

CLIMATE CHANGE AND CENTRAL BANKING IN LEAST DEVELOPED COUNTRIES

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Abstract

This paper analyses the role that central banks in least developed countries (LDCs) could play in the climate crisis era. It develops a climate central banking toolbox for LDCs that includes: (i) climate-adjusted analytical frameworks; (ii) climate risk exposure tools; and (iii) climate mitigation and adaptation tools. It explains how this toolbox could be used by central banks in LDCs through a 'one size does not fit all' approach that pays particular attention to the central bank mandates, the country-specific contexts, the potential side effects, and the implementation challenges. This approach is exemplified by using the central banks in Bangladesh, Madagascar and Zambia as case studies. Special attention is paid to the fact that the central banks in LDCs should not be viewed as 'fixers' of the climate crisis, but should, instead, be understood as actors that can, under specific conditions, support climate-related fiscal and industrial policy targets. The paper also covers global climate justice issues in the context of finance. It highlights channels through which the global financial system exacerbates climate injustice at the expense of the policy space of LDCs and explains why these channels matter for the climate considerations of central banks.

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1. Introduction

Climate change poses unprecedented challenges to least developed countries (LDCs). These countries are particularly vulnerable to climate change, despite their extremely small contribution to global warming. This is exemplified by the fact that 4 LDCs (Malawi, Mozambique, Niger and South Sudan) are in the list of the 10 most climate affected countries (Ekstein et al., 2021). Despite the high heterogeneity in the way that climate change is affecting LDCs, for the vast majority of LDCs, climate change is increasing the frequency and severity of droughts, storms, floods, cyclones and other weather events. These changes are disproportionately affecting the population that lives in coastal areas and relies on agriculture. They are also exacerbating food insecurity and water scarcity problems.

To attenuate the adverse social and economic implications of climate change in LDCs, an unprecedented increase in climate adaptation investments is necessary (UNCTAD, 2021b). Such investments would not only make LDCs climate resilient, but, if designed properly, they have the potential to contribute to economic development. At the same time, LDCs need to contribute to the reduction of global emissions in accordance with the United Nations Framework Convention on Climate Change (UNFCCC) principle of common but differentiated responsibilities and respective capabilities (UNFCCC, 1992: 4). This principle has significant implications for climate mitigation strategies in LDCs. The minimal contribution of LDCs to climate change and their lower level of development suggest that decisions about climate mitigation need to pay explicit attention to how actions that lead to a reduction in emissions can affect development and human progress. Climate mitigation actions should be oriented towards fostering development – if this is not possible, priority might be given to development targets, rather than emission reduction targets.

Achieving climate-aligned development in LDCs requires structural transformations that need to be designed based on an industrial policy mindset that can lead to actions that will shift the production structure towards activities and sectors that are conducive to energy and resource security, low-carbon agriculture, climate resilience, food security and lower inequalities (UNCTAD, 2021b, 2021c). At the same time, a radical change in the financial support mechanisms from the international community is needed, enabling LDCs to finance climate-related spending without increasing their debt burden. The existing bilateral and multilateral public finance mechanisms (OECD, 2022), the blended finance tools (UNCTAD, 2021b), and the recently established Resilience and Sustainability Trust (RST) of the International Monetary Fund (IMF), are insufficient – or not properly designed – to address the climate mitigation and adaptation financing needs of LDCs. They are also incapable of providing finance for covering climate losses and damages.¹

The responsibility for climate-aligned structural transformations in LDCs and the design of climate financing mechanisms rest primarily with governments, public authorities and multilateral organisations. However, central banks (as well as financial supervisors and regulators) might also have a role to play in supporting climate-aligned development, without substituting for the policies that need to be implemented by other actors. Over the last few years, climate-aligned central banking has received growing attention (Campiglio et al., 2018; NGFS, 2019; Barmes and Livingstone, 2021; Robins et al., 2021). In 2017, the Network for Greening the Financial System (NGFS) was established to support and coordinate actions on climate change by central banks around the world.

