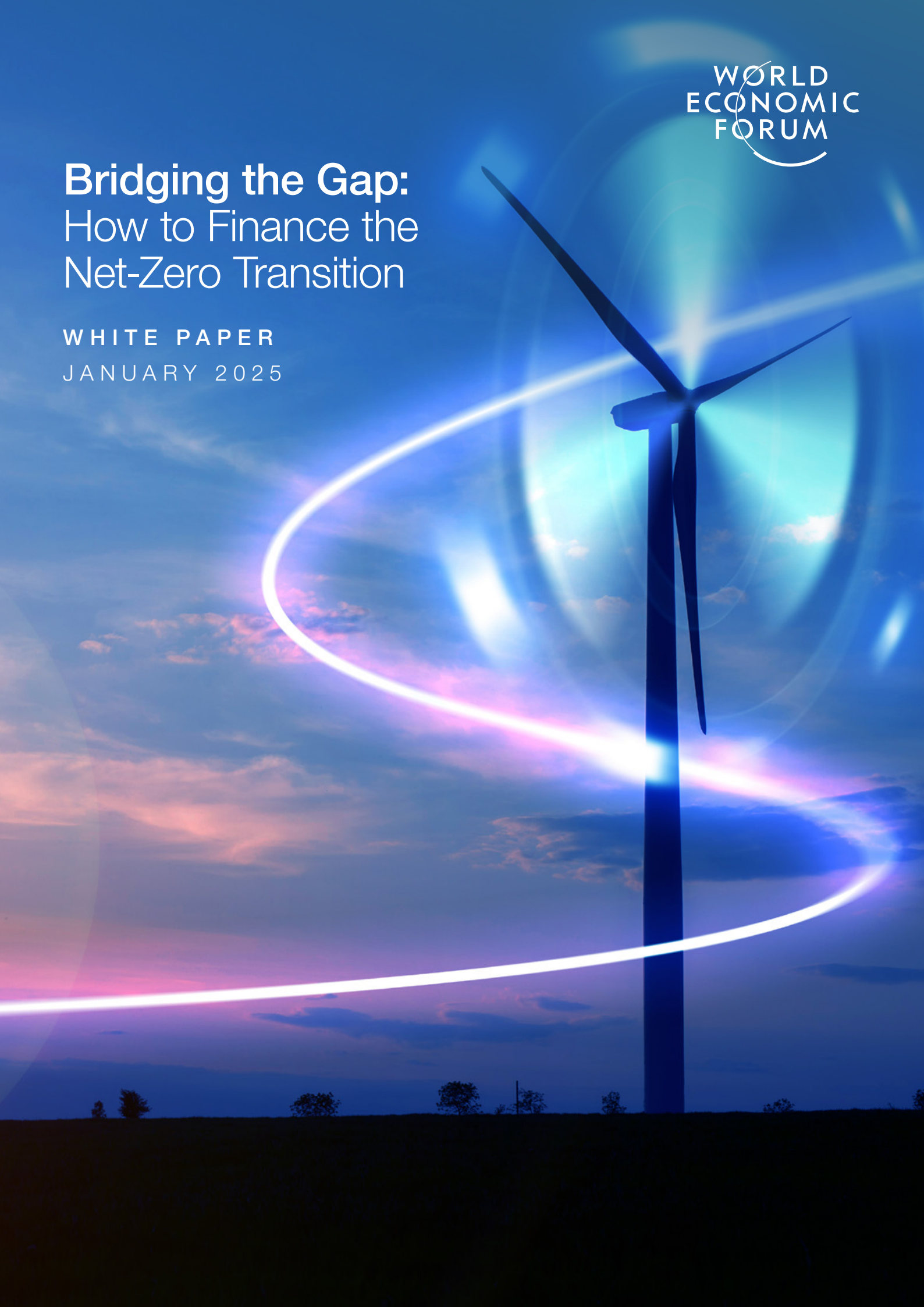

WORLD ECONOMIC FORUM

Bridging the Gap: How to Finance the Net-Zero Transition

WHITE PAPER

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Images: Getty Images

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Foreword

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The financing of a lower-carbon economy is one of the defining challenges of our era. As Bill Gates argues, the energy transition will demand over $3.5 trillion in annual investments for decades. It is a challenge of unprecedented scale, requiring us not only to reimagine global supply chains and financial systems but to ensure that the frameworks underpinning them are coherent, adaptable and equitable.

This paper offers a timely exploration of the transition finance gap, a critical fault line in global efforts to meet climate goals. The gap is not simply one of capital and business case, but also of public policy and frameworks, as this paper makes clear. One example: while the European Union (EU) has sought to establish leadership in defining what constitutes "green", its green taxonomy illustrates both the ambition and the pitfalls of such an endeavour. The EU's approach, however well-intentioned, has often been bogged down in detail and a quest for exhaustive universality. This has resulted in a framework that is, by turns, too binary, too rigid and too complex to serve as a practical guide for investors and financiers. The authors of this white paper realize only too keenly that solutions need to work not just on paper, but in the real world. As the paper emphasizes, frameworks must reflect shades of progress, capturing both the risks and opportunities that come with moving from "brown" to "green".

The provocative ideas in this paper challenge us to rethink a range of policy frameworks. They call for richer, more dynamic systems that can adapt to the evolving science, business case, markets and investor needs.

The role of private capital is central to bridging the climate finance gap. Public funding, while vital, cannot meet the scale of the challenge alone. Unlocking private sector engagement will require de-risking mechanisms and a regulatory environment that is clear, consistent and credible. This is particularly true in developing economies, where the barriers to investment – high capital costs, political uncertainty and inadequate project pipelines – are most acute. Development banks will need to use all their capacities – operational, financial and technical – to maximize the total amount of financing towards climate and development goals. "Crowding in" private finance at the scale needed will require much greater and more effective use of guarantees, risk insurance and blended finance.

What this paper ultimately calls for is boldness – not only in ambition but in experimentation. We need the "persistent experimentation", as exemplified by Franklin Roosevelt's New Deal, to find what works across jurisdictions, sectors and contexts. Transition finance, after all, is not just a technical and business challenge but a profoundly human one, requiring us to align economic incentives with societal values.

I will not endorse every conclusion drawn here, but I find the arguments intriguing. This paper invites us to engage deeply with the complexities of the climate finance gap and to rethink how we define success in this space. It does not claim to have all the answers, but it offers a framework for asking the right questions – questions that will define the future of our economies, our planet and our shared aspirations.

Executive summary

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This white paper addresses the funding gap in the transition to net zero. It aims to define the climate finance gap and explore its drivers, including the fragmentation in both climate policy-making and the global financial services sector. It explores how the gap affects developing and developed countries differently and the role of "common but differentiated responsibilities and respective capabilities" in potentially ameliorating the developing-developed country divide.

Additional factors contributing to the climate finance gap include insufficient public funding, limited private sector engagement, high costs of capital in developing economies, political and regulatory uncertainty, inadequate project pipelines and the complexity of climate finance mechanisms and initiatives.

The paper reviews the financial and economic mechanisms for addressing the funding gap. It specifically considers:

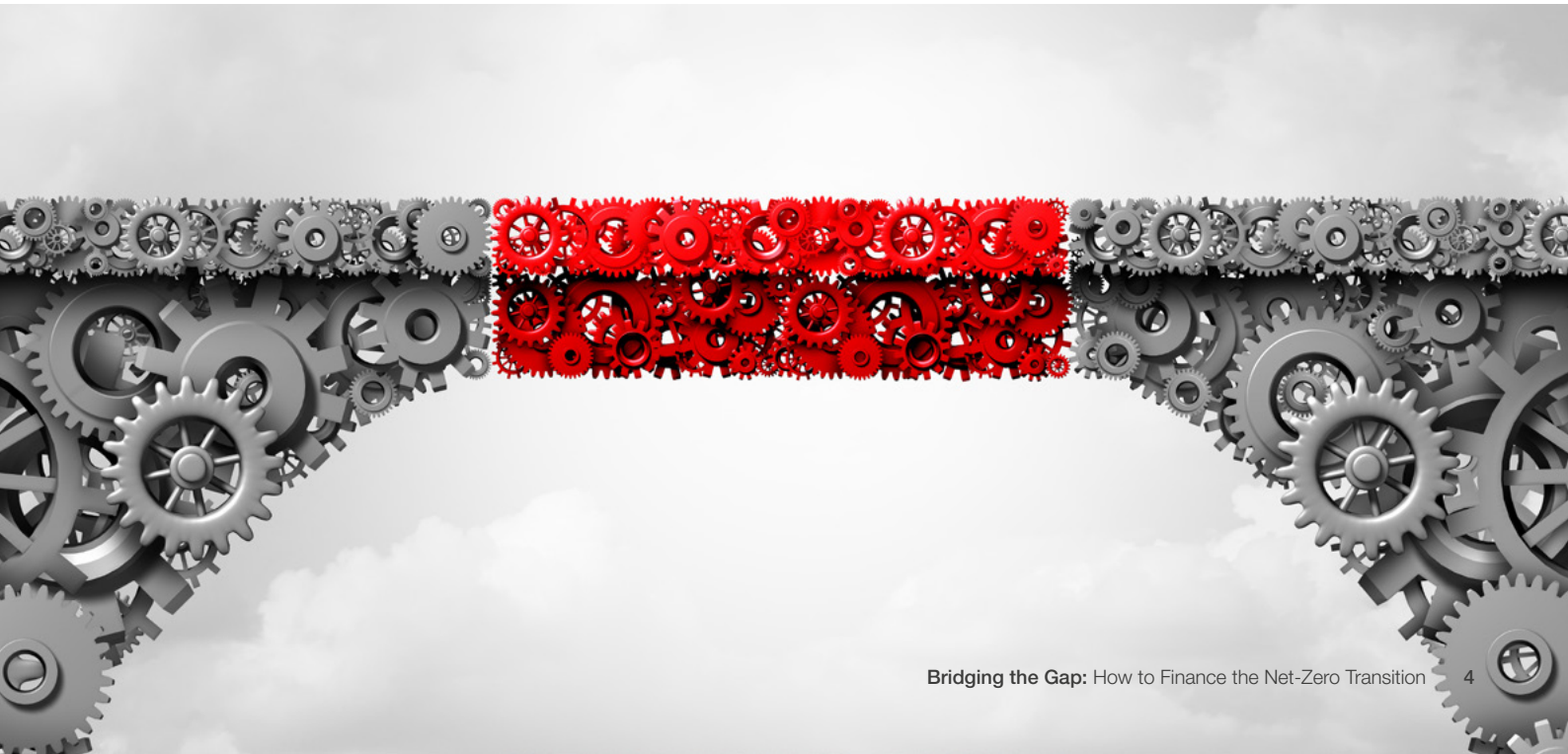
– Use of strategic policy levers to effectively mobilize transition finance.

– Market-based instruments to address the negative externality effects of climate change and eliminate the market failure it engenders.

– Hybrid mechanisms that combine non-market and market principles to mobilize finance.

Furthermore, it discusses specific flagship hybrid instruments from the European Union (EU), including the European Green Deal, EU Emissions Trading Scheme (EU-ETS) and the Carbon Border Adjustment Mechanism (CBAM), as well as the US Inflation Reduction Act. It describes and critically reviews the essential elements of these mechanisms, outlining the challenges they may face in achieving their stated objectives.

Against the backdrop of this analysis, the report concludes by outlining a set of principles for the design of instruments to address the climate finance gap. It argues for policy-makers to exploit the expansion in economic, financial and other data generation in an increasingly digital world to craft innovative instruments that eliminate risk factors impeding the flow of critical capital to low-carbon innovation and climate projects. It further advances an ambitious agenda that establishes coherence, clarity, fairness and appeal at the heart of climate change policy instruments' design.



1 Defining the climate finance gap

Annual investment in the low-carbon transition needs to multiply seven-fold by 2030, if the world is to stand a chance of steering the climate towards a Paris-aligned pathway.

