

The role of international climate finance for bridging the low carbon investment gap

Principles of international climate finance



About this study

Project

Strengthen National Climate Policy Implementation:

Comparative Empirical Learning & Creating Linkage to Climate Finance

The project explores how international climate finance can support the implementation of NDCs in emerging economies and EU countries through comparative analyses and by providing a better understanding of the interface between finance and policy implementation.

Project coordination

The German Institute for Economic Research - DIW Berlin

Financial support

The International Climate Initiative (IKI), Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection

Study conducted by

NewClimate Institute

Authors

Markus Hagemann

Imogen Outlaw

Frauke Röser

Cite as

Hagemann, M., Outlaw, I., Röser, F. (2023). The role of international climate finance for bridging the low carbon investment gap. Principles of international climate finance. NewClimate Institute.



Supported by:



Federal Ministry
for the Environment, Nature Conservation,
Nuclear Safety and Consumer Protection

Based on a decision of the German Bundestag

Table of Contents

Summary	5
1. Introduction – The need for financing transformative processes in developing and emerging economies	7
2. Finance needs articulation to date	10
3. Principles for financing transformative processes in developing and emerging economies	14
4. Conclusions	35
5. References	37

List of figures

Figure 1: The gap between current policy and highest possible ambition pathways and the need for technical and financial support (Roeser et al., 2019)	23
--	----

List of tables

Table 1 – Inclusion of ICF needs in NDCs	13
Table 2 – Implications of effort sharing approaches for Net zero years and emissions in 2030	17
Table 3 – Funding requirements for 2023 - 2027 outlined by the JET IP	20
Table 4 – JETP breakdown of funding per sector	21

List of acronyms and abbreviations

CO ₂	Carbon Dioxide
DBCS	Debt for Climate Swaps
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
IPG	International Partners Group
JET-P	Just Energy Transition Partnership(s)
L&D	Loss and Damage
NCQG	New Collective Quantified Goal
NDC	Nationally Determined Contributions
PPP	Public Private Partnership
PV	Photovoltaic(s)
R&D	Research and Development
RE	Renewable Energy
SDG	Sustainable Development Goal(s)
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WEF	World Economic Forum

Summary

The IPCC Special Report on 1.5 degrees shows that urgent action is needed to mitigate climate change. While the Paris Agreement does not provide guidance on differentiated ambition levels for each country, it urges all countries to embark on high ambition pathways. Current NDCs and pledged action falls short of what is needed to reach net zero emissions. To facilitate deep global emission reductions, all countries must implement ambitious mitigation efforts and significant financial resources must be channelled to developing and emerging economies to support them in taking mitigation action beyond what they could do with national finance.

National financial frameworks and public budgets alone cannot provide the scale of finance needed to facilitate transition. High-debt distress in developing and emerging economies limits governments' domestic resources and access to global debt markets. In line with the UNFCCC principle of common but differentiated responsibilities (CBDR), developed countries have a responsibility to lead in global action and provide support – in the form of finance, technology and knowledge transfer, and policy support – to developing countries.

Climate finance needs articulated by developing and emerging economies in NDCs differ significantly in scope and detail and rarely contain details on the role international climate finance should and can play in transition (UNFCCC, 2022a). There is no “one size fits all” approach to determining and articulating finance and support needs. Low-carbon transformations involve different asset types and business models, having varying degrees of capital intensity, and attract different investors; therefore, different financial, regulatory, and fiscal policy instruments are needed to drive change. In addition, finance schemes need to address socio-economic transition factors to ensure transitions are just. This paper outlines why there is need for better information on financial needs and introduces nine exploratory principles to consider in the context of international support to achieve net zero targets. The outlined principles offer a starting point for understanding and defining the finance and support needed to achieve the goals of the Paris Agreement with a focus on scaling ambition and facilitating just transitions.

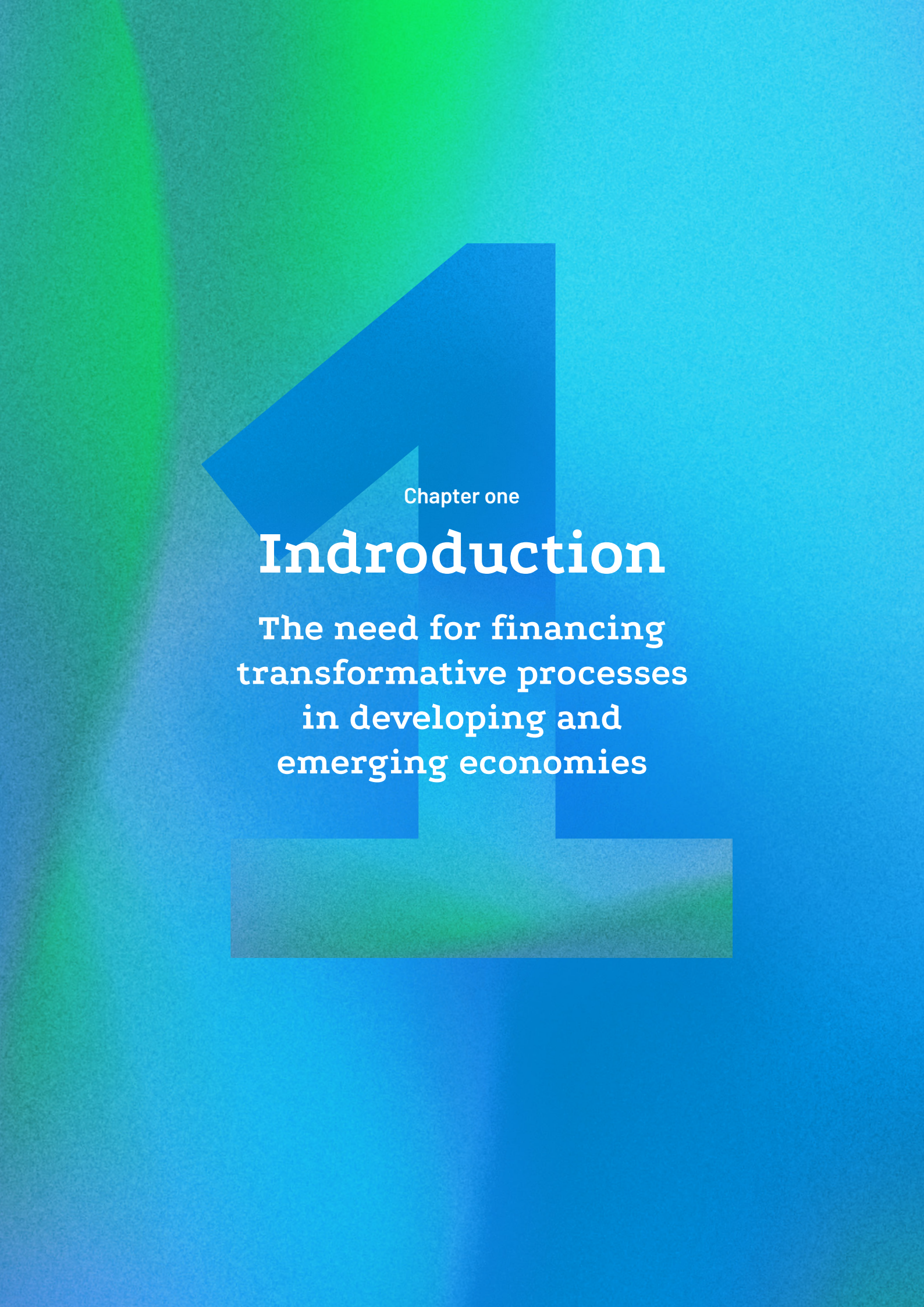
The paper suggests several actions by donors and recipient countries and the international community to better inform international climate finance needs:

- Support the articulation of domestic and international climate finance needs to facilitate highest possible just ambition pathways building on net zero pathways
- Develop shared goals and criteria for international climate finance, either at the UNFCCC level or bilaterally, considering national context and priorities.
- Articulate high ambition pathways with reference to unilateral and international climate finance and technological needs. Clarify how international finance could support innovative finance mechanisms with ambitious decarbonisation objectives
- Use national policy processes as a starting point for strengthening ambition and the facilitation of finance flows. Ensure climate objectives are rooted in national priorities to increase domestic buy-in and support sustainable development goals.

- Ensure the articulation of finance needs follows a bottom-up approach rooted in national context and sectoral circumstances.
- Developed countries should put forward significantly increased finance pledges that reflect CBDR and equity considerations.

Principles of international climate finance





Chapter one

Introduction

The need for financing
transformative processes
in developing and
emerging economies

1. Introduction – The need for financing transformative processes in developing and emerging economies

As the UNEP Emission Gap Report (UNEP, 2022) reiterates annually, years of insufficient climate action have led to an ever-increasing ambition gap between what is needed and what is happening. Aggregated global trajectories based on current NDCs and policies amount to emission levels well above those required in a 1.5-degree compatible world (Climate Action Tracker, 2022e). Countries are not putting forward sufficiently ambitious NDCs, and even though countries have agreed to update their commitments regularly, only a few have provided new, more ambitious NDCs (UNEP, 2022). Net-zero emission targets put forward by countries present an attempt to bridge that ambition gap by providing a long-term vision directly linked to the long-term targets of the Paris Agreement. If combined with an implementation plan, they could allow a full view of the transformations needed across the economy by connecting the endpoint to today's actions. Most NDCs do not align with the long-term vision articulated in net zero emissions targets (UNEP, 2022).

The deep sectoral transformations needed to move to net zero GHG emissions are unprecedented. For instance, global energy-related CO₂ emissions should reach zero by 2050 (IEA, 2021a), implying that carbon-emitting technologies need to be phased out or combined with the option to store carbon in some form or another. Given the short timeframe remaining to reach net zero emission, carbon-intensive technologies need to phase out faster than they otherwise would have been. This is further amplified by the fact that the availability and feasibility of low-carbon technologies to date differs significantly between sectors. Because of these differences, from an economic perspective, it makes sense to phase out technologies in some sectors earlier than others. The scale and speed of transformation required bring along socio-economic challenges because, for instance, communities reliant on revenues from high-carbon technologies need to restructure economically.

The finance to support transition needs to align with the sectoral transformations. Significant financial resources need to be mobilised to scale low-carbon technologies. Early phase-out of high-carbon technologies will have to be accompanied by financial schemes that allow early retirement. Governments need to present socially disadvantaged communities with opportunities to transition their economies and create new revenue sources. All this needs to be provided by a mix of financial instruments, from grants that support the development of enabling environments or otherwise non-competitive technologies to concessional loans that provide favourable finance conditions. The amount and type of financing needed will be highly context and time dependent. In developing and emerging economies, national financial frameworks and public budgets alone cannot provide the scale of finance needed (Kreibiehl et al., 2022). In addition, many developing countries are already faced with very high levels of debt that severely limit their ability to shoulder the financial burden associated with a deep transformation against the backdrop of high costs of dealing with the impacts of climate change.

