with the financial resources to decisively step up their financing to the level

21 The role of MDBs in middle-income countries has long been subject to much debate. See, for example, Commission on the Role of the MDBs in Emerging Markets (2001). That report made the case for MDB operations in middle-income countries that catalyze additional private investment and do not displace those that would otherwise be made. This Policy Brief adapts this catalytic approach to the context of low-carbon energy.

required. This capital increase should clearly expand MDB resources beyond those necessary to fulfill their existing development mandates amid today's public health and cost of living crises (Kenny and Morris 2021, Kenny 2022).

The pivotal change in MDB climate mitigation financing goes well beyond the doubling of effort to which the MDBs have committed and ticking the right strategic themes in their climate-related strategies. EMDEs and MDBs should work together with urgency to lower the significant nonprice barriers to the widespread diffusion of increasingly competitive low-carbon technologies.

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