The sixth assessment report of the Intergovernmental Panel on Climate Change (IPCC),[1] published in 2023, provides a comprehensive assessment of the current state of knowledge on climate change and its impacts. Most importantly, it emphasizes human activity – such as the burning of fossil fuels, land-use changes and industrial processes – as a significant driver of climate change and anticipates global surface temperatures will reach 1.5°C above pre-industrial levels between 2030 and 2035 in nearly all scenarios. In 2024, global surface temperatures temporarily exceeded 1.5°C above pre-industrial levels,[2] underscoring the need for urgent and sustained action on greenhouse gas (GHG) emissions reduction across all sectors of the global economy.

However, global action on the scale required to address the challenge requires several trillions of dollars in annual investments. The current level of global investment in climate-related initiatives falls significantly short, creating a substantial financing gap that impedes progress towards meeting climate targets and mitigating climate change impacts. To bridge this gap, it is crucial to mobilize diverse sources of public and private finance by deploying effective policy frameworks and innovative financial and market instruments.

International cooperation and support are critical in addressing the finance needs of developing countries that are most vulnerable to climate change. Securing adequate funding for mitigation, adaptation and resilience not only advances climate action but also contributes to achieving the United Nations (UN) Sustainable Development Goals (SDGs) and to fostering equity more broadly.

1.1 The climate finance gap in numbers

Annual climate finance requirements are projected to rise to $9 trillion by 2030 and exceed

$10 trillion

annually from 2031 to 2050 – yet only $1.26 trillion was invested in 2021/2022.

The climate finance gap for both mitigation and adaptation is considerable. According to the Climate Policy Initiative (CPI), annual climate finance requirements are projected to rise to $9 trillion by 2030 and exceed $10 trillion annually from 2031 to 2050.[3] Mitigation finance alone must surpass $8.4 trillion per year by 2030, yet only $1.2 trillion was invested in 2021/2022.[4]

On the adaptation front, financing reached a record annual value of $63 billion in 2021/2022, a 29% increase from $49 billion in 2019/2020. The great majority (98%) of this funding came from public sources. Development finance institutions (DFIs) were major contributors, accounting for 86% of the total.[5] Despite this progress, the *Adaptation Gap Report 2023*, published by the UN Environment Programme (UNEP),[6] identifies an annual adaptation finance gap of between $215 billion and $387 billion, just for developing countries this decade, and estimates that these countries require between 10 and 18 times the total global public finance currently flowing into adaptation.

Developing countries, with funding requirements in excess of $2.4 trillion per year by 2030,[7] face unprecedented challenges in mobilizing climate finance. According to UN Trade and Development,[8] an estimated $1 trillion needs to originate from sources external to these countries. Current flows of both climate and non-climate finance to developing countries continue to remain insufficient to meet their developmental needs, with total foreign direct investment (FDI) having fallen by 12% to $1.3 trillion in 2022.

1.2 What are the drivers of the climate finance gap?

There is a dearth of the institutional capacity and technical expertise required to design and implement bankable climate projects in some developing countries.

Developed countries fulfilled their pledge to mobilize $100 billion in climate finance for developing nations in 2022.[9] Nevertheless, the scale of the financing required for mitigation and adaption efforts, limited government budgets and competing priorities imply that public funding alone is inadequate for addressing climate change challenges in middle- and low-income countries.

Enhanced public financing mechanisms are crucial, but so is the engagement of the private sector. Unfortunately, private investors often hesitate to commit capital to climate projects due to perceived risks, uncertainty regarding returns and insufficient policy support.[10] This reluctance is compounded by high capital costs, political and regulatory unpredictability and the complex landscape of climate finance, which includes inadequate project pipelines and fragmented financial systems.[11,12] Nevertheless, investors prioritizing short-term returns over long-term sustainability goals remain, perhaps, the most significant impediment to investments in climate-friendly projects, including innovative or unproven yet promising technologies.

To make long-term commitments, investors require stable and predictable policies, which are often lacking in many developing countries and regions. Pervasive institutional weaknesses in some developing countries can lead to higher perceived risk, thus deterring private sector investment in otherwise impactful climate-related projects. Although this is not an issue plaguing only developing countries, the effects in this context are more acute when considered in tandem with other socio-economic challenges they may face.

In addition, while many developing countries have broad targets in their Nationally Determined Contributions (NDCs), they lack specific plans and detailed energy transition strategies to achieve them. Absence of clarity in national plans and stable regulatory frameworks make it difficult to attract international investment and secure long-term private sector engagement.

Private investors willing to engage in projects with higher risk profiles require higher rates of return – and this could ultimately make such projects unviable when assessed using conventional mean-variance optimization assessment methods. For emerging economies with other and arguably more pressing priorities, this almost certainly limits the availability of funds for both mitigation and adaptation initiatives, exacerbating the challenge of attracting sufficient investment to address climate change where the need is greatest.

The challenges posed by these issues are reflected in the shortage of well-conceived and bankable projects that can attract investment. Reports suggest that many projects lack necessary feasibility studies, technical assessments or clear business models, making it difficult even for donor organizations to commit funds.[13,14,15] There is a dearth of the institutional capacity and technical expertise required to design and implement bankable climate projects in some developing countries.

Even when commitments for provision of financial assistance, technology transfer and capacity-building support from donor organizations are a near-certainty,[16,17] the lack of proficiency in project preparation and knowledge of how to access and utilize climate finance remain concerns.

Furthermore, the disjointed global financial system – arising from geopolitical constraints and lack of coordination among funding sources – creates inefficiencies, particularly for developing countries. Lack of coordination among multiple potential funding sources can cause difficulty in mobilizing and deploying funds effectively, resulting in underinvestment.

This fragmented climate finance landscape also suffers from a lack of standardized metrics and methodologies for measuring and reporting financial flows, introducing unhelpful opacity and unaccountability. This complexity, combined with insufficient expertise to navigate the landscape, can constrain private sector investment and impede the effective leveraging of resources.[18]

1.3 Developed versus developing countries: an enduring gap in fortunes

The climate finance gap between developed and developing countries is striking. Developed nations benefitted from 44% of the total tracked capital in 2021-22 while emerging markets and developing economies (EMDEs), excluding China, received only 14%, according to the Climate Policy Initiative's *Long-Term Climate Risk Index*. Although the investment in EMDEs has increased sharply in recent years, the 10 most climate change-vulnerable developing countries received just $23 billion between 2000 and 2019, less than 2% of the total capital outlay.[19]

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of the total tracked capital in 2021-22 while emerging markets and developing economies (EMDEs), excluding China, received only 14%.

This persistent disparity highlights a broader investment gap for sustainable development in developing countries, which collectively require approximately $3-4 trillion per annum in climate-related funding by 2030 to meet the UN's Sustainable Development Goals.[20,21] A substantial portion of this requirement, approximately $2 trillion, is expected to be sourced domestically, with the remaining $1-2 trillion expected to be sourced from external financing, including international aid, FDI and loans from multilateral development banks (MDBs).[22]

EMDEs and least developed countries (LDCs) face extraordinary challenges due to limited financial resources, while heightened vulnerability to the effects of climate change is yet another contributory factor to the plethora of obstacles to their development. Higher cost of capital (often five to 10 times greater than in developed countries)[23] is an unwelcome consequence of the negative externality that is climate change.

Public finance, particularly through grants and concessional loans provided by MDBs, can play a crucial role in mitigating the perceived risks acting as a barrier to much-needed private sector investment. By spending on de-risking measures, MDBs can help lower the required rate of return on projects, thus making them more attractive to private investors. This blended approach is essential for scaling-up sustainable projects in EMDEs and LDCs, especially given that the development priorities of these countries often centre around more immediate needs – such as poverty alleviation, infrastructure development and energy access[24,25] – which often conflict with the contemplation or introduction of stringent net-zero compliant policies.

This underscores the need for a balanced approach that integrates climate action with long-term economic growth, not at the expense of countries' aspirations for development. For instance, economic development in many developing countries is undermined by energy poverty, with significant portions of their populations lacking access to electricity and clean cooking fuels,[26] vital elements for economic expansion. Hence, fossil fuel resource-rich developing countries, such as Nigeria and Angola, would appear more inclined to address this issue by exploiting their natural resources and existing technologies, where they already have expertise.

Nevertheless, technology transfer to these countries can help them better exploit their natural resources, such as solar power and tidal capacity, to generate renewable forms of energy. Since energy generation efforts in developed countries are predominantly focused on transitioning carbon-intensive infrastructure to low-carbon contexts (such as the decommissioning of North Sea oil infrastructure to facilitate offshore wind power generation in the UK), technology transfer can focus on repurposing existing infrastructure in developing countries.

International cooperation and dialogue are vital for addressing the imbalance between developed and developing country climate finance and ensuring that developing countries achieve their climate goals without compromising their development objectives. Cooperation need not only centre on the provision of financial aid; it should also involve the sharing of knowledge and technology, which are crucial for building local capacity and resilience.[27,28]

To this end, beneficiary countries must establish strong policy and regulatory environments, which are essential for the provision of clear market signals and for supporting the deployment of emerging technologies.[29] The sharing of knowledge does not imply a disregard for the differences in developing and developed country contexts – crucially, the implementation of strategies will need to take into account the specific needs and contexts of individual countries. Nevertheless, tailored strategies to increase external support and strong international cooperation are necessary to ensure that all countries can effectively participate in and benefit from the global transition to a sustainable, low-carbon future.

Mobilizing private climate finance in LDCs faces significant challenges, including data gaps, lack of carbon pricing, macro-financial risks and a generally high-risk investment environment. These regions often lack detailed data, particularly outside the renewable energy and transport sectors, making it difficult to accurately assess financing needs and hindering private investment.[30] The absence of efficient and liquid carbon pricing mechanisms[31,32] and business models for infrastructure projects further discourages investment, as investors rely on these tools to predict potential returns.[33]

Macro-financial risks, such as concerns over debt sustainability, currency liquidity and market volatility additionally exacerbate these challenges, making it more difficult to attract both domestic and foreign private capital.[34] This is concerning given the critical role private capital can play in addressing climate change. Private sector involvement is necessary to complement public sector funding and scale-up investments in sustainable infrastructure and technologies.[35,36]

Collaborations between public authorities and MDBs can lead to the establishment of well-functioning joint initiatives through capacity building, consequently enhancing the effectiveness of climate finance projects and ensuring that investments are directed towards high-impact areas.[37] Customized capacity-building initiatives play a crucial role in cultivating conducive environments for investment, particularly by strengthening policy frameworks and providing technical assistance.[38,39] Innovative financing mechanisms, such as guarantees and blended finance vehicles, can de-risk investments. Here, reinforcing the partnerships between MDBs working with LDCs and the private sector can improve the effectiveness of LDCs in mobilizing private investments, aligning MDB financing strategies with the needs and risk profiles of private investors.[40]

BOX 1 Common but differentiated responsibilities and respective capabilities

Common but differentiated responsibilities and respective capabilities (CBDR-RC) is a fundamental principle in global climate policy, asserting that while all nations must address climate change, their responsibilities vary based on historical emissions and current economic capacities.[41] This principle is vital for fairness, as it recognizes the greater responsibility of developed countries to lead mitigation efforts while supporting developing nations to meaningfully contribute to the task.[42]

In essence, equity within CBDR-RC requires wealthier nations to provide financial and technological assistance, helping poorer countries meet climate goals without hindering their development.[43,44] This requires international cooperation. Developing countries need significant assistance to contribute meaningfully to the global transition to net zero. Hence, in the absence of effective cooperation, the global response to climate change risks being insufficient and uneven.[45,46]

However, implementing CBDR-RC faces significant challenges, including disagreements over the differentiation of responsibilities, the adequacy of support from developed countries and the complexity of monitoring and accountability mechanisms.[47,48] National interests and capacities further complicate an effective application of the principle.[49]

CBDR-RC is directly linked to Nationally Determined Contributions (NDCs) under the Paris Agreement, since it allows countries to set climate targets aligned with their unique circumstances. Beyond the principle of CBDR-RC, structured frameworks such as the Green Climate Fund (GCF), adaptation funding initiatives, Article 6 mechanisms and other instruments under the Paris Agreement are strategically designed to facilitate the flow of resources from developed to developing countries, effectively operationalizing the commitments of CBDR-RC.[50,51] These frameworks provide essential financial and technological support, helping developing nations to enhance their NDCs and contribute more effectively to global climate goals. However, challenges persist in terms of political will, adequacy of funding and the efficiency of disbursement and implementation, which impact the overall effectiveness of the frameworks.[52,53]

Therefore, while CBDR-RC remains essential for stimulating global cooperation it continues to be a source of discord among nation groups, and its status as an independent legal principle is a subject of debate. For example, international maritime treaty instruments under the aegis of the International Maritime Organization (IMO) require that all ships be treated equally irrespective of flags (i.e. institutionalizing a principle of equal treatment). Developed countries are keen to respect this principle as it pertains to the sector and argue that regulations that apply to the limiting of emissions in international shipping should be enforceable. Developing countries, however, take the opposing view and demand that the CBDR-RC principle be faithfully applied. This is symptomatic of the existence of conflicting viewpoints regarding whether CBDR-RC is an independent legally enforceable principle or not and the issue continues to plague international rulemaking.