Domestic climate finance is insufficient to facilitate the scale of transformation needed (CPI, 2020), and the availability of sufficient international financial (and technical) support for developing and

emerging countries remains a barrier. The USD 100 billion climate finance goal remains unfulfilled (OECD, 2022), and the international community struggles to propose a New Collective Quantified Goal (NCQG). To facilitate access to finance, donors and recipient countries have recently come together to negotiate agreements for financing under the umbrella of 'Joint Energy Transition Partnerships' (JET-P). These JET-Ps provide capital and financing channels (e.g., concessional loans and grants). So far, three countries have negotiated JET-Ps (South Africa, Indonesia, and Viet Nam), and several others are in advanced talks (Mathiesen and Barigazzi, 2022). Finance pledged under the JET-Ps is the result of negotiations between different parties. Limited input is provided on the actual finance needs of the recipient countries, and pledged figures represent a fraction of the amount needed for the transition in the specific sector. Political priorities and strategies often influence finance negotiations, resulting in figures with limited grounding in the national context. While JET-Ps present innovative financing partnerships, vulnerable and small countries have criticized JET-Ps as contributing to a misbalance of finance because of their focus on the power sector. This paper aims to outline why there is a need for better information on financial needs and introduces key principles to consider in the context of transition finance and international support to achieve net zero targets. The paper is explorative and draws on different elements around the UNFCCC negotiations and other ongoing processes to provide guidance on how finance needs could be articulated and communicated outlining several principles in this regard.



Chapter two

Finance needs articulation to date

2. Finance needs articulation to date

The scale of finance needed to transform economies to align with the Paris Agreement is influenced by context-dependent factors, including domestic capacities, national development priorities, macroeconomic circumstances, and climate vulnerability. Different finance sources and instruments play different roles in the transformation. Sectoral transformations involve different asset types and business models, have varying degrees of capital intensity, and attract different investors; therefore, different financial, regulatory, fiscal, and other policy instruments are needed to drive the change. The appropriateness of instruments also depends on the phase of innovation – concept development versus proof-of-concept versus scaling for commercial use – and is responsive to cost and investor confidence (PIDG, 2019). Ideally, support needs are linked with long-term targets to account for changing finance needs over time.

The articulation of finance needs should also consider the role of domestic public and private sources and where international public and private investment is most effective. De-risking mechanisms, for example, are crucial in lowering the cost of capital and mobilising diverse financing streams. Climate finance can also play a facilitating role in developing enabling environments for transformation and investment through facilitating capacity building and technical assistance which can support the creation of conducive governance structures and investment frameworks. An enabling investment environment can increase investor confidence and lead to longer-maturity loans and access to larger pools of capital.

Studies on identifying climate finance needs

Several studies have estimated finance needs on a global level with reference to achieving net zero GHG emissions by 2050, but there is little to no detail on the role international finance should and can play. According to the International Energy Agency (IEA) (2021b) and World Economic Forum (WEF) (2021), reaching net zero emissions globally by 2050 requires an annual investment of USD 4-5 trillion by 2030, which is three times the current rate. To limit warming to 2°C, research estimates USD 3.5 trillion per year is needed between 2016 and 2050 (OECD/IEA and IRENA, 2017). The IEA (2021b) suggests that around 70% of that financing should come from private actors and that development institutions need to play a role in raising public funds. However, there is no indication of which parts of the finance should flow from international financial institutions or through international finance deals (see above). Finance agreements often introduce and discuss the use of financial instruments, such as risk capital for early-stage development or blended finance, at a general level.

National, often sector-specific, studies articulating the finance demands of developing countries provide more insight into investment needs and viable financial mechanisms to facilitate access to capital. However, they often do not answer questions about the role of international climate finance in transition. Studies for several countries, especially those with large shares of coal generation and coal resource endowments, such as South Africa or Indonesia, have estimated the overall investment needs for the power sector. These studies detail the financing needs of technology over time (e.g., (IESR, 2021)), but lack details on the sources of financing, especially concerning the role of international

financing. Emerging studies on the design of an international financial support scheme only exist to date in the context of the South African JET-P (Steyn et al., 2021). However, even in this context international finance needs as defined in this study are not further detailed, but instead only mechanisms are discussed that define how the international finance could flow.

International finance needs in country plans

Climate finance needs articulated as part of NDCs differ significantly in scope and detail and rarely contain estimates of international finance. Countries use a range of methodologies to articulate climate finance needs that differ in precision (i.e., aggregate versus itemised), length of implementation, completeness (i.e., how many sectors are covered), cost, and conditionality (Pauw et al., 2020). Lack of clarity, transparency, and differing interpretations of international climate finance further complicate the communication of finance needs (UNFCCC, 2022a).

Countries' articulation of finance needs in NDCs indicate unique government priorities and offers insight into similar high-level challenges faced in formulating and communicating finance needs, including insufficient administrative and technical capacity and difficulty defining the scope of activities required to align with net-zero pathways. Table 1 shows this leads to very different articulations of international financing needs in NDCs with different degrees of conditionality. Importantly the table indicates multiple channels facilitate access to international climate finance (i.e., Articles 6 and 9 and bilateral and multilateral initiatives), and finance needs are not generalisable but dependent on country circumstances.

Table 1 – Inclusion of ICF needs in NDCs

Summary of Selected NDCs				
Countries	Brazil	India	Indonesia	South Africa
Net Zero Target Year	2050	2070	No explicit target. 2060 mentioned in LTS	2050
2030 unconditional NDC target	- Emissions 37% below 2005 levels by 2025 - Emissions 50% below 2005 levels by 2030	- Emission intensity of 45% below 2005 levels by 2030 - Create additional carbon sink of 2.5 to 3 billion tonnes of CO₂ equivalent by 2030	Emissions reduced by 32% against 2030 BAU	Target conditional on international support
2030 conditional NDC target	Implementation of NDC is unconditional	50% cumulative electric power installed capacity from non-fossil fuel-based energy by 2030	Emissions reduced by 43% against 2030 BAU	- Annual GHG emissions range from 398–510 MtCO₂-eq in 2025 - Annual GHG emissions will be in a range from 350–420 MtCO₂eq
Sector Coverage	Economy-wide	Economy-wide	Economy-wide	Economy-wide
Climate Finance Requirements	Not mentioned	Required CF is partially quantified but distinction between unilateral and ICF not explicit. - Mitigation ≈ USD 834 billion till 2030 - Adaptation ≈ USD 206 till 2030 (not including disaster mgmt. and resilience) - Preliminary estimate USD 2.5 trillion by 2030	Mentioned but unclear what is general climate finance and what is ICF needs. - Unconditional mitigation target ≈ USD 281 billion - Conditional mitigation target ≈ USD 285 billion	Distinction between CF and ICF not always clear - Mitigation ≈ USD 60–64 billion till 2030 - Adaptation needs also indicated and quantified for each indicator
Channels of ICF	Use of Art. 6 to reach the NDC but no mention of using international offset credits	Not explicitly stated, India is “experimenting with a careful mix of market mechanisms” to collect national and ICF (use of Art. 6 unclear)	- Multilateral (e.g., Adaptation Fund, Bio-CF, FCPF, FIP, GCF, GEF, UNREDD+, WB, etc.) - Bilateral (e.g., Germany, Norway, Japan, USA etc.) - Article 6 through national environmental fund management agency (BPDH) and REDD+ - Proposed introduction of carbon pricing mechanism - Financial instruments mentioned: loans and grants	- Article 9 noted as a key to reaching the targets set out in the NDC - Bilateral and multilateral channels - Financial instruments mentioned: grants, loans, concessional finance, debt-restructuring

Sources: Government of India, 2015, 2022; Government of South Africa, 2021; Republic of Indonesia, 2021; Climate Action Tracker, 2022c, 2022d, 2022a, 2022b; Federative Republic of Brazil, 2022; Indonesia, 2022



Chapter three

Principles for financing transformative processes in developing and emerging economies

3. Principles for financing transformative processes in developing and emerging economies

The knowledge gap with regard to the definition of specific mitigation related transition finance needs and the role of international finance speaks to the difficulty of formulating such needs. At the same time, understanding finance needs in a specific country and sector context is critical to facilitate climate finance flows and ensure their appropriateness in terms of scale, type, and target. Given the very different national and sector contexts, there is no “one size fits all” approach. This section lays out several principles (outlined in no particular order) around understanding and defining finance and support needed to achieve the Paris Agreement goals focussing on the long-term transformation needed to move to net zero economies. The principles may help inform countries to articulate finance needs and guide the strategies of climate finance providers to scale-up support.

Principles of international climate finance

1. Developed countries need to deliver on their responsibility to provide scaled up support 	2. Investments early on can jump start transformations and reduce overall investment costs 	3. International support needs may be understood at the sector level while recognising overall national needs and context as well as cross sectoral linkages 
4. Developing countries need to follow just transitions towards high ambition pathways 	5. National policy processes need to be the starting point for defining more ambitious and equitable interventions and communicating climate finance needs 	6. Co-benefits can act as an entry point to climate action and inform finance contributions 
7. Innovative financial mechanisms help channel national and international, public and private, finance towards ambitious and equitable action on mitigation, adaptation, and loss and damage 	8. Balanced funding strategies for climate action need to consider that higher mitigation ambition potentially leads to lower future need for adaptation and loss & damage finance, and recognize already incurred and unavoidable costs 	9. Commonly agreed goals and criteria can help to mobilise and operationalize climate finance which adequately addresses the global climate emergency and national needs 

Principle 1 – Developed countries need to deliver on their responsibility to provide scaled up support

Under fairness considerations, developed countries need to reach net-zero a lot earlier than their targets suggest. This implies that they need to significantly improve their domestic targets and provide significant support to developing and emerging economies.

Net zero emission targets put forward by countries to date often mirror what is deemed feasible but often do not reflect what is necessary. Global pathways in line with the 1.5°C temperature target are often directly translated into national targets by developed countries: the IPCC recommends that global CO₂ emissions reach net zero around 2050 (IPCC, 2018a) – 19 of 29 net zero targets submitted to date aim at a time horizon of 2050 (CAT, 2022). Nine of the remaining ten have net zero targets later than 2050, and only one has a net zero target before 2050. As a result, the aggregated targets are not sufficiently ambitious to reach the temperature targets agreed upon in the Paris Agreement (CAT, 2022).

Article 3 of the UNFCCC stipulates that countries should act on the basis of “common but differentiated responsibilities and respective capabilities”. The principle is vaguely formulated and leaves ample space for interpretation. Effort sharing studies have attempted to translate the principle into country specific pathways (Höhne et al., 2014) or carbon budgets (van den Berg et al., 2020). They result in a broad set of pathways and emission budgets for individual countries. However, most studies do not provide sufficient insight to determine years when emissions reach net zero.

Table 2 shows the resulting 2030 emission levels in several developed countries under a range of effort sharing approaches. The ranges stretch between negative and positive emissions levels for highlighted countries. In addition, the Table highlights two simple and transparent calculations based on a) a distribution of the remaining carbon budget under a 1.5-degree scenario based on population and b) the equal distribution of the historical carbon budget since the start of the industrial revolution (~1850) among countries¹. While differing significantly in the year that emission levels reach zero, what the latter two effort sharing approaches have in common, is that the net zero years are all well before the target years put forward by the countries under the UNFCCC.

¹ For calculating the carbon budget, we discounted historical emissions by 2% (den Elzen et al., 2013). This approach attempts to account for the fact that low carbon technological alternatives have become more and more available over time and that the process of burning fossil fuels have become significantly more efficient, hence allowing countries today to emit significantly less for the same service provided compared to the beginning of the industrial revolution. This is a normative setting that aims to illustrate that even under when discounting historical emissions all developed countries will have reached their net zero year in the past under the carbon budget approach presented here.

Table 2 – Implications of effort sharing approaches for Net zero years and emissions in 2030

Country	Min emission 2030* [MtCO _{2e}]	Max emissions 2030* [MtCO _{2e}]	Net zero year under population principle* [year]	Net zero year according to historical responsibility* (discounted) [year]	Net zero years put forward under the UNFCCC (CAT, 2022) [year]
Germany	-699.83	583.57	2033	1983	2045
UK	-658.6	412.97	2041	1986	2050
Japan	-484.94	914.45	2032	2005	2050
USA	-1672.76	4275.92	2027	1983	2050

*(Rajamani et al., 2021) *(Rajamani et al., 2021)

*(own calculation)

*(own calculation)

The evaluated countries all show a gap between targets based on fairness considerations and submitted targets. While the size of the gap can differ significantly based on the interpretation of fairness, targets based on fairness considerations would even at the minimum require extremely strict climate action leading to net zero emissions in this or the next decade². If developed countries are not able to work towards such targets as current net zero targets clearly indicate, then they need to increase the financial support they provide to developing countries significantly to support them to move towards more ambitious targets.

The discrepancy provides insight into the need for developed countries to not only meet ambitious domestic targets beyond their current net zero commitments, but also increase financial support to developing countries to aid them in their mitigation and adaptation efforts. This points to a significant finance gap that needs to be closed. While effort sharing approaches do not provide insights on the level of this finance gap, they hint at the magnitude of financing needed, even if developed countries increase their ambition. In summary, developed countries should tackle the gap in two ways: (1) increase domestic ambition and (2) increase finance contributions to developing countries. These actions correspond to UNFCCC provisions that developed countries lead in combatting climate change and have a responsibility to provide financial support to developing countries.

For current net zero emission targets and commitments from developed countries this means that they need to (a) provide insights on how their commitment relates to “common but differentiated principle” under the UNFCCC and (b) include consideration for increased financial support to developing countries given the discrepancy between current targets and fairness considerations.

² Based on the least ambitious approach depicted in Table 2, the population principle

Principle 2 – Investments early on can jump start transformations and reduce overall investment costs

Scaling up investments in the transformation today minimises the costs in the long run by avoiding lock-ins and reducing technology costs in developed and developing countries.

Global studies show that transformation finance needs are significant but that embarking on a net zero emissions pathway today can help reduce the level of finance needed overall. Scenarios that estimate transformation finance needs under a cost-optimised pathway require significant immediate investments (IEA, 2021b; WEF, 2021a). In contrast, country emissions pathways under current NDCs are projected to see significantly lower investments until 2030. Scenarios in the IPCC emissions database indicate that such delayed action leads to increased marginal costs in the long run. (Riahi et al., 2022)

Immediate action pathways contribute to reduced marginal costs over time because they avoid lock-ins and allow for learning (Riahi et al., 2022). Continuing to invest in carbon-intensive technologies that are not in line with net zero emissions pathways has a high risk of causing lock-ins due to sunk investments. Many carbon-intensive assets have significant lifetimes and will need decommissioning under delayed pathways leading to additional future costs. At the same time, investing more in low-carbon technologies early on brings down costs and investment needs in the long run through technological learning. Experience with renewable energy technology (e.g., photovoltaics (PV)) has shown that this effect can be significant and hard to predict and lead to higher than projected technology uptake (Cronin et al., 2015).

Embarking on immediate action pathways towards net zero emissions also reduces costs in developing countries in the long run given that technological learning and cost reductions are also achieved at the local level. Local innovation and deployment are needed to reduce the perceived risks and to bring down financing costs, which are often significantly higher in developing countries. Technological learning and innovation can tailor technology to fit the local context. For example, PV deployment in deserts requires solutions for cleaning the surfaces or the yield will decrease significantly. The development of local value chains takes time but leads to cost reductions as it, for instance, reduces transport costs and generates added value in the country context.

Principle 3: International support needs may be understood at the sector level while recognising overall national support needs and context as well as cross sectoral linkages

Finance needs vary significantly between sectors in a country as do the actors involved and the finance type and instruments deployed to incentivise low-carbon technology uptake and phase out of fossil fuels.

A bottom-up approach that considers national and subnational context and sector transition needs helps to frame international support for countries to achieve net zero emissions. Article 4.4 of the Paris Agreement advocates for economy wide GHG emission reduction targets which integrate

national circumstances. Within the national context, breaking GHG mitigation targets into sector-level strategies (including their interlinkages) can make the transition journey more tangible to actors and provide insight into enabling factors and challenges (Sophie Boehm et al., 2022), and highlight the social and economic impact on vulnerable communities. Recently the utility of looking at sectors was also acknowledged at the UNFCCC level, as the Glasgow Breakthrough Agenda provides a platform to strengthen sector-based collaboration between countries and businesses (IEA, 2022). Systemic change is needed to decarbonise; therefore, it is important to view sectoral transition pathways within the larger context of economy wide targets with the recognition that synergies and overlaps exist between sectors.

Sectoral transformations are at different stages globally and need varying degrees of international support in each national context to meet net zero emission targets. Globally, the energy supply sector is comparatively advanced with its landscape shifting from a focus on centralised fossil-fuel based power stations to decentralised renewables (IEA, 2020; WEF, 2021b). In contrast, the decarbonisation of the industry sector is lagging globally due to process emissions, high heat requirements, and unfavourable economic factors in the cement, steel, and chemical industries (i.e., capital intensity, low profit margins, trade exposures, and long asset life) (Gross, 2020). While renewable technologies in the power sector have reached cost parity in many global constituencies and have attracted significant private investments, technologies that lead to decarbonisation in the industry sector are often in the R&D stage (e.g., hydrogen steel routes) with much smaller amounts of private capital put forward to date. Although the situation at the national level can be quite different across countries, the state of global transformation can have important implications as technologies might be more readily available or policy frameworks more easily adaptable. The green transition and technological innovation are not confined to sectors; therefore, a cross sectoral perspective is helpful in identifying linkages. For example, the transition of the power sector is closely linked to decarbonisation in demand sectors, where electrification is part of the sectoral transition. A sectoral approach has to account for such cross-sectoral overlaps.

Sector circumstances in a specific country context significantly influence net zero emissions financing needs and strategies to access and mobilise capital. Asset types differ across sectors, require varying levels of capital investment, depending also on existing infrastructure lock-in and the technological lifetime of assets, and attract different types of investors. The level of private sector engagement and the most appropriate financial mechanisms can change between sectors and national contexts. For example, de-risking mechanisms may be needed for early-stage innovation, whereas large capital investments may be required to bring technologies to scale at later stages of the innovation curve. As the situation from one national context to another can vary significantly in the same sector (e.g., with some countries financing RE development primarily through balance sheets, while others rely primarily on private loans), understanding how the sector in each country works is of essence to define finance and support needs. The different situations in sectors should however not lead to international finance focusing on a limited number of sectors, as is currently the case with JET-Ps which focus almost entirely on the power sector. Quite the opposite is necessary as all sectors require decarbonisation, and there is often overlap. The focus of international finance should be sufficiently broad in terms of sectors and balanced in terms of mitigation and adaptation.

Beyond technology and infrastructure, climate finance is also necessary to address broader socio-economic impacts of the transition which are highly context and sector specific. Take for example

the building sector, where a green transition generally entails building new net zero energy buildings, renovating existing structures to net zero energy standards and electrification of the remaining energy use (Sophia Boehm et al., 2022). A just transition needs to manage skilling and reskilling workers in low carbon technologies as well as recognise the financial impact of renovations and energy standards on housing prices. International climate finance is crucial in supporting just transitions and ensuring workers (both formal and informal) and communities (directly and indirectly) impacted by transition are not left behind. Again, a bottom-up analysis of the just transition elements, inclusive of impacted communities' perspectives, is critical to understand and define overall transition finance needs.

Box 1 – Connecting the international, national, and sectoral for supporting just transitions – The case of the JET IP in South Africa

South Africa has made significant progress at identifying and communicating their support needs for a just transition, with the development of a Just Transition Framework (JTF), an updated Nationally Determined Contribution (NDC), and Just Energy Transition Investment Plan (JET IP). These documents outline the country's vision for achieving a just and equitable transition towards a low-emissions and climate resilient economy over the coming decades. The JTF builds on a multi-year consultative process and prioritises procedural, redistributive and restorative justice, the NDC sets the level of ambition and medium-term emissions target, and the JET IP details the financial requirements in three priority areas for implementing the NDC, with an initial time horizon of five years and the ultimate objective of funding the path to a low carbon and climate resilient society over future decades.

The JET IP includes the transformation of the electricity sector and development of new energy vehicle and green hydrogen sectors, led by the principles and priorities detailed in the Just Transition Framework. Table 1 shows a breakdown of funding requirements by sector in the JET IP, which includes skills development and municipal capacity as key justice elements.

Table 3 – Funding requirements for 2023 - 2027 outlined by the JET IP

Funding requirements 2023 - 2027	ZAR billion (USD billion)
Electricity sector	711.4 (47.2)
New Energy Vehicle Sector	128.1 (8.5)
Green Hydrogen Sector	319 (21.1)
Skills development	2.7 (0.18)
Municipal capacity	319.1 (21.3)
Total	1 480 (98.7)

Source: (The Presidency, 2022)

The funding requirements for each sector vary drastically, with the largest allocation going to the electricity sector, followed by green hydrogen, then new energy vehicles. The techno-economic case for the transition of the electricity sector is well understood, reflecting the maturity of this sector and a clear understanding of the policy and infrastructure, and finance needs.

The green hydrogen and new energy vehicles sectors are less mature with fewer technical options and less developed policy environments.

The Just Energy Transition Partnership (JETP), through which the EU, Germany, France, UK and US (known as the International Partners Group (IPG)), committed to mobilise USD 8.5 billion over the next five years to support South Africa's just transition to a lower carbon and climate resilient economy (International Partners Group, 2021). Table 2 provides a breakdown of the JETP finance by sector showing it makes up just a small fraction of the total investment needs articulated by the JET IP. Importantly for South Africa, the JETP recognises skills development and investment in economic and social aspects as crucial enablers for progress in all three sectors.

Table 4 – JETP breakdown of funding per sector

ZAR (USD) billion	Electricity	NEV	Green Hydrogen
JET IP Financing needs	1 030 (68.7)	128 (8.5)	319 (21.3)
JETP package			
Infrastructure	6.9	0.2	0.5
Planning and implementation capacity	0.7		0.2
Skills development	0.012		
Economic diversification & innovation	0.022		
Social investment & inclusion	0.016		

Source: (The Presidency, 2022)

The JETP and JET-IP have been crucial in determining the scale of investment required for the identified sectors. They demonstrate the importance of interactions between international, national and sectoral levels for financing transitions; without the sustained work at the national level, it is unlikely that these sectors would have received the funding they have from the international community through the JETP.