1.4 Key sectors

Greening the transport sector demands an annual investment of $2.5 trillion by 2030, rising to **$3.2 trillion** by 2050.

The decarbonization of key sectors – transport, energy, buildings, industry and agriculture – is essential for achieving global climate goals and requires extensive financial investment and strategic innovation (see Table 1).

Although all sectors of the economy demand attention with regards to decarbonization efforts, the needs of these sectors are more complex. Each sector faces unique challenges: for example, the high cost of electric vehicle (EV) infrastructure in the transport sector, or the substantial capital required for the energy sector to transition to renewables.

While significant capital investments are essential, equally important are robust policies, innovative technologies and equitable approaches that ensure the benefits of decarbonization are broadly shared. Blended finance will play a decisive role in mitigating investment risks, particularly in EMDEs and LDCs, while policy instruments, such as quantity and price incentive-based market instruments, can stimulate low-carbon innovation investment in developed and large emerging economies.

TABLE 1 **Actual investment vs. investment needed to transition key sectors towards a Paris-aligned pathway**

Sector	Actual investment	Annual investment by 2030	Annual investment by 2050
Transport	$95.9 billion (2019-20)	$2.5 trillion	$3.2 trillion
Energy	$1.74 trillion (2023)	$4.5-5.7 trillion	$125 trillion (cumulative)
Buildings & infrastructure	$14.2 billion (2019-20)	$731 billion	
Industrial	$10.2 billion (2019-20)	$320-540 billion	
Agriculture, forestry and other land use	$6.5 billion (2021-22)	$130 billion	

Source: Climate Policy Initiative (CPI).[54]

Transport sector

The CPI[55,56] estimates that greening the transport sector demands an annual investment of $2.5 trillion by 2030, rising to $3.2 trillion by 2050. These investments are essential for transitioning to EVs, developing EV infrastructure and promoting alternative fuels for other forms of transport, including freight.

However, the high upfront costs associated with EVs, and the necessary infrastructure, pose significant challenges, especially in emerging markets where disposable income is typically low.[57,58] Blended finance instruments that improve the risk-return profile of transport projects could play a pivotal role in addressing these challenges by leveraging public and private capital to mitigate investment risks.

$1.74 trillion
global investment in clean energy in 2023.

$2.7 trillion
investment needed to be on track to meet Paris goals.

$1.05 trillion
global investment in new fossil fuel projects in 2023.

Decarbonizing the building sector is core to meeting global climate targets and requires an estimated **$731 billion** annually through to 2050.

Low-carbon technologies, such as high-frequency chargers and hydrogen refuelling infrastructure, which are vital for the widespread adoption of EVs and other clean fuel technologies, could be beneficiaries.[59]

Equity considerations are paramount in this transition. Ensuring that low-income communities can access affordable, low-emission transport options is essential for a just and inclusive transition. This involves providing subsidies and/or incentives for EV purchase (as in China and Norway) and developing green public transport systems that are both efficient and affordable (as in the Netherlands and Sweden). Equity-focused policies can help prevent the exacerbation of social inequalities, ensuring that all demographic groups benefit from improved air quality and GHG reduction.

Achieving market tipping points for low-carbon transport solutions, where they become competitive with high-carbon alternatives, is essential for driving private sector investment.[60] This would involve creating a favourable regulatory environment, financial incentives and enabling infrastructure for innovators. Public policy must induce the market to favour green innovation by setting ambitious emission standards, offering tax incentives for green technologies and investing in enabling public transport infrastructure. Additionally, consumer behaviour and demand-side options, such as promoting public transport, efficient urban planning and digitization, remain vital for reducing emissions and driving the transition to sustainable transport systems.[61]

Energy sector

Estimates of the cumulative capital that the energy sector needs to achieve the Paris climate goals exceed $125 trillion by 2050,[62] with annual investments of $4.5 to $5.7 trillion by 2030. The International Energy Agency (IEA) estimates that in 2023, global investments in clean energy reached approximately $1.74 trillion, reflecting a growing commitment to renewable technologies. However, these investments fall significantly short of the estimated $2.7 trillion needed to be on track to meet Paris goals.[63,64] The discrepancy underscores the difficulty of meeting global climate objectives, particularly as $1.05 trillion was simultaneously invested in new fossil fuel projects over the same period.[65]

This indicates a persistent investment in high-carbon infrastructure and the need for emphasizing a stronger shift towards renewables. Managing consumer behaviour and demand-side strategies are an essential part of this shift. Policies can encourage energy conservation – such as the adoption of energy-efficient appliances and smart grid technologies – and significantly lower energy demand. Key policy frameworks include eliminating fossil fuel subsidies, implementing carbon pricing to address the market failure implications of climate change as a negative externality and establishing renewable energy mandates. The result would be consumer adoption of clean energy technologies, such as EVs and solar panels, that can accelerate the sector's transition.

Decarbonization of the energy sector offers significant long-term benefits, including reduced GHG emissions, improved air quality and energy security. The path forward involves a comprehensive approach that includes technological innovation, robust international partnerships and, most importantly, public engagement. Policy-makers must engage in meaningful consultation with consumer groups and take due consideration of the effects of policies on the most vulnerable in society – all core elements of climate policy-making. These issues are addressed in Chapter 4.

Buildings and infrastructure

Decarbonizing the building sector is core to meeting global climate targets and requires an estimated $731 billion annually through to 2050.[66] This investment must focus on energy efficiency improvements, retrofitting existing structures and integrating renewable energy sources within the built environment.

The sector's energy consumption, particularly for heating and cooling, contributes significantly to GHG emissions.[67] However, despite the potential for substantial economic benefits, decarbonization of built infrastructure often presents limited financial attraction to private investors as standalone projects, necessitating the deployment of innovative financing mechanisms to further de-risk them.

Policy can play an important role in changing this paradigm by updating rules for the built environment, an approach that has been introduced with success in the EU. For instance, energy performance standards and building codes have been fundamental in setting benchmarks for energy efficiency in new and existing buildings; this has made investment by energy service companies (ESCOs) financially attractive due to legislation increasing demand for buildings that comply with performance standards.

Carbon pricing also helps to internalize the environmental costs of carbon emissions, thus making energy-efficient solutions more competitive. Additionally, incentives for adopting renewable energy technologies, such as tax credits or rebates for installing solar panels and heat pumps, can drive consumer uptake and investment in clean technologies. Governments can also implement mandatory retrofitting policies for existing buildings, requiring upgrades to meet modern efficiency standards.

For EMDEs and LDCs, the decarbonization of buildings presents unique challenges and opportunities, because these countries often face significant financial and technological barriers, as well as difficulties around the implementation of rules – such as lack of stringent building codes and energy performance standards – which complicate efforts to improve building efficiency.

Public awareness campaigns and educational initiatives focused on the economic benefits of energy conservation at the household level can help shift consumer behaviour towards the adoption of energy-efficient appliances, renewable heating technologies and the use of smart technologies for energy use management.

Addressing the unique needs of EMDEs also requires a focus on equitable solutions that consider the socio-economic realities of these regions. The support of MDBs and other international institutions is crucial for overcoming the initial cost barriers associated with energy-efficient technologies and renewable energy integration. For example, MDBs can provide long-term technical assistance to help local governments develop and implement robust building codes and standards, as well as assist in the design of financial instruments that attract private investment into the building sector. These can involve the funding of departments of technical experts working with and within relevant governmental departments and non-governmental entities.

Industrial sector

Decarbonizing the industrial sector requires between ~$320 and

~$540

billion

annually from 2021 to 2050.

Decarbonizing the industrial sector requires between ~$320 and ~$540 billion annually through to 2050.[68,69] Finance is essential for deploying cutting-edge technologies and optimizing industrial processes, especially in “hard-to-abate” industries – such as aluminium, aviation, cement and concrete, chemicals, shipping, steel and trucking – that require tailored approaches.[70] These industries are significant contributors to global GHG emissions and implementing innovative solutions such as carbon capture, utilization and storage (CCUS), green hydrogen and enhanced energy efficiency measures are crucial to decarbonizing industrial processes.[71]

The World Resources Institute highlights critical strategies for these transitions, including reducing demand for high-emission materials such as steel and cement, electrifying industrial processes and minimizing methane emissions from the oil and gas sector.[72] Meanwhile, the World Economic Forum’s First Movers Coalition is leading the way in setting targets and highlighting breakthrough technologies to decarbonize these sectors.

In countries where financial systems are less developed and investment risks are perceived as being higher, blended finance is emerging as a crucial tool for mobilizing the necessary capital for industrial decarbonization.[73] As a hybrid instrument that leverages public funds to attract private investment, blended finance typically works by offering de-risking mechanisms such as political risk insurance, guarantees from MDBs, concessional loans and strong regulatory frameworks that ensure stability and transparency.[74] These measures are essential in mitigating risks associated with investing in nascent technologies and infrastructure required for a low-carbon transition.

Additionally, creating an enabling environment through policy frameworks that include carbon pricing, energy efficiency standards and renewable energy mandates is important for guiding consumers and other economic agents towards sustainable practices.[75] These policies not only incentivize the adoption of low-carbon technologies but also provide a predictable and supportive regulatory landscape that encourages long-term investment.[76]

Potential breakthrough technologies – such as CCUS and green hydrogen – can play a pivotal role in reducing emissions in hard-to-abate industries, despite being economically unfeasible and challenging to implement in other contexts. CCUS technology can capture up to 90% of CO_2 emissions from industrial sources, while green hydrogen, produced using renewable energy, offers a viable alternative to fossil fuels in high-temperature industrial processes.[77] The UK government is investing in CCUS to capture and sequestrate emissions from industrial processes such as hydrogen production and energy generation from natural gas and biomass. However, despite their potential, commercializing these technologies is difficult because of high upfront capital costs, technological immaturity and financing gaps.[78] The UK government’s approach to CCUS is instructive: following an initial investment of $28.5 billion, the government expects to attract around $10.5 billion in additional investment from the private sector.

The challenges are even more pronounced in EMDEs and LDCs, where infrastructure, capacity development and public funding are often lacking. Overcoming these hurdles requires a multi-faceted approach involving substantial financial investments, robust policy support, international cooperation and innovation in technology and business models.[79,80]

Agriculture, forestry and other land use

The agriculture, forestry and other land use (AFOLU) sector is a significant contributor to global GHG emissions, accounting for around 22% of total global emissions.[81] This sector is critical to both emissions reduction and carbon sequestration efforts. AFOLU has substantial potential for mitigating climate change, particularly through practices such as reforestation, afforestation and improved land management strategies that can enhance forests and soils’ capacity to absorb CO_2 and act as critical carbon sinks.

However, as with other sectors, the financial requirement for decarbonizing this sector is equally substantial. Estimates suggest cashflow requirements of up to $130 billion annually by 2030.[82] This is far higher than the average investment level in 2021-22, estimated at $6.5 billion.[83] The gap in funding is more acutely felt in EMDEs, where the problem is compounded by financial barriers and heightened risks fuelled by unstable markets and regulatory uncertainty.