Experience at the sectoral level will provide valuable learnings for future work at the national level and efforts to attract more funding. However, much work remains to implement the focus areas and attract full financing, and other sectors not included in the JETP and JET-IP also require significant finance. The progress achieved by the JET-IP and the JETP will have importance implications for the country's ability to attract significantly more funding, post 2027. Lastly, given the interest in JETPs in numerous other emerging economies, the experience of the JETP and JET-IP in South Africa can offer relevant learnings for these countries.

Principle 4 – Developing countries need to follow just transitions towards high ambition pathways with the support of developed countries

To achieve Paris objectives, developing countries need to shift onto highest possible ambition pathways to reach net zero by 2050 but can only achieve this with financial and technical support to accelerate action.

To address the climate crisis, almost all countries need to significantly raise their levels of ambition (IPCC, 2018b). The insufficient ambition level of developed countries' net zero targets and the lack of signs that these will be increased significantly (Principle 1) furthers the need for developed countries to support developing and emerging economies to embark on ambitious pathways, if the world aims to reach the long-term goals of the Paris Agreement. Some developing countries have already put forward net zero targets that indicate the willingness to go beyond what could be considered their fair share (Chapter 2). Significant immediate investments are needed to allow developing countries to frontload their effort pathways and embark on near-term ambitious net zero emission pathways which avoid the costs of delayed action (Principle 2). To enable this, developed countries need to increase the currently insufficient financial support they provide to developing countries significantly to support them in moving towards their highest possible ambition. For developing countries this has implications in two major ways: First they need to develop highest plausible ambition pathways, and second provide a clear indication of additional financial needs, including for technology and capacity building, considering realistic and fair unilateral capacity (Roeser et al., 2019).

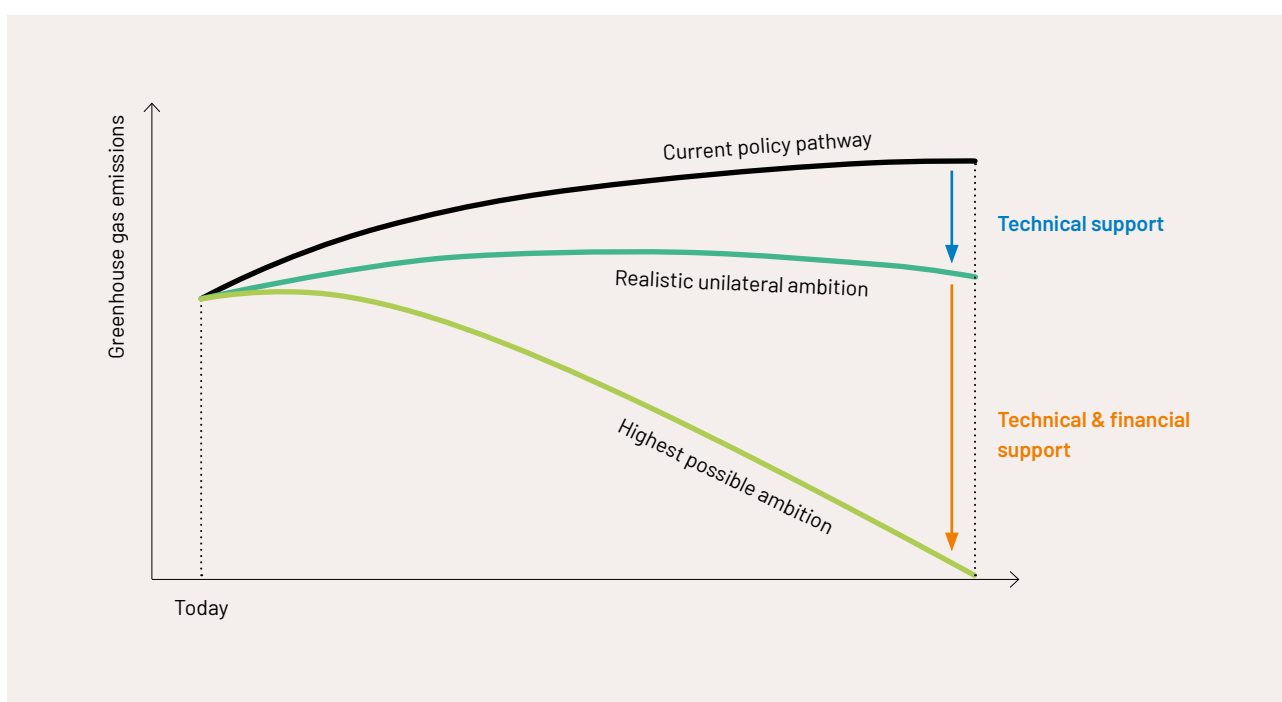
Highest possible ambition pathways developed in the national context should be based on a combination of what is possible and necessary and contribute to just transitions. Paris-compatible global pathways (e.g., IEA (2022) or sectoral benchmarks (CAT, 2020) can inform highest ambition pathways but need to consider the trajectory that fits best in the national context. Given the uncertainties inherent in any future projection, actors should develop multiple pathways that lay open the solution space without pre-determining a single future and allow for science-based discourse within civil society. Pathways provide an idea of where investments need to flow short- to long-term and help identify areas that require divestment. In doing so, they provide an important signal to a broad range of societal actors, from policymakers to investors. To further enhance this, pathways should be embedded in a societal discourse and updated frequently to take account of new insights and shifts in the discourse. (Roeser et al., 2019)

Evidence suggests that current policy pathways or NDCs are overly cautious and that countries could present more ambitious pathways already taking account of the national resources available. Countries' caution is multi-layered. Equitable pathways must consider not only investment costs but the socioeconomic impacts and trade-offs inherent in transitions (Principle 6). For example, analysis of decarbonisation in the transport sector in South Africa indicates potentially negative impacts on employment which can be mitigated when efficiency improvements and behavioural change is introduced simultaneously (Caetano et al., 2017). Caution might also be rooted in a lack of data or resources to analyse sectors or to undertake more comprehensive planning processes (Roeser et al., 2019). With the help of technical assistance, improved planning processes could lead to updated pathways that can be put forward as realistically achievable unilateral contributions. As such,

pathways form a basis for the identification of further technical assistance and financing needs while transparently communicating the national efforts undertaken.

While countries have started to put forward more ambitious plans by submitting net zero targets, these are not sufficiently detailed to derive investment needs. Breaking down climate finance into unilateral investment capacity and international public and private investment needs can highlight and make transparent the finance gap that impedes ambitious action (See Figure 1). Finance needs can be further broken down by sector (Principle 3). Communicating finance needs in net zero strategies and NDCs can indicate commitment to the international community, potentially attracting more support and informing the prioritisation of investments. Importantly the transparency of finance needs provides the opportunity for greater scrutiny of financial flows and a metric to assess international support for ambitious decarbonisation.

Figure 1 – The gap between current policy and highest possible ambition pathways and the need for technical and financial support (Roeser et al., 2019)



Principle 5 – National policy processes need to be the starting point for defining more ambitious and equitable interventions and communicating climate finance needs

National processes, including those around NDCs and net zero emission targets, could, if harmonised form a basis to ensure that finance is used in an effective manner, in line with national priorities.

The Paris Agreement replaced negotiations over who reduces emissions by how much with a “stock take” of international action where countries are entirely responsible for defining their pathways, policies, strategies, and pledges. Under this regime, raising ambition is mainly achieved from the bottom up as countries submit new and updated NDCs. These NDCs are formulated through national processes that combine input from different national stakeholders, especially line ministries, to result in one economy-wide pledge under the UNFCCC (Roeser et al., 2019). The result reflects what a country deems feasible in the near to mid-term. In contrast, net zero targets often utilise a top-down approach as countries commit to high-level pledges in line with global targets without clear or only rough implementation plans (see Chapter 1).

Consolidating these and other national processes, bringing together bottom-up near-term and top-down long-term approaches, is important to present an internally consistent, nationally driven approach to the international community. Current NDC targets are far from sufficient to be considered Paris aligned (UNEP, 2022). On the other hand, net zero targets presented by both developed and developing countries may be a step towards a Paris-compatible world (see Chapter 1) but provide little guidance on what is needed to achieve them. If translated into pathways underpinned by mid-term targets, as is already happening in some constituencies, these could represent the highest plausible ambition pathways we argue for under Principle 4. Furthermore, they could inform NDC updates and thus contribute to a national, internally consistent approach that represents high levels of integrity towards the international community. Ideally, both would be updated iteratively over time (Roeser et al., 2019).

Finance needs established through national processes and linked with highest ambition pathways (Principle 4) can best ensure that international finance sources complement public and private financing in the most effective manner. Finance needs articulated at the national level could include financing of low carbon assets, technical assistance for climate policy processes, and other types of support to create enabling environments for low-carbon investments. Donors can for instance support bottom-up policy development and just transitions through supporting actors to build the capacity needed to enable and drive transformation.

National policies and other interventions included in NDCs are ideally directly linked to national budgets. Finance ministries have set aside budget lines to help support the implementation of these policies or, in some cases, even disbursed subsidies as part of these policies. Complementing these fiscal lines with international finance for asset development and climate policy development represents an effective way to ensure that the finance provided is used according to national priorities and ensures the longevity and sustainability of its impact. Even if not complementing national fiscal lines directly, international financing that clarifies its relationship to national finance can, at a minimum, ensure that the scarce financial resources available do not double each other but are synergetic.

Even when financing aims to support transformative interventions that are new to the context, such as those derived from international good practice examples (IPCC, 2014; Kuramochi et al., 2018), these will only be successful if anchored in national circumstances. It is important to understand which net zero policies and financing mechanisms are realistic and implementable and which are out of reach because of capacity constraints or macroeconomic challenges in the national context. A stock take of existing policies and finance initiatives is a first step to define more ambitious interventions because it offers insight into gaps and opportunities for alignment and avoids parallel processes. Transition policies and frameworks are not implemented in a vacuum but impacted by existing legislation and policies. For instance, the uptake of carbon taxation is growing because of its dual benefits of expanding revenue needed for public investments in green transitions and incentivising actors to reduce emissions. However, carbon taxation is reliant on existing fiscal infrastructure that may or may not enable its introduction and interacts with broader legislation and policy (UN, 2021).

Box 2 – Climate mitigation contributions of Brazil's National Biofuel Program (RenovaBio)

RenovaBio (Statute No. 13,156/2017) is Brazil's first public policy with the explicit goal of contributing to its Nationally Determined Contribution (NDC) (Simões, 2021) and the country's only carbon pricing initiative (Grangeia et al., 2022). It has the following objectives:

- Contribute to the attainment of the country's commitments under the Paris Agreement and the United Nations Framework Convention on Climate Change (UNFCCC);
- Promote the adequate expansion of the production and use of biofuels in the national energy matrix, with emphasis on the regularity of fuel supply; and
- Contribute in conferring predictability for the competitive participation of the various biofuels in the national fuel market (Presidência da República Brasil, 2017).