Hybrid finance mechanisms can de-risk investment opportunities in the AFOLU sector and help attract private capital.[84] Instruments such as concessional loans, guarantees from MDBs and crop insurance offer options for reducing the perceived risks associated with long-term, high-risk projects.[85,86]

Incentivizing sustainable practices in the sector may call for the implementation of a range of policy and market-based instruments, such as carbon pricing and associated stringent and enforceable regulatory frameworks.[87] For example, some carbon pricing instruments can be adapted to make it economically viable for landowners to adopt practices that increase carbon sequestration. Emissions trading schemes can provide financial incentives for reducing emissions, thus encouraging investment in low-carbon technologies and sustainable land-use practices.[88] Additionally, eco-labelling and certification schemes – along with public engagement campaigns – can drive consumer demand for sustainably produced goods, further incentivizing producers to adopt environmentally friendly practices.

The AFOLU sector offers significant opportunities for technological innovation. Breakthrough technologies such as precision agriculture, which utilizes data analytics and satellite technology to optimize farming practices, can significantly reduce emissions.[89,90] Advanced biotechnologies, including genetically modified crops that require less water and fertilizer, can contribute to emissions reductions.[91] In forestry, technologies such as drones and remote sensing can improve monitoring and management, helping to optimize forest growth for carbon sequestration and prevent illegal logging.[92]

Integrating climate goals into agricultural and land-use policies is critical for aligning the sector with broader decarbonization strategies. This integration involves ensuring that food production systems are sustainable and resilient to climate impacts, thereby supporting long-term food security.[93] Community engagement remains an important aspect of policy initiatives in this sector, as involving local stakeholders in decision-making processes enhances their effectiveness and sustainability. Incorporating traditional knowledge and practices into modern land management strategies can also improve outcomes and ensure cultural appropriateness.[94]

2 Mechanisms for change

Mechanisms to mobilize finance for the climate transition range from policy interventions to market-based measures, with hybrid public-private approaches offering a potent blend of the two.

2.1 Strategic policy levers for effectively mobilizing transition finance

Concessional finance and incentives

Offering capital at below-market rates or under more favourable conditions can mitigate investment risks and enhance the attractiveness of climate-related projects in EMDEs and LDCs. Doing so not only encourages private sector engagement in critical areas such as renewable energy and climate adaptation, but also ensures that essential initiatives can advance despite financial limitations. In practical terms, this involves extending low interest rates and longer repayment periods, thus making it more likely that conventional discounted cashflow analysis will yield competitive net present value estimates and internal rates of return for climate projects.

By making projects more financially attractive, additional funding can be generated for climate-related initiatives. The strategic application of incentives such as tax breaks and subsidies can stimulate growth and innovation in sectors with significant climate impacts, including energy and transport. In this way, investments encouraged by the strategic application of concessions align with broader development goals, supporting economic growth while advancing environmental sustainability.

Concessional finance lowers overall capital costs and mitigates financial risk. As a result, it is well-suited to advancing sustainability initiatives with long-term environmental and social benefits but requiring significant upfront investment. By providing more advantageous terms for climate projects than the market offers for competing alternatives, concessional finance directs timely capital into sectors vital for achieving sustainable development and climate resilience.

Examples of concessional finance include:

- Green Climate Fund (GCF)
- Climate Investment Funds (CIF)
- World Bank's International Development Association (IDA)

More concessional finance is required, particularly in emerging and developing countries. At COP29 in Baku, MDBs announced plans to play a pivotal role in mobilizing concessional finance, estimating that by 2030, they could collectively provide $120 billion annually for climate financing in low- and middle-income countries (of which $42 billion would be dedicated to adaptation) and $50 billion annually for high-income countries, while aiming to catalyse an additional $65 billion annually from the private sector across all regions.[95]

Subsidies and grants

Fossil fuel subsidies remain high, with $1.3 trillion in explicit subsidies and a further

$5.7 trillion

in implicit subsidies recorded in 2022 alone.

Subsidies and grants can lower the cost of capital for sustainable projects, making them more attractive to private investors and accelerating the adoption of low-carbon technologies. By targeting early-stage innovations and sectors with significant barriers to entry, these tools can help overcome market inefficiencies, thereby driving the transition to a sustainable economy.[96]

However, subsidies and grants can also create market distortions by encouraging dependence on financial support, which can lead to inefficiencies and reduced incentives for innovation. Additionally, poorly designed subsidies and grant programmes may yield unintended outcomes, potentially diverting resources away from more impactful climate and sustainability initiatives[97] and entrenching economically ruinous rent-seeking behaviour. This implies that, while access to incentives is critical for the net-zero transition, the long-term financial and economic viability of beneficiary firms must remain the core factor in the provision of financial support. Thus, factors such as effective lobbying should not play a role in deciding who benefits from incentives.

In EMDEs and LDCs, these challenges are often exacerbated by weaker institutional frameworks and limited financial resources, making it harder to design and implement effective subsidy and grant programmes.[98] Therefore, subsidies and grants, as with all strategic policy instruments, must be carefully designed to address local needs and align with regional technical capacities. Focus should also be on building technical capacity to aid constructive implementation.

Examples of impactful subsidy and grant programmes include:

- Caribbean Catastrophe Risk Insurance Facility, a multi-country risk pool providing technical assistance funded by grants alongside climate-related insurance products.
- China's EV subsidies, which have positioned it as a global leader in EV adoption and production.
- Brazil Investment Plan (BIP), which addresses drivers of deforestation and forest degradation.
- India's Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) Scheme, aimed at ensuring energy security for farmers.

Subsidy and grant financing for the transition to a sustainable future reflects both substantial public sector investment and ongoing challenges related to attracting private sector financing. Governments around the world provide a combined average of $30 billion annually in grants for climate mitigation, with $26 billion allocated to transport subsidies; however, there has been a decline in grant financing for adaptation.[99]

Paradoxically, fossil fuel subsidies remain high, with $1.3 trillion in explicit subsidies and a further $5.7 trillion in implicit subsidies recorded in 2022 alone.[100] This highlights the difficulty in shifting financial support from fossil fuels to sustainable initiatives, although the scientific evidence on the negative effects of fossil fuel on our world has never been more incontrovertible.[101]

Regulatory reforms

By crafting policies that incentivize green investments, enhance transparency and set clear environmental standards, governments can create an environment that attracts capital and drives innovation. Strategic regulatory reforms are particularly relevant to encouraging growth in transition finance as they can provide the necessary framework to ensure that climate financing initiatives are sustainable and impactful.

The policy realm in many developed economies is replete with regulatory and policy levers that are essential in driving the transition towards sustainability, each targeting key areas to align economic activities with environmental goals. When these measures are well-implemented, they can help address the fundamental issues driving the gap, such as market failure.

Some examples of climate-focused regulation include financial disclosure requirements (mandating companies to disclose climate-related financial risks) and green finance regulations and taxonomies (establishing standards for sustainable investment instruments).

Both these sets of regulations encourage transparency and accountability, help investors understand the environmental risks in their portfolios and thus facilitate informed decision-making.

Energy efficiency standards, tax incentives and mandatory risk assessments are some of the other relevant regulatory routes that can help reduce the transition finance gap, conserve resources and promote a more sustainable economic model.

Implementing regulatory mechanisms poses distinct challenges in both developed and developing countries. In developed nations, the main complexity lies in overcoming entrenched interests, regulatory inertia and the integration of new policies into existing frameworks without causing significant economic disruption.[102,103] Meanwhile, developing countries face obstacles such as limited institutional capacity, insufficient financial resources and the need to balance growth with sustainability.[104] The disparity in technical expertise and infrastructure further complicates the uniform application of much needed regulations, often leading to uneven progress in global sustainability efforts.[105] These challenges can be overcome by fostering international cooperation, enhancing capacity-building efforts, securing adequate financial resources and tailoring regulatory frameworks to local contexts.[106,107]

The integration of robust regulatory frameworks is essential for a global shift towards a low-carbon global economy. By enforcing financial disclosures, streamlining processes, incentivizing green investments and strengthening environmental regulations, policy-makers can effectively mobilize the necessary resources to achieve climate goals. These strategic levers not only guide investments but also ensure that the transition to a sustainable future is equitable, efficient and aligned with the broader objectives of environmental preservation and economic resilience. Yet regulatory interventions in themselves are only a first step to bridging the transition finance gap and addressing the externality imposed by climate change.

As an example, the United Kingdom financial services regulator, the Financial Conduct Authority (FCA), introduced a rule aimed at enhancing climate-related disclosures by premium listed companies in January 2021 and has recently concluded consultations on additional proposals to strengthen disclosure. Crucially, these rules will facilitate reporting on the emission intensity of companies' value chains, which in turn signals their exposure to climate risks and, theoretically, impacts their cost of capital.

The inability of asset managers, banks, investors and consumers to obtain information on these risks as part of the global financial system constitutes a negative externality that drives emission-intensive activities and climate change. The FCA's rules and others similar to it will only go so far towards addressing the issue, but without the emergence of a private sector-led agenda to improve disclosure regimes and generate accessible data, the information required for efficient climate risk-resilient asset allocation and consumer consumption decisions will continue to elude stakeholders.

2.2 Market instruments

The market-led nature of the global economy suggests that market instruments are a critical component in plugging the transition finance gap. Market instruments include the following:

– Sustainable debt

– Tradable certificate schemes

– Performance-based financing mechanisms

– Sustainable investment funds

These instruments offer a means of incentivizing sustainable practices and directing capital towards environmentally beneficial projects. They have been shown to be effective as economic instruments that can help drive innovative responses to environmental challenges while preserving economic benefits that might otherwise be sacrificed under a command-and-control approach.

For example, Stavins[108] estimates that the US Acid Rain programme implemented in 1995 led to $250 million in annual savings in contrast to the command-and-control alternative, while Carlson et al.[109] report that the programme allowed for annual estimated savings of about $1 billion in comparison to savings that the direct regulation alternative would have afforded. This welfare effect was achieved while also recording a decline in sulphur dioxide emissions by US electricity producers of more than 35% to 10.2 million tonnes in 2005. Thus, by integrating market mechanisms into global and local strategies, the complexities of climate finance can be addressed, making it more accessible and effective for a broad range of stakeholders.

Incentive-based market instruments

Incentive-based instruments include the following:

– Carbon taxes

– Cap-and-trade systems

– Baseline-and-credit schemes

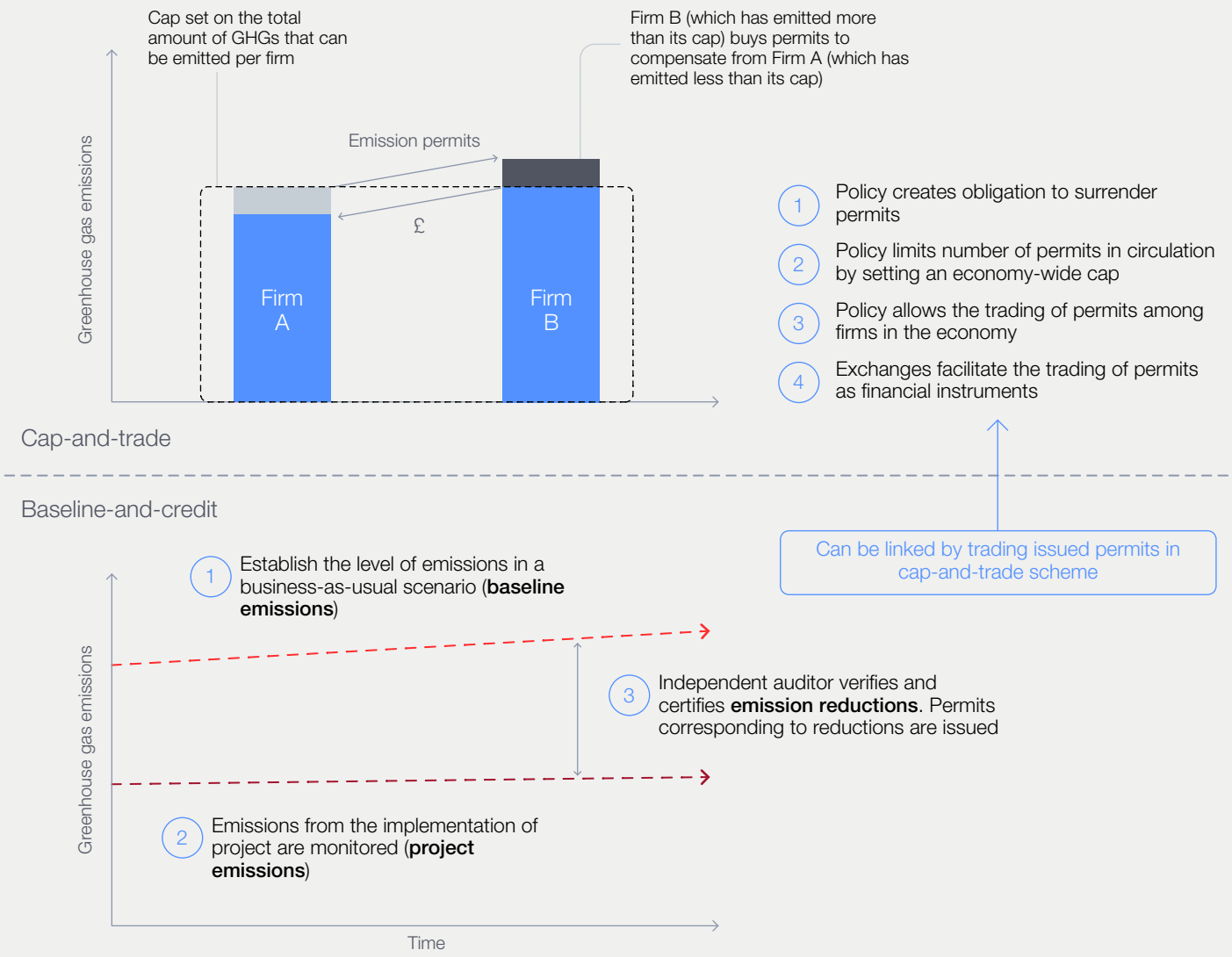
These instruments are designed to change behaviour. In the context of climate change, they create conditions that encourage consumers to substitute away from emission-intensive products. Theoretically, the broad economic and behavioural changes driven by these instruments could be realized by applying them to either producers or consumers at any stage of the value chain. However, incentive-based tools like cap-and-trade are predominantly used at the producer level, where producers must participate in the trading of permits or allowances. Regulating producers is practical because they are better placed to bear the costs of trading emission permits in a cap-and-trade scheme. Furthermore, governments can more easily enforce regulations on hundreds or thousands of companies rather than millions of individuals.

Thus, in an incentive-based system the cost of compliance is expected to be passed through to consumers. Specifically, what consumers pay for products is driven by the emission-intensity of the products. Naturally, consumers will limit their consumption of the more emission-intensive products or, in extreme cases substitute away from emission-intensive products altogether, assuming there are alternatives. Internal combustion engines and EVs are a good example. Incentive-based regimes simply require consumers to react to pricing, thereby not adding extra cognitive load to their decision-making. Moreover, since consumers can express their preferences, these tools theoretically enable the system to find the most efficient method to reach targeted emission levels without dictating specific changes in consumption behaviour.

Following the adoption of the Kyoto Protocol in 1997, cap-and-trade schemes such as the EU Emissions Trading Scheme (EU-ETS) and baseline-and-credit schemes such as the Clean Development Mechanism (CDM) and Joint Implementation (JI) emerged as the core market instruments for driving emission reduction (see Figure 1).

Incentive-based instruments such as the CDM, JI and EU-ETS operate using tradeable certificates, permits and allowances. Examples include renewable energy certificates (RECs), issued for renewable electricity produced, and carbon credits, allowances and permits, which are traded as “permissions to pollute”. Implementing tradeable certificate schemes requires stringent regulatory measures to ensure certificate integrity, prevent fraud and manage market supply and demand. This underscores the need for a clear monitoring, reporting and verification (MRV) process to ensure the schemes’ effectiveness and credibility.

FIGURE 1 | **Emissions trading instruments**



Source: Carbon Markets, University of Edinburgh Business School.

Policy-makers must address potential issues such as double counting and maintain a balance between supply and demand that supports policy aims. Specifically, events such as the oversupply-induced decline in the price of carbon financial instruments (CFIs) traded in the EU's signature cap-and-trade scheme, the EU-ETS, in 2006, can be avoided by establishing clear rules for issuing, trading and retiring certificates, as well as through the development of reliable tracking systems. Additionally, integrating the schemes with other policies and ensuring stakeholder participation can enhance their effectiveness in promoting sustainability goals.[110]

However, while cap-and-trade and baseline-and-credit schemes often become intertwined organically, leading to the exchange of credits across schemes, integrating them with other schemes often presents challenges. Too many policies to address the same overarching challenge can be detrimental to the success of the individual policy instruments. A case in point is the situation in Europe, a continent that has no shortage of policies aimed at engendering a low-carbon economy. A review of energy efficiency initiatives and instruments conducted by Ibikunle and Okereke[111] found that the UK and Germany each have approximately 100 different instruments that are often duplicated and ineffectively implemented.

The sustainable debt market reached a cumulative size of

$4.4 trillion

in 2023.

Negative energy pricing is one of the unintended consequences of many of the initiatives designed to boost renewable energy generation. Substantial declines in emissions from energy generation also depress CFI prices on EU-ETS platforms, thus potentially rendering the EU's flagship climate change instrument ineffective. The EU-ETS is only effective if its price signals are high enough to drive low-carbon innovation and discourage emissions production. Consequently, there needs to be an emphasis on policy coherence in the development of climate change policy instruments.

The EU-ETS is discussed at greater length in Chapter 3.2.

Sustainable debt instruments

According to the Climate Bonds Initiative, the sustainable debt market reached a cumulative size of $4.4 trillion in 2023. Sustainable debt instruments include the following:

- Green bonds: these have thrived due to increasing climate commitments and growing investor demand for sustainable assets.[112] Green bonds were the largest category in 2023, at $2.8 trillion in issuance.

- Social bonds: these have also gained in prominence, particularly in the context of the post-pandemic drive to address socio-economic disparities.[113] Social bond issuance totalled $821 billion in 2023.

- Sustainability bonds: these offer a comprehensive approach, funding projects with dual environmental and social benefits. They incentivize issuers to meet specific sustainability targets, reflecting a trend towards outcome-driven finance. Sustainability bond issuance totalled $768 billion in 2023.

Despite the strong growth observed in the sustainable debt market, 2023 saw substantial declines in some instruments. Sustainability bond issuance fell by 31% and development bank issuance declined by 71%, reflecting market challenges amid global economic uncertainty.[114] However, emerging markets continued to demonstrate resilience, with new issuers such as Saudi Arabia entering the social bond market.[115] Sovereign issuances, especially from Mexico and Thailand, played significant roles, while the Latin America and Caribbean region led in sustainability bonds issuances in 2023.[116]

Nevertheless, the overall plunge in issuances underscores challenges faced in raising climate financing in the presence of inflationary pressures and highlights the need for stronger market incentives and policies to maintain growth.

Improving broader economic conditions, comprehensive policy and regulatory frameworks, standardization and transparency will be needed to sustain the market's growth, maintain investor confidence and market integrity and address other challenges ahead.[117,118]

Performance-based finance mechanisms

Performance-based financing mechanisms enhance accountability by directly tying financial rewards and compensation to the achievement of defined and measurable outcomes, funding recipients incentivized to meet environmental or other targets. Existing performance-based instruments leverage market principles to promote renewable energy, sustainable practices and environmental conservation. Instruments such as power purchase agreements (PPAs) and investment tax credits provide financial incentives linked to measurable outcomes, encouraging efficiency, innovation and investment across various sectors. Collectively, they demonstrate how performance-based approaches can align financial incentives with sustainability goals.

Performance-based incentives have been successfully implemented to promote renewable energy and sustainable projects. For example:

- Germany's market premium scheme under the Renewable Energy Sources Act (EEG) provides renewable energy producers with a performance-based premium, incentivizing them to compete to optimize energy generation in line with market demand.

- India utilizes solar PPAs with performance-based incentives to drive the scale-up of solar energy.

- In the US, California and other states offer performance-based incentives within renewable portfolio standards, rewarding generators for renewable energy output.

- South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) ties financial rewards to energy output, to enhance competition and efficiency in the renewables sector.

- Chile and Brazil have implemented auction systems where developers bid to supply renewable energy, reducing costs and increasing investment in renewables.[119]

These examples indicate how performance-based finance can play a transformative role by directing capital towards projects that deliver measurable environmental or social outcomes, thereby enhancing the impact of limited financial

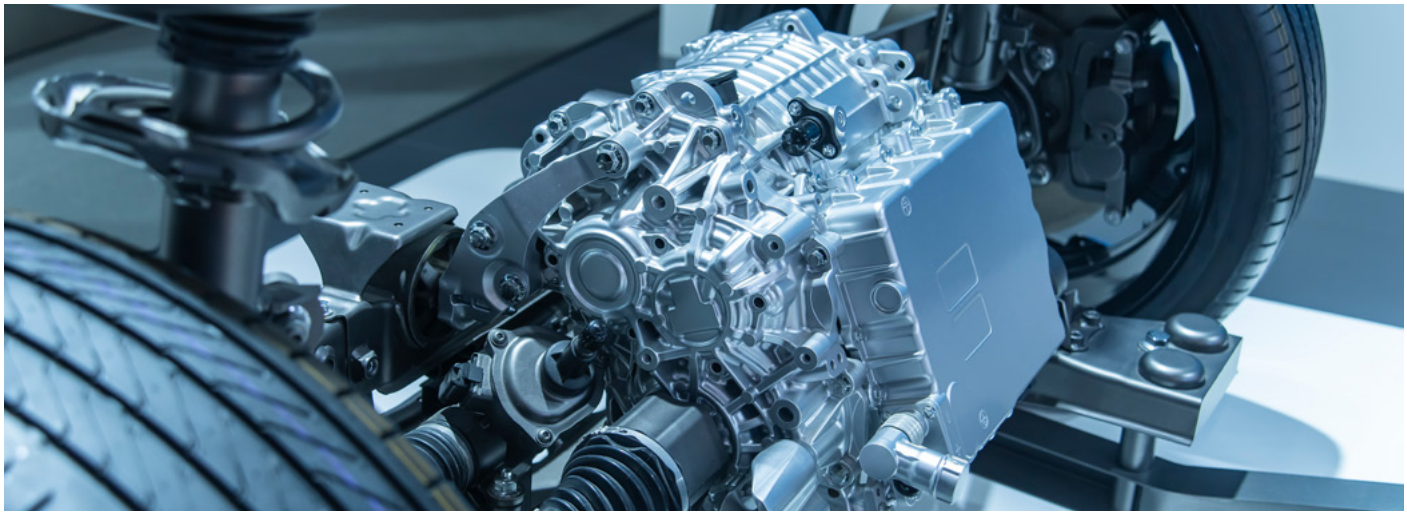
resources.[120] However, successful implementation is dependent on effective MRV regimes, an area where some EMDEs and LDCs face challenges. Capacity building that accounts for the unique conditions of these economies can help and MDBs and international donor agencies are well-placed to offer such support.

Sustainable investment funds

Sustainable investment funds are a central element for financing the global transition to a low-carbon, climate-resilient future. By integrating environmental, social and governance (ESG) criteria into investments, capital can be directed towards projects promising both financial returns and positive environmental impacts, thus addressing investment gaps in critical sectors such as renewable energy and transportation. As the average investor seeks mean-variance optimization, by focusing on environmental and social goals, sustainable investment funds offer investment opportunities to a growing segment of responsible and value-driven investors. Providing a vehicle for aggregating the capital for this non-negligible proportion of the investing class, the funds can drive the adoption of green technologies and best practice, thus promoting broader market transformation.