RenovaBio utilises two instruments to reduce the carbon intensity of the Brazilian transportation sector: emission reduction targets for fossil fuel producers and certifications of biofuel producers. Annual national emission reduction targets are set by the National Energy Policy Council (CNPE) for a 10-year period, which are then translated, by the National Agency of Petroleum, Gas and Biofuels (ANP), into individual targets for all fossil fuel distributors, proportional to their market share (Ribeiro and Cunha, 2022). In order to meet its targets, each fossil fuel distributor must purchase, from biofuel producers, an amount of decarbonisation credits (CBIOS) equivalent to its targets (Ribeiro and Cunha, 2022).

The participation of biofuel producers and importers in the program is voluntary. Those interested in participating must hire certification firms, previously accredited by the ANP, to validate their Energy-Environmental Efficiency Scores, which reflect their individual contribution in mitigating GHG emissions in relation to the fossil fuel substitute (Grangeia et al., 2022).

To calculate producers' Efficiency Scores, RenovaBio uses lifecycle GHG accounting ("from well to wheel"). The calculation tool is RenovaCalc, developed by an interdisciplinary group of scientists from the government, universities, and the private sector, evaluating the following

biofuels: (i) first and second-generation sugarcane ethanol; (ii) corn ethanol; (iii) biodiesel; (iv) bio-methane; and (v) bio-kerosene (Ribeiro and Cunha, 2022). RenovaCalc calculates total emissions from the different stages of production (agricultural production, industrial production and distribution), which generates the Efficiency Score, in gCO₂eq/MJ (Folegatti et al., 2018). Representing one tonne of avoided CO₂eq, CBIOs are calculated by multiplying the Efficiency Scores and the volume of biofuels sold by the producer. Biomass that has been produced in areas deforested before December 2018 is not eligible (Brazil, 2018). CBIOs are attested by certification agencies, and traded, in an over-the-counter (OTC) market, at trading platform B3 (Grangeia et al., 2022).

Although there was no participation of international climate finance in the development of RenovaBio, we believe there are opportunities for international partners to cooperate with government entities through technical assistance to further improve the Program, addressing issues such as integration with existing (and future) carbon markets and development of CBIO price stability mechanisms. By contributing to the financial health of biofuel producers, the program can also help these producers attract international investors.

Although there are still challenges to overcome, RenovaBio represents a successful example of integration of climate change concerns into a sectoral policy process. More information about RenovaBio's policy process can be found in FGV's upcoming study, part of the SNAPFI project, to be published in September 2023.

Principle 6: Co-benefits can act as an entry point to climate action and inform finance contributions

Consideration of the co-benefits of climate action and risks of climate change to sustainable development can help inform finance contributions and facilitate greater buy-in.

Addressing the climate crisis and achieving development goals included in the 2030 Agenda are interlinked. So called “co-benefits of climate interventions” – climate actions with net benefits to SDGs – are often more important to national development agendas and represent primary drivers for climate action in the national context. Climate change is a threat multiplier and will directly or indirectly undermine nearly all SDGs (Ransom et al., 2021). Net zero pathways and NDCs need to meaningfully consider the impact of climate action on development and potential trade-offs.

Framing net zero pathways under narratives that address sustainable development priorities (co-benefits) can drive transformative climate action and enable the formulation and implementation of climate-related policies across sectors (Nachmany, 2018). For instance, decarbonisation of the energy sector likely requires disruptive action that impacts livelihoods connected with fossil fuel power production and traditional internal combustion engine (ICE) vehicle manufacturing and use. To gather broad support for transformative action and policy alignment across sectors, co-benefits in line with sectoral priorities can be highlighted, such as green job creation, clean air, and reduced congestion. Managing links between climate and (sectoral) development priorities can increase policymaking efficiency and promote policy coherence. Further, integrating a climate perspective in sectoral policy processes can bring advantages such as gathering a wider coalition of supporters and increasing visibility (FVGces, 2022). Overall, climate co-benefits can reinforce SDG achievement and increase stakeholder buy-in for submitting more ambitious decarbonisation pathways (NewClimate Institute; ECN, 2018).

Co-benefits can be an entry point for engaging diverse stakeholders in climate action and can broaden the pool of available resources. Sustainable development is often a key component of developing and emerging economies’ priorities and budget expenditures. Linking climate action with co-benefits mainstreams implementation efforts outside of typically climate-oriented sectors and enhances coordination between stakeholders and institutions that typically work in silos (i.e., ministries of environment and climate and ministries of finance and economy) (Ransom et al., 2021). Cross-fertilisation between institutions helps foster synergies, address conflicting goals, and broaden the landscape of invested stakeholders outside of traditionally climate-oriented institutions.

Identifying co-benefits for climate interventions can allow for the financial alignment of transformative climate action and SDGs. When mitigation activities link with SDG co-benefits, domestic public funds can be utilised to guide investment towards activities with sustainable development co-benefits (NewClimate Institute; ECN, 2018). Quantifying economic benefits or cost savings (e.g., reduced air pollution and related health costs) could lead to the mobilisation of additional public resources, and increased support for shifting the allocation of public funds towards mutually beneficial activities. At the international level, linking action to national development priorities can facilitate recipient ownership in the distribution of international climate finance.

Box 3 – Indonesian Green Bonds and Green Sukuk and SDG Government Securities Frameworks

Indonesia is committed to achieving its NDC and the SDGs but faces a significant gap between its financial needs and the availability of state resources. To achieve the SDGs and implement climate actions, Indonesia will need USD 400 – 750 billion to achieve the 2030 SDGs targets (Bappenas, 2019) and USD 285 billion to meet the conditional target by 2030 in the NDC (Republic of Indonesia, 2021).

Since 2016, the Government of Indonesia, through the Ministry of Finance, has carried out climate budget tagging to determine the budget spent on tackling climate change and to achieve the NDC target. Climate budget tagging highlights a fiscal gap between state resources and the finance needed to achieve SDG and NDC goals. The government developed two bond and securities frameworks – the Green Bonds and Green Sukuk Framework and the SDGs Government Securities Framework – to address the gap. In 2018, the government issued the Green Bonds and Sukuk Framework intended to finance or refinance equitable green projects that contribute to the country's goals of reducing greenhouse gas (GHG) emissions, adapting to climate change, and conserving biodiversity. The Indonesian government developed its SDGs Government Securities Framework in 2021, which integrates climate and SDGs targets. In the SDG Framework, sustainable financing is broken into three categories of eligible expenditures, green, blue, and social, while the Green Bond and Green Sukuk Framework only focuses on green interventions. The criteria for „qualified green initiatives“ change across the SDGs Securities and Green Sukuk frameworks. For instance, although the Green Sukuk Framework does not consider SDG-relevant industries like sustainable water and waste management eligible, the SDG Securities Framework does. The SDGs Securities Framework has more explicit SDGs directives in line with the 2030 Development Agenda compared to the Green Sukuk Framework.

In 2021, the SDGs Securities Framework refinanced three projects, while the Global Green Sukuk Allocation supported nine eligible projects that also address SDGs (Ministry of Finance, 2021). For example, one funded project is the development and management of railway transportation infrastructure and supporting facilities which aims to improve public transportation access and enhance interregional connectivity, safety, and security by providing an alternative to already heavily burdened roads. Besides providing emission reduction benefits, this project is considered to provide benefits for the achievement of SDGs 8 (decent work and economic growth), 9 (industry, innovation, and infrastructure), 11 (sustainable cities and communities), and 13 (climate action).

The Indonesian government implicitly addresses climate „co-benefits“ in the SDGs securities framework. In identifying the project's impact, the government considers three aspects; mitigation (Annual GHG Emission Avoided, in CO₂), social and SDGs impacts, and others. Indirectly, this shows the consideration of climate co-benefits from the projects. The SDGs Securities Framework explains that eligible projects can potentially reduce GHG emissions and create a more resilient society through economic diversification and increased product-added value. Some examples of projects with co-benefits are the generation and transmission of energy from renewable energy sources and research and development of products or technology („R&D“) for renewable energy generation, including turbines and solar panels.

Principle 7 – Innovative financial mechanisms help channel national and international, public and private, finance towards ambitious and equitable action on mitigation, adaptation, and loss and damage

International climate finance has so far been insufficient. Innovative mechanisms are needed to crowd in net zero aligned investment in a manner that is responsive to the macroeconomic challenges of developing countries.

The speed and scale implied by net zero targets require rapid implementation of action. However, there are complex obstacles to investments that potentially undermine net zero pathways, including unsustainable sovereign debt burdens, high climate vulnerability, and high levels of perceived investment risk (Moreno Badiam and Dudine, 2019; Akhtar et al., 2020). In addition to the financial risk that exists when introducing new complex technologies and mitigation solutions, macroeconomic circumstances impact access to capital markets and the sustainability and appropriateness of financing mechanisms. Moreover, regulatory frameworks, political climates, and low levels of investor confidence impact the enabling environment needed to mobilise capital and lead to an unequal geographical distribution of climate finance availability – predominately favouring developed and a few emerging economies (Ameli et al., 2021). Innovative financing mechanisms can address challenges caused by unsustainable sovereign debt burdens and high-risk investment environments.

The demand for climate finance requires new thinking to channel the scale of finance needed to achieve net zero emission pathways and drive the implementation of climate action. There are several mechanisms to link international climate finance with the implementation of climate action. Country context influences the suitability and applicability of financing mechanisms. For instance, debt for climate swaps (DBCS) aim to address existing sovereign debt and free up fiscal resources to support climate action by allowing debtor countries to channel repayments to agreed domestic climate projects in leu of making repayments to lenders (Chamon et al., 2022). Another mechanism is linking concessional interest rates or long-term loan distribution payments to mitigation targets – a form of results-based finance. By linking concessional terms to ambitious emission reduction pathways or enabling milestones (i.e., investments in grid infrastructure or reforming governance frameworks), finance could incentivise action and appeal to donors who want to ensure net zero alignment (Steyn et al., 2021).

JET-Ps pose an opportunity to create innovative mechanisms that coordinate scaled finance to support net zero CO₂ compatibility. While the International Partner Group (IPG) provides the finance and wants to ensure financial integrity, recipient countries determine its distribution in a bottom-up manner. South Africa and Indonesia set up national steering groups for this purpose. The groups aim to enable the participation of a broad scope of stakeholders and develop mechanisms that fit the national context. For instance, South African ESKOM's high level of debt presents a unique challenge that does not necessarily exist in other countries, such as Indonesia, and effective financial mechanisms need to take account of these contexts.

Box 4 – Indian case of deployment of the Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE)

Under the National Mission on Enhanced Energy Efficiency (NMEEE), the Bureau of Energy Efficiency (BEE) in India institutionalized a 'Partial Risk Guarantee Fund for Energy Efficiency' (PRGFEE) for addressing debt-related issues in financing energy efficiency projects. The Guarantee Fund was established with the objective of enhancing availability and access to funds for energy efficiency projects in India. The Fund is a risk-sharing mechanism that gives Participating Financial Institutions (PFIs) a portion of the risk coverage needed to offer loans for Energy Efficiency projects in India. The Government of India approved INR 312 crores (USD 40 million, approx.) for the fund till 2020. The Fund has supported energy efficiency initiatives in government buildings, private buildings (commercial or multi-story residential buildings), municipalities, SMEs, and industries.