The scale of sustainable investment funds is growing, with trillions of dollars under management, driven by initiatives such as Europe's Sustainable Finance Disclosure Regulation (SFDR) and the alignment by the Glasgow Financial Alliance for Net Zero (GFANZ) of $130 trillion in assets with net-zero pathways by 2050.[121] These efforts target both institutional and retail investors to mobilize capital towards sustainable projects, particularly in regions with critical needs. However, scaling-up the funds presents challenges, such as the lack of standardized impact measurement frameworks. The success of sustainable investment funds depends on strong regulatory frameworks to ensure transparency and prevent greenwashing. Initiatives such as SFDR can enhance market clarity and investor confidence. Despite some progress in this direction, overcoming this issue requires global cooperation in an increasingly multipolar world.

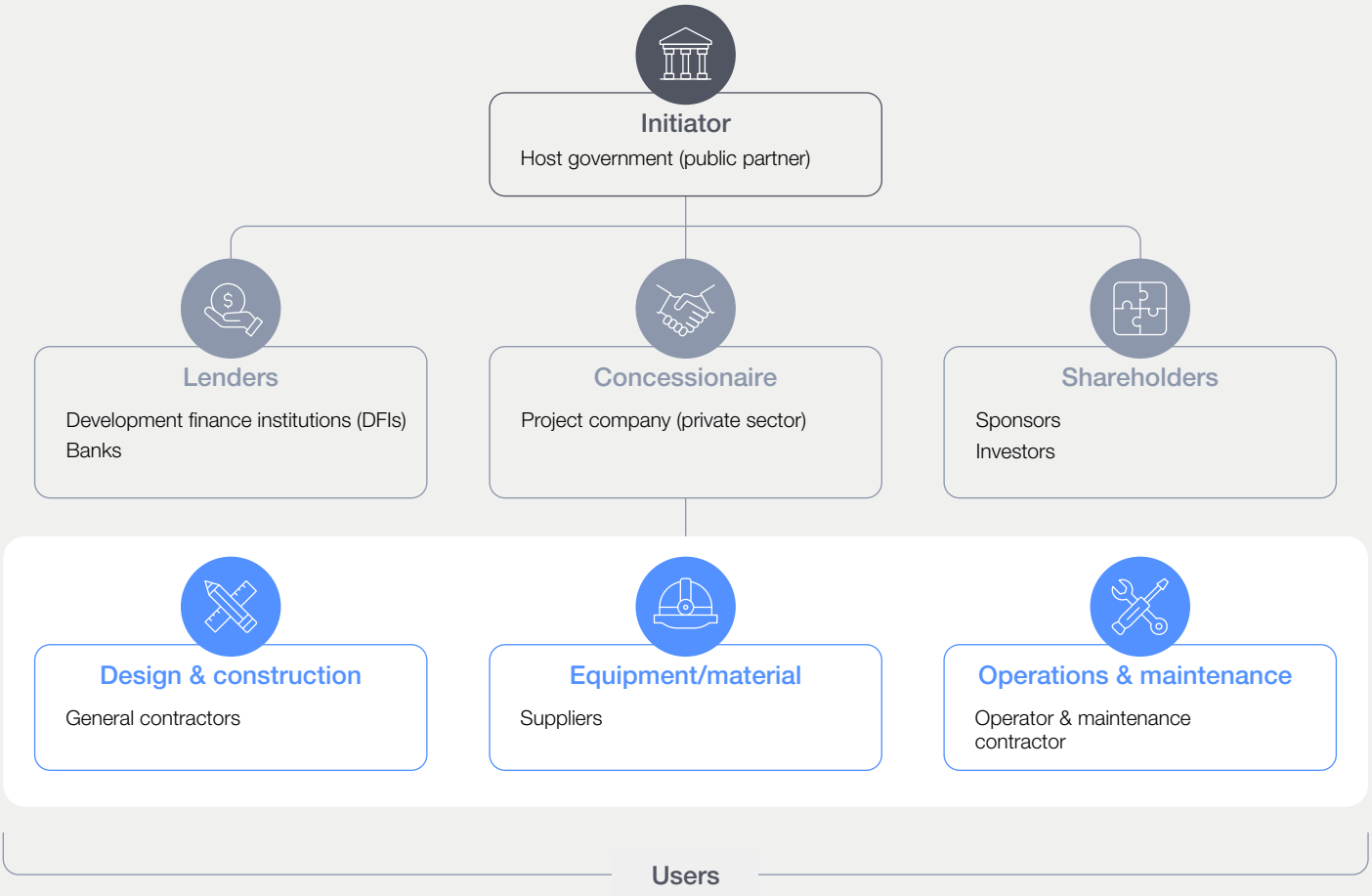
For EMDEs and LDCs, higher investment risks due to political instability and underdeveloped financial markets constitute a further obstacle.[122,123] This creates challenges for adaptation financing in the developing world, as projects in many LDCs – which often lack clear revenue streams – are unlikely to attract private investment. Public and donor funding thus almost always becomes the only source of investment for these countries.[124]



2.3 Hybrid mechanisms

Hybrid transition finance mechanisms blend policy with market strategies to mobilize capital for climate action. By leveraging the strengths of both public and private sectors, hybrid mechanisms can bridge the gap between public policy objectives and the financial returns sought by private investors. As such, they could potentially become the most consequential stream of finance in the drive to accelerate the global transition to a low-carbon economy. Mechanisms such as blended finance, public-private partnerships (see Figure 2), feed-in tariffs (FiTs), "feebates", insurance and risk-sharing tools are emerging as indispensable elements in mobilizing transition finance.

FIGURE 2 | **Example of a public-private partnership (PPP)**



Source: Global Commission on Adaptation.

Blended finance

Blended finance combines public and private capital to de-risk projects and attract private sector participation. According to OnePlanetLab,[125] it mobilizes an estimated $15 billion annually. The strategic capital leverage potential of blended finance instruments is particularly vital in supporting climate adaptation and mitigation efforts in EMDEs and LDCs, where high risk perception routinely deters investment. Therefore, improving investment viability by utilizing concessional funds for first-loss absorption or guarantees can enhance the risk-return profile of climate-related projects, making projects in sectors such as energy, which are vital to EMDE and LDC development goals, more attractive to private investors.

Public-private partnerships (PPPs)

PPPs facilitate collaboration between governments and private entities by combining public oversight with private sector efficiency and innovation, to facilitate risk-sharing, resource optimization and enhanced project viability. This approach is especially tailored to capital-intensive initiatives such as clean energy and sustainable infrastructure. With government budgets feeling the strain of unprecedented spending in the wake of the Covid-19 pandemic, the risk sharing and resource optimization elements of PPPs help bridge the gaps in public funding of socially-relevant climate projects and offer the opportunity to reduce the financial burden on governments.

Feed-in tariffs (FiTs)

FiTs provide long-term payment guarantees to renewable energy producers, encouraging investment in clean energy technologies. FiTs guarantee a fixed, above-market price for electricity supplied to the grid over a specified period, offering investors stable returns and reducing investment risks, especially for renewable energy projects with high upfront costs. They have been globally implemented with demonstrable success, leading to substantial growth in renewable energy capacity, particularly in developed and large emerging economies. Germany, China and India are excellent examples of countries that have used FiTs to drive clean energy investment and technological innovation. However, implementing them in emerging markets that are prone to financial and regulatory constraints remains a challenge.[126,127] Furthermore, integrating FiTs with existing policies and infrastructure requires robust institutional frameworks and technical expertise, which may be limited in some developing country contexts.[128]

Feebates

Feebates impose fees on high-emission products and provide rebates for low-emission alternatives, thereby financially incentivizing sustainable choices by consumers. Such choices constitute a signal to producers to invest in low-emission outputs, so feebates stimulate innovation by incentivizing the development and adoption of low-emission products. They can be designed to be revenue-neutral by using collected fees and taxes on emission-intensive products to fund the rebates on low-emission alternatives. The flexibility and adaptability of feebates imply that the mechanisms can be tailored to various sectors, including the following:

- Automobile industry: higher registration fees on high-emission vehicles; rebates for low-emission or electric vehicles.
- Energy efficiency: higher rates for inefficient appliances; rebates for energy-efficient appliances.
- Building codes: fees for non-compliant, energy-inefficient buildings; incentives for highly efficient buildings.
- Agriculture: fees on high water-consuming irrigation systems; rebates for the deployment of water-saving technologies.
- Waste management: fees on excess waste generation; rebates for recycling and composting initiatives.

These examples illustrate the versatility and effectiveness of feebates across various sectors in promoting sustainable practices. By making environmentally friendly choices more economically attractive, consumers are more likely to choose low-emission vehicles, energy-efficient appliances and sustainable building practices. This shift in consumer behaviour not only reduces environmental impact but also encourages manufacturers and service providers to innovate and offer more sustainable options, further reinforcing the cycle of sustainable development.[129]

Insurance and risk-sharing

Lastly, insurance and risk-sharing mechanisms mitigate financial risks associated with climate-related investments, making it easier for private investors to support sustainable projects. The inability to mitigate investment risks is a significant barrier to investments in climate projects and instruments that reduce perceived risks in such projects are therefore crucial in enhancing their viability and attractiveness to private investors.[130] The provision of a safety net, which boosts private sector engagement and investor confidence, is particularly important for financing in high-risk markets and contexts, including emerging economies and innovative technologies.[131]

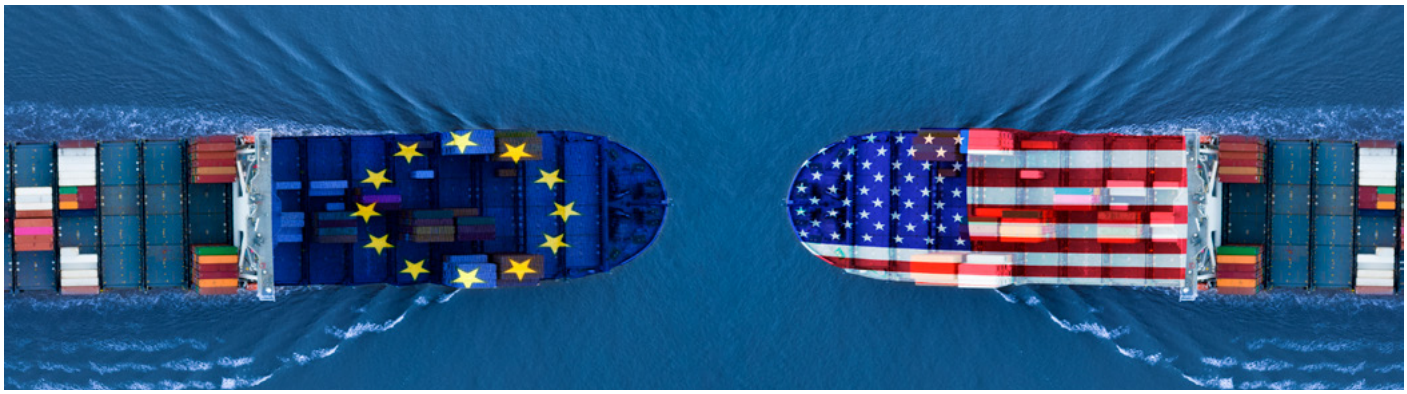
Examples of insurance and risk-sharing mechanisms include the following:

- Political risk insurance
- Credit guarantees
- First-loss guarantees
- Currency hedging
- Revenue guarantees

Each mechanism is often tailored to mitigate specific investment risks, such as political instability, borrower defaults, currency fluctuations or initial project losses. Multi-sovereign guarantees, which involve multiple countries backing a guarantee fund, are especially useful structures that can help achieve higher leverage ratios and attract more private capital by spreading risk across several sovereign entities.[132,133,134]

3 Case studies from Europe and the US

Europe has chosen a more market-focused approach driven by regulations to promote its climate goals while the US government has opted for policy incentives. However, both have attracted criticism for being overly protectionist.



3.1 European Green Deal

The European Climate Law, passed in 2021, sets legally binding targets for achieving climate neutrality by 2050 and reducing emissions by at least

55%

by 2030.

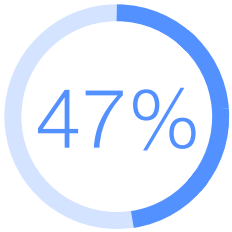
The European Green Deal aims to make Europe climate-neutral by 2050.[135] The European Climate Law, passed in 2021, sets legally binding targets for achieving climate neutrality by 2050 and reducing emissions by at least 55% by 2030 compared to 1990 levels for all EU member states. This establishes a firm framework for accountability and intermediate targets to ensure continuous progress and adherence to common but differentiated responsibilities and respective capabilities (CBDR-RC). Its comprehensive scope integrates climate action across all sectors, aims to align with international agreements and promotes innovation. Additionally, the law emphasizes mechanisms for public participation and socio-economic considerations, with a view to ensuring a fair and inclusive transition to a sustainable long-term future.[136]

The European Green Deal provides the strategic framework and comprehensive policy initiatives to achieve the goals set by the European Climate Law, encompassing a wide range of strategies, policies and interventions across multiple sectors. It aims to promotes economic growth, job creation and social inclusion.[137] It exists alongside the Fit for 55 policy, introduced in 2021 – a comprehensive set of proposals aimed at achieving the EU's legally binding emission reduction targets across sectors.[138]

The transition to a low-carbon economy offers new opportunities for investment, innovation and green jobs across all sectors. Hence the mechanisms driving this change aim to restore the EU's biodiversity, decarbonize industrial systems, transition food systems to resilient and sustainable models, shift to circular systems of production and consumption, and implement EU forest and deforestation strategies.[139] Several incentive-based market instruments and funding mechanisms, some of which pre-date the Green Deal, are employed to operationalize it, including the EU-ETS, ETS2,[140] NextGenerationEU Recovery Plan,[141] Multiannual Financial Framework (MFF) 2021-2027,[142] and the Just Transition Mechanism.[143]

3.2 European Union Emissions Trading System (EU-ETS)

From 2005 to 2023, the EU's Emissions Trading System helped reduce emissions from European power and industry plants by approximately



The EU-ETS was established as the primary policy tool to fulfil the EU's commitments under the Kyoto Protocol. Launched in 2005, it has expanded to become the largest carbon market globally based on the volume of emission allowances traded. By 2009, the system represented 96.46% of all global allowance transactions.

While the scheme is no longer as dominant as it was with the coming onstream of other cap-and-trade schemes, such as China's ETS (now the world's largest in terms of emissions covered), it remains the dominant driver of global carbon pricing. In 2022, 12.5 billion tonnes of emission allowances with a value of $958 billion were traded on EU-ETS platforms. In its first two years, between 2021 and 2023, China's ETS recorded a cumulative trading value of 239.9 million tonnes of emission allowances valued at $1.5 billion.

The EU-ETS covers around 40% of the EU's GHG emissions.[144] The scheme sets a cap on the total amount of emissions that can be emitted by power plants, industrial facilities and aircraft operators covered by the system. The cap is reduced annually in line with the EU's climate targets, using the so-called linear reduction factor. This is currently 4.3% and will increase to 4.4% from 2028 to 2030. Regulated entities can trade emission allowances within this cap, providing a financial incentive to reduce emissions. The EU-ETS significantly contributes to reducing emissions in the EU: from 2005 to 2023 it helped reduce emissions from European power and industry plants by approximately 47%.[145]

Recent developments have expanded its scope and ambition. The cap on emissions has been tightened to achieve a 62% reduction in covered emissions by 2030 compared to 2005 levels.[146] The scheme now includes maritime transport emissions starting in 2024 and will cover road transport and buildings under a new separate system, the ETS2, which will become operational in 2027.[147] ETS2 aims to further reduce emissions by 42% by 2030 compared to 2005 levels, focusing on emissions from fuel combustion in buildings, road transport and small industrial sectors.[148] These expansions reflect the EU's ambition to achieve climate neutrality by 2050 and the comprehensive nature of the bloc's carbon pricing mechanisms.

BOX 2 Deploying EU-ETS revenues

The EU has set up three funding programmes to deploy the revenue generated through the auctioning of allowances in the EU-ETS:

Innovation Fund: one of the world's largest financing programmes dedicated to deploying innovative, net-zero technologies, particularly in the energy and industrial sectors. It is funded with the auctioning of around 530 million EU allowances (estimated at €40 billion).[149] One EU allowance (EUA) gives the holder the right to emit one tonne of CO_2e.

Modernization Fund: more targeted, focusing on modernizing energy systems in lower-income EU member states. With a projected total budget of €57 billion from 2021 to 2030,[150] it is financed through the auctioning of 2% of the total EUAs issued from 2021 to 2030, with an additional 2.5% from 2024 to 2030.[151]

Social Climate Fund: established to ensure that addressing climate change is inclusive by mitigating the social impact of the EU-ETS's expansion, particularly on vulnerable households, micro-enterprises and transport users.[152]

3.3 Carbon Border Adjustment Mechanism (CBAM)

CBAM could increase the cost of delivered steel to the EU by about 56% and 49% for India and China, respectively, by

2034

Climate change as an unusual externality demands collective, global action. Hence, when the global community fails to act collectively, taking meaningful action individually can put a country or region at a significant economic disadvantage through carbon leakage. Specifically, businesses from countries with no or lax emission constraints, all other things being equal, may benefit from trading internationally at lower costs in comparison to those from countries or blocs taking meaningful action on reducing emissions, such as the EU.

The EU's Carbon Border Adjustment Mechanism (CBAM) is the EU's response to this challenge. It is a policy tool designed to address carbon leakage by imposing a carbon price on imports from countries with climate policies less stringent than those of the EU. It combines both regulatory and market-based elements to level the playing field for EU businesses that must comply with EU-ETS regulations while encouraging global adoption of more ambitious climate measures. CBAM started in 2023 with a transitional phase focusing on reporting requirements. Implementation, including financial penalties, is expected by 2026 and full implementation by 2034.[153]

The revenue generated from CBAM, which will be based on EU-ETS prices, could be substantial, with potential uses for funding both mitigation and adaptation efforts within and outside the EU.[154] Specifically, these revenues could be allocated to support the transition to low-carbon technologies, fund climate resilience projects or contribute to global climate finance, particularly aiding developing countries under the principle of CBDR-RC.[155]

The implementation of the CBAM faces several critiques and challenges, both within the EU and internationally. One of the primary concerns for European producers is the potential increase in production costs due to the need to account for the carbon content of imports.[156] This could, perversely, put some European producers at a competitive disadvantage relative to producers in countries with more lenient carbon regulations. Additionally, the administrative complexities associated with CBAM – such as the precise calculation of the carbon content in imported goods and navigating intricate reporting requirements – could impose further financial and logistical burdens on businesses.[157,158]

Internationally, the CBAM has been criticised for its potential to exacerbate trade tensions, particularly with countries that view the mechanism as a form of protectionism. Critics argue that CBAM could be perceived as a unilateral EU measure and lead to retaliatory trade measures from other countries.[159] Additionally, there are concerns about the compatibility of CBAM with World Trade Organization (WTO) rules, particularly regarding non-discrimination principles.[160,161] The mechanism could be seen as a violation of WTO agreements if it is perceived to unfairly target imports from specific countries or disrupts free trade. Wood Mackenzie, a data analytics company, estimates that CBAM could increase the cost of delivered steel to the EU by about 56% and 49% for India and China, respectively, by 2034.[162]

CBAM also raises various sectoral concerns, especially for industries that are heavily reliant on carbon-intensive processes. Key sectors targeted by CBAM, including steel, aluminium, cement and fertilizers, are particularly anxious about the increased costs associated with compliance.[163] These industries already face MRV challenges under the EU-ETS, and the additional burden of the CBAM could further strain their competitiveness in global markets. For instance, CBAM will increase production costs in the steel and aluminium sectors, potentially making them less competitive against producers from countries with more lax environmental regulations when trading with a third country.[164] Moreover, the cement industry has raised concerns regarding the accuracy and fairness of carbon content calculations, which are crucial for determining the carbon price on imports.[165] There is also apprehension about how CBAM will interact with existing measures such as the EU-ETS, which already imposes non-negligible costs on these sectors.[166] The sector lobbies argue that without adequate protection or compensation, such as free allowances or rebates, CBAM could inadvertently lead to more carbon leakage, where production shifts to countries with less stringent climate policies, undermining the EU's environmental goals.

While these concerns are valid, there is also the potential that the sheer size of the EU's single market will lead to the bloc's emergence as the principal climate policy-maker through the implementation of CBAM. Carbon content will become a vital component of international trade, forcing producers to reflect the abatement costs of GHG emissions in their prices. As the cost grows, higher-emitting producers will find the EU a less economically attractive trading destination,[167] thus providing an opportunity for low-emitting producers to capitalize and compete for market share. In the long run, as EU demand for low-emitting products rises, high emitters will be incentivized to decarbonize their products. CBAM thus holds some promise as an instrument for addressing the unusual externality that is the core driver of the climate finance gap.

3.4 US Inflation Reduction Act (IRA)

The measures in the IRA are projected to reduce US GHG emissions by approximately 33% to

40%

below 2005 levels by 2030.

The Inflation Reduction Act (IRA), passed into US law in 2022, represents an ambitious effort to accelerate the US's transition to a low-carbon economy, targeting critical sectors with substantial financial and policy support and incentives. According to the US's Congressional Research Service, the measures in the IRA are projected to reduce US GHG emissions by approximately 33% to 40% below 2005 levels by 2030.

Consistent with the EU's approach, the IRA constitutes a mixture of means to scale-up transition finance:

- Regulatory policies: such as tax credits for renewable energy generation
- Market-based instruments: such as methane emission charges
- Hybrid mechanisms: such as PPPs and EV grants and subsidies

Specifically, it includes the Production Tax Credit (PTC) and Investment Tax Credit (ITC) to bolster renewable energy generation and infrastructure investment. For transportation, it introduces Clean Vehicle Tax Credits to accelerate the adoption of EVs and funds alternative fuel infrastructure development to foster a sustainable transportation network. Additionally, it allocates $1 billion for clean heavy-duty vehicles and $3 billion for reducing air pollution at ports.[168] In connection with this, restrictions on fossil fuel resourcing are imposed, such as methane emission charges on specific petroleum and natural gas facilities.

The manufacturing sector receives approximately $41 billion in tax credits for advanced energy production, underscoring the focus on domestic clean energy manufacturing. For buildings and energy efficiency, the IRA offers Energy Efficiency Tax Credits to encourage retrofitting homes and businesses, reducing energy consumption while also supporting the use of low-carbon building materials.[169]

With respect to environmental and climate justice, funding is made available for ensuring that disadvantaged communities gain equitable access to the benefits of climate initiatives, thus seeking to address long-standing environmental disparities. Agriculture, forestry and land conservation are also key components, with the Act promoting sustainable agricultural practices and funding forestry programmes focused on carbon sequestration, which are crucial for mitigating climate change.

Furthermore, the IRA invests in climate research to enhance understanding and inform future policy decisions, ensuring that climate strategies are data-driven and effective. Cross-cutting provisions support interagency collaboration to ensure that climate considerations are integrated across various sectors for cohesive and effective policy implementation.[170] This approach potentially positions the IRA as a pivotal framework for achieving the US's climate goals.

However, in light of the November 2024 US elections, the Act faces an uncertain future. The new Republican administration with the support of a Republican-controlled legislature may, at a minimum, be inclined to undermine its continued implementation.

BOX 3 The IRA – contending with its internal inconsistencies and other concerns

The IRA has faced several criticisms, primarily concerning its potential economic and environmental shortcomings. Critics argue that the Act could inadvertently drive up energy prices and inflation, especially as the demand for clean energy increases, without immediately mitigating the higher costs of fossil fuels during the transition.[171] Concerns have been raised about the effectiveness of its environmental justice provisions, which some believe may not adequately address the needs of the most disadvantaged communities.[172]

The provisions tying renewable energy development to continued fossil fuel extraction – a political necessity in a highly polarized policy-making environment – have been criticized as counterproductive and perpetuating fossil fuel dependence.[173] Challenges in implementation and regulatory coordination also pose significant risks to its success, with doubts about whether the current infrastructure and supply chains can meet the ambitious targets of its framers.[174]

Partners, such as the EU, have protested at its domestic production provisions, contending that they constitute a potential violation of trade rules and distort the market. There are also European concerns regarding the subsidies offered by the IRA and the potential growth of the US market for low-carbon innovation and technologies enticing European companies to the US at the EU's expense.