The initiative extends a guarantee to financial institutions that pass an eligibility check by rating agencies and are enrolled by the BEE. Prior to disbursing a loan to the borrower under the fund, the PFIs may request a guarantee from the Implementing Agency (IA) directly or through its designee. The guarantee entails 50 percent of the loan amount or INR 10 crore (approx. USD 1.25 million) per project, whichever is less. The BEE has appointed an IA, which is a consortium of Rural Electrification Corporation (REC), REC Power Distribution Company Limited (RECPDCL), and Energy Efficiency Services Ltd (EESL) for implementing and operationalizing the PRGFEE program. Through the guarantee, PRGFEE supports PFIs in providing loans to the Energy Service Companies (ESCOs) for implementing energy efficiency projects in India.

The benefit of the fund is two-fold. On one hand, the PFIs receive partial risk coverage for energy efficiency loans. To decrease risk, the BEE conducts a validation check of eligible ESCOs which substantially reduces PFIs risk of providing loans. The empanelment of the ESCOs is carried out by the BEE through a process of grading out by the Securities and Exchange Board of India (SEBI) accredited organizations. Eligibility is based on an assessment of capacity to implement energy efficiency projects through performance contracting based on availability of technical manpower, financial strength, market position, etc. The fund also guarantees a coverage of first loss, subject to a maximum of 10% of the guaranteed amount, which further builds confidence for investment in the Indian energy efficiency domain. On the other hand, the ESCOs get an opportunity to take up large scale projects in India. The fund provides a common platform for the PFIs and ESCOs to join hands, which has sensitized utility owners on energy efficiency implementation, thus generating more awareness, knowledge sharing, and business, contributing significantly towards climate mitigation initiatives in India.

International climate finance has a role to play in scaling up the corpus of the Risk Guarantee Fund. There are examples of best practices that support this argument. For example, the African Guarantee Fund (AGF) which supports SMEs in Africa was established by the African Development Bank (ADB), Danish International Development Agency (DIDA) and the Spanish Agency for International Development Co-operation in 2011, and further supported by the Swedish International Development Cooperation Agency and the French Development Agency (AFD). Through the support of its shareholders, the Fund has the ability to guarantee

banks and credit institutions and provide SMEs with higher capital base, suitable tenors, and fewer collateral restrictions. Another example is the 'Partial Risk Sharing Facility for Energy Efficiency (PRSF)' managed by the Small Industries Development Bank of India (SIDBI) in India as the World Bank in the capacity of the implementing agency of the Global Environment Facility (GEF) and the Clean Technology Fund (CTF) provides financial support to the PRSF. The entire "Risk Sharing Facility" component of USD 37 million is managed by SIDBI, under which partial credit guarantees are provided to cover a share of default risk faced by Participating Financial Institutions (PFI) in extending loans to eligible energy projects implemented through ESCOs.

Principle 8 – Balanced funding strategies for climate action need to consider that higher mitigation ambition potentially leads to lower future need for adaptation and loss & damage finance, and recognise already incurred and unavoidable costs

Mitigation, adaptation, and loss and damage financing are inherently coupled and should receive balanced funding. Ambitious mitigation action now can lead to lower levels of adaptation and loss and damage finance in the future.

The scale of future adaptation and loss and damage (L&D) costs varies with future emission scenarios. Unsurprisingly, higher adaptation and L&D costs are predicted at higher degrees of warming. Rapidly scaling global mitigation action can reduce future adaptation costs by as much as three quarters by 2100 (Chapagain et al., 2020). Meeting the goals of the Paris Agreement can limit the costs of climate change by almost half in most regions (Estrada and Botzen, 2021). While relationship between mitigation and adaptation and L&D is not inherently linear due to residual climate risks and costs, strong mitigation action is essential to reduce the long-term economic impact of climate change and safeguard vulnerable populations from further risk (UNEP, 2021). Moreover, there are synergies between mitigation and adaptation that can stimulate implementation of NDCs (Suroso et al., 2022).

Highlighting the relationship between mitigation trajectories and adaptation and L&D finance needs could increase support for financing and implementing mitigation activities. Articulating scales of future financing needs under different emission scenarios can provide further impetus for increased action. For instance, estimating adaptation and L&D finance needs at 1.5°C of warming compared to 2°C of warming, or current warming trajectories, would highlight the financial cost of inaction. However, the estimated costs of mitigation now cannot be compared to the estimated future cost of adaptation and L&D because cost estimates often do not include non-monetary (social) losses or ethical considerations and are inherently uncertain (UNEP, 2021).

The distribution of climate finance between mitigation and adaptation and L&D is interlinked and critical to addressing the climate crisis. Achieving net zero emissions alone will not address the

multidimensional impacts of climate change. Adaptation and L&D are key to responding to residual impacts. Under a 1.5-degree scenario, adaptation and L&D will still be essential for vulnerable regions facing climate risks. Increased ambition and a just transition, in terms of finance and implementation, are needed to prevent existing societal and economic costs of climate change from widening (UNEP, 2021). Balanced international public finance, which addresses national priorities presented by developing countries' NDCs, is key to building trust. Adapting to a changing environment and increasing resilience must go hand in hand with mitigation.

Like mitigation, scaling adaptation and L&D require diverse and resilient forms of capital. Mobilising investment faces several hurdles. Adaptation interventions are context-dependent and cannot be copy-pasted across regions – leading to concerns over the effectiveness and bankability of investments. The majority of L&D yields no return and rising climate change impacts are increasing uninsurable risk (Richmond and Hallmeyer, 2019; Savvidou et al., 2021). Multiple barriers impede countries' access to funding: the tendency of funders to favour loans over grants; co-financing requirements; rigid climate fund rules and inadequate capacity to meet application requirements; and insufficient programming capacity to implement adaptation projects (Savvidou et al., 2021). Public actors can employ innovative financing mechanisms to de-risk investments and encourage private sector participation, such as co-financing, blended finance, and public-private partnerships (PPPs). Tailored financing approaches and capacity support is needed on a country-by-country and sector-by-sector basis.

Principle 9: Commonly agreed goals and criteria can help to mobilise and operationalise climate finance which adequately addresses the global climate emergency and national needs.

Building trust and cooperation between donors and recipient countries is critical and can be enhanced by defining a vision and shared understanding in line with the Paris Agreement's long-term goals in the form of a shared set of criteria, considering CBDR, to guide climate finance and ensure finance goals are met.

International climate finance should in principle be country-driven and guided by the needs and perspectives of national stakeholders to ensure domestic support and ownership (Winkler and Dubash, 2016). In that sense, international finance flows should match national priorities and not follow the priorities of donors (OECD 2016), not least as climate finance can be regarded as a form of restitution payment by countries that are responsible for the lion's share of past emissions (Principle 1). Considering this, and following the polluter pays principle, recipient countries should have greater influence over how climate finance is spent than has often been the case with traditional ODA. Enhanced recipient country ownership is already reflected in the structure of climate funds like the Adaptation Fund and the Green Climate Fund (GCF), where recipient countries have a voting share of at least 50% (Browne, 2022). The GCF is piloting Enhanced Direct Access (EDA) to climate funds which devolves decision making and project oversight to the national or regional level and moves towards a stakeholder-driven approach.

Concerns remain about the efficient handling of climate funds due to poor governance structures and accountability standards. It is critical that international finance avoids leading to new carbon lock-ins and is channelled towards low-carbon investments and climate protection measures in line with the long-term temperature goal of the Paris Agreement. This poses challenges in national contexts where the current level of climate policies (i.e., the NDC) are not sufficiently ambitious to align with long term trajectories towards net zero emissions (as is the case for most developing and developed countries alike). In these cases, national policy provides limited guidance to international finance as the sectoral actions under the NDCs might not align with the sectoral transformations needed in the long term. For instance, current NDCs might support investments in gas infrastructure in the power sector as gas have lower emissions than coal power plants and are often regarded as a transition technology (Cantzler et al., 2017). However, these new gas investments could lead to diversion of funds away from renewable energy and, if not embedded into a transition strategy, can cause new lock-ins into infrastructure that result in the need for (costly) early retirement at a later point in time (see Principle 2). Other sectors, especially with long lifetimes of assets, might see similar or even stronger lock-ins of technologies.

Ensuring that the use of climate finance is determined at the national level and that investments are aligned with the long-term goals of the Paris Agreement are thus essential elements of international climate finance. At the time of implementation, these elements may present challenges as stakeholder interests may not be aligned with long term climate goals and country ownership may be at odds with donor principles of accountability. Agreeing to goals upfront, such as in the form of criteria, can help to direct negotiations and coordination and provide a framework to reconcile different interests (SNAPFI, 2021). Existing support criteria by bilateral DFIs and MDBs provide a foundation for developing standardised criteria but often apply to only project-based financing. New criteria could focus at the national level and seek to align national climate strategies with the Paris Agreement, while streamlining access to climate finance and centring country ownership. Shared criteria could be agreed upon ideally under the UNFCCC, but given the often arduous agreement process, could also be developed in other multilateral fora or even bilateral arrangements. Shared criteria could ensure that climate finance works to transform the economy in line with the speed and scale needed (Principle 4) and encompass accountability measures fit for both funders and donors, while also enabling countries to pursue pathways that are just and grounded in national circumstances (Principle 5).

Ideally criteria are agreed not only between specific donors and recipients but at the international level as this would allow for coherence and broad acceptance amongst stakeholders. Potential criteria should consider differentiation between parties and relate to both country ownership principles and accountability and reciprocity in cooperation. Specific climate criteria could be included, such as legal anchoring of net zero emission targets, a commitment to no new fossil fuel infrastructure, or progressively enhanced NDC ambition along highest possible ambition trajectories – considering equity and just transition elements. Accountability criteria could build off GCF's public finance criteria that promotes country ownership while ensuring fund accountability, including requiring transparent and effective financial management systems, use of results-based management frameworks, and regular monitoring and evaluation of projects (GCF). Further accountability criteria could be developed that encourage support and set out mechanisms for scaling and fulfilling donor finance pledges. Criteria should be broad and agreed by participating parties and aligned with those developed by MDBs and MFIs under the Sharm El-Sheikh Implementation Plan (UNFCCC, 2022b). UNFCCC fora like the

Sharm el-Sheikh dialogue could act as channels where criteria could be further developed and refined. With attention currently on modernising the Bretton Wood Institutions to address climate change and channel more funds to developing countries, its timely to consider broad criteria that streamlines access to finance in line with the needs of developing countries and builds strong accountability mechanisms fit for donors and recipients.

The background features a gradient from light blue at the top to a darker blue at the bottom, with a bright green vertical band on the left. Overlaid on this are several semi-transparent geometric shapes: a large blue parallelogram on the left, a blue rectangle in the center, and a green rectangle at the bottom. The text is centered over these shapes.