4

Bridging the climate finance gap: the big picture

Three principles can help guide the successful deployment of market mechanisms as consumer behaviour-altering instruments: coherence, fairness and appeal.

Germany introduced a de facto tax of €25/ tCO_2e on petrol, diesel, heating oil and gas to ramp up the cost of dirty energy and incentivize greener ways of living.

An emerging conclusion in this paper is that meaningful action on bridging the climate finance gap will require an innovative integration of market and non-market instruments. It demands the design of policies that can mobilize private and public sector funding as part of an ambitious agenda to equitably reduce global dependence on emission-intensive consumption with little to no adverse economic effects. This is a tall order.

The scale of the challenge suggests that the majority of the financing to drive meaningful action on climate change must be mobilized from the private sector by deploying incentive-based market instruments that eliminate or significantly reduce the risk associated with climate projects. However, the strategic allocation of public funding also plays a critical role. Carbon pricing instruments, such as the EU-ETS and CBAM, appear to be effective examples – yet these instruments need to be resilient enough to address the often-overlooked misattribution challenge affecting such incentive-based tools.

For example, in theory, cap-and-trade – the most significant market instrument currently deployed globally (e.g. China ETS, EU-ETS) – streamlines the vital features that make the implementation of carbon pricing workable. Nevertheless, even if the process generates an "accurate" price signal that can impact consumption patterns significantly enough to achieve policy goals, product price signals by themselves are unlikely to offer the information consumers need to change their behaviour over the long term. This is because the evolution of prices may be due to factors not directly related to the emission-intensity of products, preventing consumers from being able to accurately assess the reasons for price changes in their consumption decisions.

This is a crucial issue, because addressing climate change requires consumers to accurately infer the emission-driven costs of their consumption decisions. When this happens, consumers will gravitate towards lower-emission consumption, thus imposing higher risk on emission-intensive production activities. This paper proposes a set of principles that could be applied in developing instruments that can help accelerate the arrival of this future.

At the core of the proposed principles is an acknowledgement of the opportunity presented by the combination of a data-rich economic environment, which has emerged in recent years, and an improved understanding of human behaviour. These two factors can help address the practical issues of price discovery, information transmission and consumer engagement.

To address these issues, some jurisdictions are considering augmenting their existing upstream carbon pricing schemes with features that engage consumers more directly, or have already done so. Germany introduced a *de facto* tax of €25/ tCO_2e on petrol, diesel, heating oil and gas to ramp up the cost of dirty energy and incentivize greener ways of living, while Canada is examining the implementation of personal low-carbon savings accounts which consumers pay into each time a hydrocarbon-based fuel is purchased.

Incentive-based schemes that are well-designed and elicit the expected response from consumers can be expected to lead to an intensification of capital flow towards low-carbon innovation as a result of the elimination of the negative externalities that make low carbon projects financially unfeasible.

By designing consumer-focused incentive-based mechanisms that capitalize on big data-driven innovation and fairly entrench individual responsibility, policy-makers will align their efforts to target market failures. This is fundamental, because achieving net zero will require change across the economy and society. The UK government's *Ten Point Plan for a Green Industrial Revolution* is a good example.[175] The plan's ambition to deliver "jet zero and green ships" requires changes in the volume and patterns of foreign travel, while accelerating the shift to zero-emission vehicles, green public transport, cycling and walking requires consumers to purchase EVs, adopt ride-sharing habits and change their day-to-day patterns of movement.

4.1 Principles for the design of market instruments to address the climate finance gap

This paper presents three principles that can help guide practical policy design actions to mitigate some of the political and behavioural constraints that impede the successful deployment of market mechanisms as consumer behaviour-altering instruments. The three principles are coherence, fairness and appeal.

Coherence

It is important that instruments are designed to help their targets, such as consumers and businesses, understand the costs and environmental implications of each design choice. Design options and associated implementation and operational costs should be tested to investigate the relative advantage or disadvantage of one choice over the other, with the need for ease of understanding and engagement being the goal.

For example, under carbon pricing regimes that place instruments at the producer level, businesses face trading costs. It is important to examine the likely range of trading costs that makes one type of carbon pricing regime, such as cap-and-trade and carbon taxes, equivalent from the perspective of a business's total costs, and assess how carbon pricing design elements, such as supply control mechanisms, can mitigate these costs. An example of a supply control mechanism is the market stability reserve (MSR),[176] which the EU deploys in the EU-ETS.

From an informational perspective, while cap-and-trade, for example, does not offer the same degree of price certainty as a carbon tax, it can play a much stronger role in raising awareness of the implications of CO_2 consumption on business and consumer budgets. In this context, the conditions under which cap-and-trade and taxes generate the same level of emission reductions would need to be examined, along with how design elements, such as price collars, may make the former the preferred carbon pricing instrument.

Fairness

For fairness purposes, policies should explicitly account for variations in target characteristics, such as the socio-demographics of consumers and economic attributes of businesses. Surveys indicate voter support for using climate change policy instruments if the potential negative effect on low-income households is mitigated.[177] Therefore, policy-makers should endeavour to quantify the potential distributional impacts of design choices by investigating how different types of households and businesses are affected by the instruments they design, both in terms of implementation and their design features. For policies affecting households, microeconomic analysis can be undertaken using datasets combining household expenditure, the associated emission for each commodity group and estimates of consumer demand for different commodities. This analysis can then be used to quantify sensitivities to price changes for different commodities for households of certain socio-demographic attributes (and businesses' financial constraints) as well as their associated emission equivalence. These estimated parameters can feed into models used to illustrate the distributional and GHG emission implications of implementing specific design features of policy instruments.

Appeal

Evidence suggests that voters will support climate policy instruments when revenues generated are spent on low-carbon research and development and subsidies to promote deployment. Hence, assessing the level of public acceptability or demand for proposed new regime(s) – and how this varies by institutional design features, feasible scope (e.g. across commodity groups, sectors and households) and allocation of benefits and burdens (e.g. revenue recycling and cost containment provisions) – should be a fundamental part of climate change policy-making.

This may involve conducting surveys to quantify consequential factors, such as the:

- Proportion of businesses and consumers willing to engage with policy instruments
- Level of financial incentive required to encourage unwilling participants to engage
- Extent to which appeal varies along socio-demographic and economic dimensions and by key design features

Economic valuation methods[178] can be used to assess demand, adoption and non-market valuation.[179] Elicited demand curves from these exercises can be used to assess which design features are most appropriate, the socio-economic characteristics of likely participants and how to encourage and compensate laggards.

BOX 4 Important policy design questions

This paper advocates that the achievement of the policy design principles set out in this chapter can be realized by addressing the following questions during the design phase of developing instruments:

1. What is the required and feasible scope of the policy instrument?

Streams of rich datasets from an array of sources, including those capturing the online presence of consumers and open finance-enabled financial transactions, now make it possible to account for the emissions consequences of consumption at a much more granular level than ever before. Policy-makers could exploit these datasets to create models of demand and corresponding emissions intensity across commodity groups and households by socio-economic characteristics. This will allow estimates of the scope required for participation in market instruments and coverage of commodity groups required to achieve change and can also inform how the instruments may support significant investments in low-carbon technologies through changes in consumer behaviour.

2. How would the instrument allocate the benefits and burdens of the required changes?

A transition to a net-zero future offers large future benefits. The scope of the changes, however, involves all sectors of the economy and society – and requires significant costs – along with burdens of change which will have to be borne in the early years. The success of any instrument will depend on it being seen as acceptable across society, by allocating the benefits and burdens fairly. For example, an instrument which taxes petrol is consistent with achieving net zero; however, the *gilets jaunes* protests in France were driven in part by the perceived economic injustice that these types of taxes disproportionately place on lower income consumers. The French government was forced to backtrack and reconsider the policy. Hence, policy-makers should focus on developing tools that model their policies' aggregate benefit to society by each layer of design feature and seek to allocate its benefits and costs fairly.

3. What are the appropriate institutional design features of the instrument?

Any effective instrument with some consumer focus (i.e. aimed at changing human behaviour) will require that consumers engage with both the price and the emission intensity of their consumption. This implies that the introduction of such instruments will require consumers to make decisions under both financial and environmental constraints. Although we have much evidence on how individuals behave in making buying decisions alone, such as buying an item online or at a supermarket, there is a gap in our understanding of how people will behave when faced with multiple constraints. Therefore, the design of instruments should involve an understanding of how individuals can integrate both financial and environmental information in their decision-making and how features of the planned instrument can support the required information processing.

Conclusion

Businesses need to prepare for a new era of aggressive environmental regulation, while welcoming enhanced transparency on risks to supply chains. Climate finance and policies should be tailored to end users and focus on addressing the effects on vulnerable populations.

The economic significance of the transition finance gap is hugely significant and its drivers, such as fragmentation in climate policy-making and the global financial services sector, are wide-ranging. Fragmentation rears its head in multiple contexts. It exists as an issue within countries, where a clear lack of coherence in policy-making may be observed, and it emerges as a serious concern for international negotiators when it fuels divergence in the perception of international guidelines, such as the CBDR-RC principle.

Other factors driving the evolution of the gap are insufficient public funding, limited private sector engagement, high cost of capital, inadequate project pipelines and the complexity of climate finance mechanisms and initiatives. Many of these issues are exacerbated in LDCs and many EMDEs due to political and regulatory uncertainty, institutional weaknesses and the need to prioritize more immediate needs such as poverty alleviation, infrastructure development and energy access. This, inevitably, creates a strikingly large and enduring gap in fortunes between developed and developing countries with respect to their ability to attract climate finance and investments.

Addressing these issues demands a multi-faceted and innovative approach that exploits the strengths of both the public and private sectors, alongside robust international cooperation. It is imperative to develop clear, supportive policy frameworks, enhance institutional capacity, where necessary, and streamline financing mechanisms. Evidence suggests that only through comprehensive and coordinated global efforts can the aspiration to mobilize the requisite resources to meet climate targets and ensure sustainable development be achieved. This is a monumental challenge given the enduring nature of the geopolitical challenges the world currently faces.

As a start, policy-makers should endeavour to address the pervasive lack of coherence in climate change policy-making to achieve efficiency gains and lower the cost of addressing climate change. New initiatives should be assessed from the perspective of how they fit with existing ones to avoid contradictions and duplication. Policy needs to be context-driven. Specifically, while a combination of market and regulatory interventions within existing policy frameworks may effectively and significantly narrow the transition finance gap in many developed countries and large EMDEs, owing to weaker institutional, regulatory and market structures, LDCs and many EMDEs will need to rely on public funding and foreign donations to leverage targeted private sector investments for adaptation and mitigation projects.

In all instances, attention needs to be paid to the impact of policy-making on those least able to bear it. This can be achieved by using a data-driven approach to craft innovative instruments that eliminate the risk factors impeding the flow of critical capital to low-carbon innovation and climate projects, while forecasting the economic and social impact of climate policy on all segments of society. The transition to a net-zero future offers large future benefits; however, the costs in the early years are significant and must be equitably distributed to ensure support from all segments of society.

More regulatory action is needed to continue to hew away at the market failure-inducing effects of climate change as a negative externality. Regulators and policy-makers should focus on enforcing financial disclosure rules, streamlining processes, incentivizing green investments and strengthening environmental regulations. Consequently, businesses need to prepare for a new era of aggressive environmental regulation, which the EU's recent implementation of the CBAM is likely to drive forwards as it moves towards full implementation in 2034. The strengthening of the disclosure regime in countries such as the UK and across the EU bloc will enhance transparency regarding the exposure of supply chain networks to climate transition and physical risks, with implications for the cost of capital. An increased level of transparency should be welcomed by asset managers, banks, investors and consumers, who need to incorporate climate risk exposure in their decision-making.

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