Chapter four

Conclusions

4. Conclusions

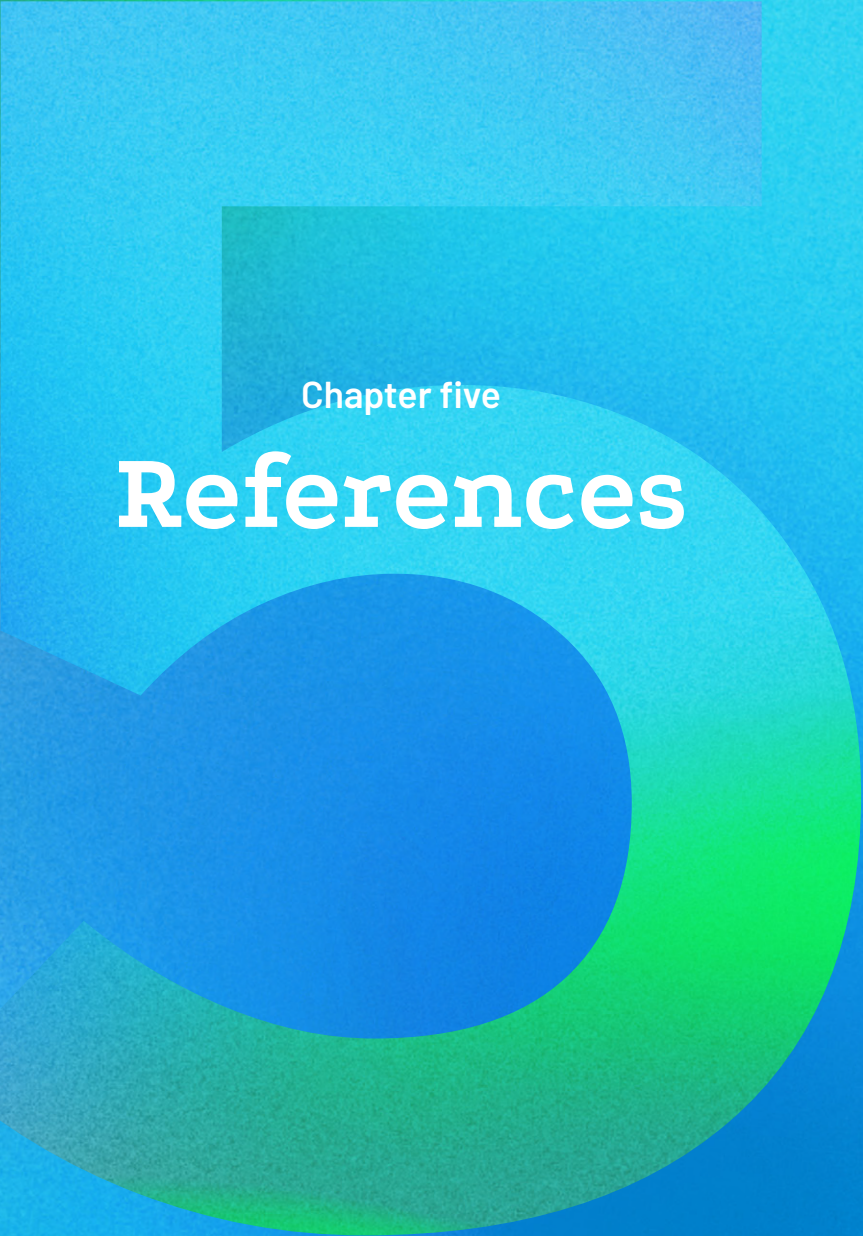
International support – finance, technology transfer, and policy and capacity development – is crucial to facilitating climate action at the scale required to meet Paris ambitions in an equitable manner. The extremely finite amount of time left for the world to reach net zero emissions requires international climate finance to be scaled significantly and deployed effectively to support and facilitate ambitious pathways towards just transitions. This paper outlines the need for better information on countries' international climate finance needs and introduces nine principles to consider in the context of financing transition towards net zero emissions especially in developing and emerging economies. The explorative principles offer a starting point for understanding and defining finance and support needed to scale ambition and facilitate just transitions.

To support the scaling of finance for developing and emerging economies to embark on equitable high ambition transition pathways, the following next steps can be drawn from the paper:

Developed economies need to clarify how their net zero targets relate to the framework of “common but differentiated” action under the UNFCCC in line with the long-term goals of the Paris Agreement. They need to update their commitment in line with more equitable pathways, achieved through presenting more ambitious targets and scaled up financing for developing and emerging economies. Given the current lack of a framework at the UN level that facilitates match-making between donor and recipient nations at an economy wide scales, they should engage with other donor and with recipient countries in JETP-like partnerships, ideally aiming to support economy wide transitions. In addition they should support an international process that enables the facilitation of financial and technical support to developing and emerging economies to finance their transitions.

Developing and emerging economies should consider the articulation of just high ambition transition pathways with reference to unilateral and international climate finance and technological support needs. This could involve the clarification of finance and technology support needs to achieve existing net zero targets. This requires an approach that takes account of sectoral characteristics but also requires the consideration of cross sectoral linkages and economy wide transition needs. Existing national policy processes could serve as a starting point to define frameworks that lead to raised ambition and facilitate the inflow of technical and financial support. The consideration of national development priorities to create greater buy in for climate objectives alongside the national development agenda Dedicated financial mechanisms could be created that enable private and public funding to be channelled where they are most needed to facilitate the just transition.

The international community should work towards a common understanding and framework to mobilise and operationalise climate finance. Commonly agreed goals and criteria could help increase trust between donor and recipient countries. This should ideally happen within the framework of the UNFCCC. Until such framework exists, good practice examples should be developed to guide the development of such criteria's for individual JETPs.



Chapter five

References

5. References

- Akhtar, S., Kevin P. Gallagher, S.G.-J., Haas, J. and Volz, U. (2020) Here's how we can defeat debt and strive for sustainability post COVID-19, World Economic Forum
- Ameli, N., Dessens, O., Winning, M., et al. (2021) 'Higher cost of finance exacerbates a climate investment trap in developing economies', *Nature Communications*, 12(1), p. 4046. doi:10.1038/s41467-021-24305-3
- van den Berg, N.J., van Soest, H.L., Hof, A.F., et al. (2020) 'Implications of various effort-sharing approaches for national carbon budgets and emission pathways', *Climatic Change*, 162(4), pp. 1805–1822. doi:10.1007/s10584-019-02368-y
- Boehm, Sophie, Jeffery, L., Levin, K., et al. (2022) State of Climate Action 2022. Berlin and Cologne, Germany, and San Francisco and Washington, D.C., United States of America: Bezos Earth Fund, Climate Action Tracker, World Resources Institute. Available at: <https://www.wri.org/research/state-climate-action-2022> (Accessed: 2 November 2022)
- Boehm, Sophia, Jeffery, L., Levin, K., et al. (2022) State of Climate Action 2022. Berlin, Germany and Washington, D.C.: Bezos Earth Fund, Climate Action Tracker, World Resources Institute
- Brazil (2018) 'Resolução No 758, de 23 de novembro de 2018'
- Browne, K.E. (2022) 'Rethinking governance in international climate finance: Structural change and alternative approaches', *Wiley Interdisciplinary Reviews: Climate Change*, 13(5), pp. 1–23. doi:10.1002/wcc.795
- Caetano, T., Merven, B., Hartley, F. and Ahjum, F. (2017) 'Decarbonisation and the transport sector: A socio-economic analysis of transport sector futures in South Africa', *Journal of Energy in Southern Africa*, 28(4), pp. 9–18. doi:10.17159/2413-3051/2017/v28i4a2945
- Cantzler, J., Ancygier, A., Sferra, F., et al. (2017) Foot off the gas: increased reliance on natural gas in the power sector risks an emissions lock-in. Climate Action Tracker (Climate Analytics, Ecofys, NewClimate Institute)
- CAT (2020) Paris Agreement Compatible Sectoral Benchmarks: Elaborating the decarbonisation roadmap. Berlin, Germany: Climate Action Tracker (Climate Analytics, NewClimate Institute)
- CAT (2022) CAT Net zero target evaluations, Climate Action Tracker. Available at: <https://climateactiontracker.org/global/cat-net-zero-target-evaluations/> (Accessed: 31 October 2022)
- Chamon, M., Thakoor, V., Klok, E. and Zettelmeyer, J. (2022) Debt-for-Climate Swaps: Analysis, Design, and Implementation, IMF Working Papers. Washington D.C. doi:10.5089/9798400215872.001
- Chapagain, D., Baarsch, F., Schaeffer, M. and D'haen, S. (2020) 'Climate change adaptation costs in developing countries: insights from existing estimates', *Climate and Development*, 12(10), pp. 934–942. doi:10.1080/17565529.2020.1711698
- Climate Action Tracker (2022a) Country Assessment: Brazil (update: 5 September 2022). Available at: <https://climateactiontracker.org/countries/brazil/policies-action/> (Accessed: 9 November 2022)
- Climate Action Tracker (2022b) Country assessment: India (update October 6 2022). Available at: <https://climateactiontracker.org/countries/india/> (Accessed: 9 November 2022)
- Climate Action Tracker (2022c) Country assessment: Indonesia (update October 26 2022). Available at: <https://climateactiontracker.org/countries/indonesia/> (Accessed: 9 November 2022)
- Climate Action Tracker (2022d) Country assessment: South Africa (update 28 October 2022). Available at: <https://climateactiontracker.org/countries/south-africa/> (Accessed: 9 November 2022)
- Climate Action Tracker (2022e) Warming Projections Global Update November 2022: Massive gas expansion risks overtaking positive climate policies. Climate Action Tracker (Climate Analytics, NewClimate Institute)
- CPI (2020) Updated View on the Global Landscape of Climate Finance 2019. Available at: <https://www.climatepolicyinitiative.org/publication/updated-view-on-the-global-landscape-of-climate-finance-2019/> (Accessed: 5 May 2021)
- Cronin, C., Menon, S., Monteith, S., et al. (2015) Faster and Cleaner - Decarbonisation in the power and transport sectors is surpassing predictions and offering hope for limiting warming to 2°C. San Francisco, USA. Available at: <https://newclimateinstitute.files.wordpress.com/2015/12/faster-cleaner-decarbonization-in-the-power-transport-sectors.pdf>
- den Elzen, M. et al. (2013) Countries' contributions to climate change: effect of accounting for all greenhouse gases, recent trends, basic needs and technological progress, *Climatic Change*. doi:10.1007/s10584-013-0865-6
- Estrada, F. and Botzen, W.J.W. (2021) 'Economic impacts and risks of climate change under failure and success of the Paris Agreement', *Annals of the New York Academy of Sciences*, 1504(1), pp. 95–115. doi:10.1111/nyas.14652
- Federative Republic of Brazil (2022) Nationally Determined Contribution (NDC). Available at: <https://unfccc.int/sites/default/files/NDC/2022-06/Updated-First-NDC-FINAL-PDF.pdf>
- Folegatti, M.I. da S.M., Seabra, J.E.A., Chagas, M.F., et al. (2018) 'RenovaCalc: A calculadora do Programa RenovaBio', in VI Congresso Brasileiro sobre Gestão do Ciclo de Vida. Brasília
- FVGces (2022) National Study: Brazil - Cabotage Navigation in Brazil: An analysis of the Legislative Process of Statute No. 14,301/2022 ("BR do Mar") using Kingdom's Multiple Streams Framework. São Paulo. Available at: https://www.diw.de/documents/dokumentenarchiv/17/diw_01.c.852273.de/220901_snapfi_report_brazil.pdf

- Government of India (2015) India's Intended Nationally Determined Contribution. Available at: [http://www4.unfccc.int/submissions/INDC/PublishedDocuments/India/1/INDIA INDC TO UNFCCC.pdf](http://www4.unfccc.int/submissions/INDC/PublishedDocuments/India/1/INDIA%20INDC%20TO%20UNFCCC.pdf)
- Government of India (2022) India's Updated First Nationally Determined Contribution Under Paris Agreement (2021-2030). New Delhi. Available at: [https://unfccc.int/sites/default/files/NDC/2022-08/India Updated First Nationally Determined Contrib.pdf](https://unfccc.int/sites/default/files/NDC/2022-08/India%20Updated%20First%20Nationally%20Determined%20Contrib.pdf)
- Government of South Africa (2021) Proposed updated Nationally Determined Contribution: South Africa's First Nationally Determined Contribution under the Paris Agreement Updated in 2021. Available at: https://www.environment.gov.za/sites/default/files/reports/draftnationallydeterminedcontributions_2021updated.pdf (accessed on 6 October 2021)
- Grangeia, C., Santos, L. and Lazaro, L.L.B. (2022) 'The Brazilian biofuel policy (RenovaBio) and its uncertainties: An assessment of technical, socioeconomic and institutional aspects', *Energy Conversion and Management*: X, 13, p. 100156. doi:10.1016/j.ecmx.2021.100156
- Gross, S. (2020) The challenge of decarbonizing heavy industry, *Foreign Policy at Brookings*. Washington D.C
- Höhne, N., den Elzen, M. and Escalante, D. (2014) 'Regional GHG reduction targets based on effort sharing: a comparison of studies', *Climate Policy*, 14(1), pp. 122-147. doi:10.1080/14693062.2014.849452
- IEA (2020) Power systems in transition, *Power systems in transition: Challenges and opportunities ahead for electricity security*. Paris. doi:10.1787/4ad57c0e-en
- IEA (2021a) Net Zero by 2050: A Roadmap for the Global Energy Sector. Paris, France: International Energy Agency. Available at: <https://www.iea.org/reports/net-zero-by-2050> (Accessed: 10 August 2022)
- IEA (2021b) 'World Energy Outlook 2021'. Paris, France: International Energy Agency. Available at: <https://www.iea.org/reports/world-energy-outlook-2021>
- IEA (2022) World Energy Outlook 2022. Paris
- IESR (2021) 'Deep decarbonization of Indonesia's energy system : A pathway to zero emissions'
- Indonesia, R. of (2022) Enhanced Nationally Determined Contribution: Republic of Indonesia. Jakarta. Available at: [https://unfccc.int/sites/default/files/NDC/2022-09/ENDC Indonesia.pdf](https://unfccc.int/sites/default/files/NDC/2022-09/ENDC%20Indonesia.pdf)
- International Partners Group (2021) 'Political declaration on the just energy transition in South Africa'. Glasgow. Available at: <https://ukcop26.org/political-declaration-on-the-just-energy-transition-in-south-africa/>
- IPCC (2014) Climate Change 2014 Synthesis Report Summary Chapter for Policymakers. Geneva
- IPCC (2018a) 'Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change', in. Geneva, Switzerland: Intergovernmental Panel on Climate Change
- IPCC (2018b) Special Report: Global Warming of 1.5°C. Geneva, Switzerland: Intergovernmental Panel on Climate Change (IPCC). Available at: <https://www.ipcc.ch/sr15/> (Accessed: 27 January 2023)
- Kreibiehl, S., Jung, T.Y., Battiston, S., et al. (2022) Chapter 15: Investment and finance. In IPCC, 2022: Climate Change 2022: Mitigation of Climate Change, IPCC Sixth Assessment Report. Geneva
- Kuramochi, T., Höhne, N., Schaeffer, M., et al. (2018) 'Ten key short-term sectoral benchmarks to limit warming to 1.5°C', *Climate Policy*, 18(3), pp. 287-305. doi:10.1080/14693062.2017.1397495
- Mathiesen, K. and Barigazzi, J. (2022) 'G7 offered Vietnam and Indonesia \$15B to drop coal. They said "maybe"', *Politico*, 26 October. Available at: <https://www.politico.eu/article/g7-climate-change-energy-crisis-vietnam-and-indonesia-15b-to-drop-coal-they-said-maybe/>
- Moreno Badiam, M. and Dudine, P. (2019) New Data on World Debt: A Dive into Country Numbers, *IMF Blogs*
- Nachmany, M. (2018) Climate change governance in Tanzania : challenges and opportunities. London. Available at: <https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2018/10/Climate-change-governance-in-Tanzania-challenges-and-opportunities.pdf>
- NewClimate Institute; ECN (2018) NDC UPDATE REPORT SPECIAL EDITION : Linking NDCs and SDGs NDC Update Report
- OECD (2022) Climate Finance Provided and Mobilized by Developed Countries in 2016-2020. Paris
- OECD/IEA and IRENA (2017) Perspectives for the Energy Transition: Investment Needs for a Low-Carbon Energy System, International Energy Agency. International Energy Agency, International Renewable Energy Agency. Available at: http://www.irena.org/DocumentDownloads/Publications/Perspectives_for_the_Energy_Transition_2017.pdf
- Pauw, W.P., Castro, P., Pickering, J. and Bhasin, S. (2020) 'Conditional nationally determined contributions in the Paris Agreement: foothold for equity or Achilles heel?', *Climate Policy*, 20(4), pp. 468-484. doi:10.1080/14693062.2019.1635874
- PIDG (2019) Five-Year Strategic Plan 2019-2023
- Presidência da República Brasil (2017) LEI No 13.576, DE 26 DE DEZEMBRO DE 2017, Diário Oficial da União. Brazil. Available at: http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2017/lei/L13576.htm (Accessed: 20 March 2018)
- Rajamani, L., Jeffery, L., Höhne, N., et al. (2021) 'National "fair shares" in reducing greenhouse gas emissions within the principled framework of international environmental law', *Climate Policy*, 21(8), pp. 983-1004. doi:10.1080/14693062.2021.1970504
- Ransom, C., Haran, V. and Baddour, O. (2021) Climate Indicators and Sustainable Development: Demonstrating the Interconnections. Geneva, Switzerland: World Meteorological Organization (WMO). Available at: https://library.wmo.int/doc_num.php?explnum_id=10804
- Republic of Indonesia (2021) Updated Nationally Determined Contribution. Available at: [https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Indonesia First/Updated NDC Indonesia 2021 - corrected version.pdf](https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Indonesia%20First/Updated%20NDC%20Indonesia%202021%20-%20corrected%20version.pdf)
- Riahi, K., Schaeffer, R., Arango, J., et al. (2022) 'Mitigation Pathways Compatible with Long-Term Goals', in *Climate Change 2022: Mitigation*

- of Climate Change - Working Group III contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva, Switzerland: Intergovernmental Panel on Climate Change (IPCC). Available at: <https://www.ipcc.ch/report/ar6/wg3/>
- Ribeiro, C.H. and Cunha, M.P. (2022) 'The economic and environmental impacts of Brazilian National Biofuel Policy', *Biofuels, Bioproducts and Biorefining*, 16(2), pp. 413–434. doi:10.1002/bbb.2326
- Richmond, M. and Hallmeyer, K. (2019) Tracking Adaptation Finance: Advancing Methods to Capture Finance Flows in the Landscape. Available at: <https://climatepolicyinitiative.org/publication/tracking-adaptation-finance-advancing-methods-to-capture-finance-flows-in-the-landscape/>
- Roeser, F., Emmrich, J., van Tilburg, X., et al. (2019) NDC Update Report - Long-term, society-wide visions for immediate action. Berlin, Germany. Available at: <https://newclimate.org/2019/12/03/ndc-update-report-december-2019-long-term-society-wide-visions-for-immediate-action/>
- Savvidou, G., Atteridge, A., Omari-Motsumi, K. and Trisos, C.H. (2021) 'Quantifying international public finance for climate change adaptation in Africa', *Climate Policy*, 21(8), pp. 1020–1036. doi:10.1080/14693062.2021.1978053
- Simões, A.F. (2021) 'Interrelationships between policies to encourage biofuels, energy efficiency and climate change mitigation: A synergistic analysis focusing on the Brazilian RenovaBio Program', *Latin American Journal of Energy Research*, 8(1), pp. 46–58. doi:10.21712/lajer.2021.v8.n1.p46-58
- SNAPFI (2021) International Study: International Climate Finance and support to national climate policy processes in emerging markets. Berlin. Available at: https://www.diw.de/documents/dokumentenarchiv/17/diw_01.c.821395.de/snapfi_intl_climate_finance_2021.594220.pdf
- Steyn, G., Tyler, E., Roff, A., et al. (2021) THE JUST TRANSITION TRANSACTION: A DEVELOPING COUNTRY COAL POWER RETIREMENT MECHANISM
- Suroso, D.S.A., Hilman, D., Fitriyanto, M.S., et al. (2022) National Study: Indonesia - Enabling Conditions and Advantages of Synergy between Climate Change Adaptation and Mitigation to Stimulate Implementation of NDC. Berlin. Available at: https://www.diw.de/documents/dokumentenarchiv/17/diw_01.c.852275.de/220901_snapfi_report_indonesia-1.pdf
- The Presidency (2022) South Africa's just energy transition investment plan (JET IP) for the initial period 2023–2027. Available at: <https://www.thepresidency.gov.za/content/south-africa%27s-just-energy-transition-investment-plan-jet-ip-2023-2027> (Accessed: 31 March 2023)
- UN (2021) UN Handbook on Carbon Taxation for Developing Countries. New York
- UNEP (2021) Adaptation Gap Report 2021: the gathering storm - Adapting to climate change in a post-pandemic world. Nairobi
- UNEP (2022) Emissions Gap Report 2022: The Closing Window – Climate crisis calls for rapid transformation of societies. Nairobi, Kenya: United Nations Environment Programme. Available at: <https://www.unep.org/emissions-gap-report-2022>
- UNFCCC (2022a) Report of the Standing Committee on Finance - work on definitions of climate finance. Sharm el-Sheikh
- UNFCCC (2022b) Sharm el-Sheikh Implementation Plan. Egypt. Available at: <https://unfccc.int/documents/624441>
- WEF (2021a) Fostering Effective Energy Transition 2021 insight report, Report: Insight. Cologny. Available at: http://www3.weforum.org/docs/WEF_Fostering_Effective_Energy_Transition_2021.pdf
- WEF (2021b) Fostering Effective Energy Transition 2021 insight report, Report: Insight. Cologny
- Winkler, H. and Dubash, N.K. (2016) 'Who determines transformational change in development and climate finance?', *Climate Policy*, 16(6), pp. 783–791. doi:10.1080/14693062.2015.1033674
- World Economic Forum & Oliver Wyman (2021) Financing the transition to a net zero future. Available at: <https://www.oliverwyman.com/content/dam/oliver-wyman/v3/Financing-the-Transition-to-a-Net-Zero-Future.pdf>