Several central banks have taken action to adjust their monetary policy and supervision tools to address climate challenges. For example, in 2021, the Bank of England decided to green its corporate quantitative easing as a response to the explicit inclusion of climate issues into its mandate (Bank of England, 2021; Dafermos and Nikolaidi, 2022). In the same year, the European Central Bank (ECB) announced a climate action plan (Dafermos et al., 2021a; ECB, 2021a and 2021b) and has recently decided to incorporate climate criteria into its corporate bond purchase programme (ECB, 2022b). The People's Bank of China has taken several initiatives to support green finance (People's Bank of China and UNEP, 2015; Dikau and Volz, 2021a) and has recently introduced a carbon emission reduction facility (People's Bank of China, 2021). The Central Bank of Kenya and the Bank of Mauritius have issued binding guidelines about financial institutions' integration of climate-related risks into their governance structure,

¹ For the limitations of these mechanisms, see UNCTAD (2019), Achampong (2021) and Mariotti (2022). At COP27, a Loss and Damage Fund was established (see Wynn, 2023). However, it is unclear how the fund will be structured and whether it has the potential to cover – in a timely manner – the unprecedented financing needs related to loss and damage.

business models and risk management framework (Central Bank of Kenya, 2021; Bank of Mauritius, 2022). The Bank of England and the ECB have conducted climate stress tests to identify how exposed their financial systems are to climate risks (Alogoskoufis et al., 2021; Bank of England, 2022) and several central banks in emerging market and developing economies are now exploring how they can design and run similar stress testing exercises (see e.g., African Development Bank Group, 2021a; Bank Negara Malaysia, 2022).

With very few exceptions, the central banks of LDCs have not yet engaged with climate change. The purpose of this paper is to explore whether and how central banks in LDCs can incorporate climate change into their monetary policy operations and financial supervision/regulation. The paper identifies which issues the central banks in LDCs need to consider in the process of selecting appropriate climate tools, taking into account their mandates, the socio-economic environment in their countries, the constraints that they face, and the potential side effects of climate-aligned actions. The paper also discusses how central banks in LDCs can coordinate with fiscal and regulatory authorities – domestically – to support climate-aligned development in the context of an industrial policy mindset. Although the paper analyses several options that the central banking community has in supporting climate mitigation and adaptation in LDCs, it also highlights that central banks should not be perceived as the ‘fixers’ of the climate crisis. Rather, they should be viewed as an additional type of actor that can – under specific conditions – help achieve developmental and climate-related targets set by governments and local communities.

The paper is structured as follows. Section 2 provides a brief overview of the financial systems and central banking in LDCs. Section 3 discusses the economic effects of climate change in LDCs and highlights how the recent climate finance initiatives in the Global North might exacerbate climate injustice. Section 4 analyses the climate tools that the LDCs can potentially use. Section 5 discusses what criteria central banks in LDCs should use when selecting these tools. Section 6 concentrates on how LDCs can coordinate with other domestic authorities and discusses the international coordination in the context of climate justice. Section 7 focusses on three LDCs (Bangladesh, Zambia and Madagascar) and discusses to what extent their central banks have used or have the potential to use climate tools. The policy lessons from these cases studies are also outlined. Finally, section 8 summarises and concludes the paper.

2. Financial systems and central banking in LDCs: a brief overview

Financial systems in LDCs are typically bank-based and foreign banks tend to have a significant presence.² The access to credit is fragmented and differs between countries and borrowers. In several countries, very poor households and small enterprises need to rely on informal money lenders to deal with their liquidity needs. These money lenders typically charge high interest rates and use predatory practices. Microfinance institutions and microfinance schemes have filled gaps in credit access. Their presence has been particularly promoted by national and international policy makers who have often portrayed microfinance as a panacea for addressing developmental challenges and reducing poverty. Microcredit initiatives have not, however, managed to achieve transformative changes. Although in some cases they have helped households deal with liquidity problems and meet financial needs, microcredit has not – overall – led to a sustained increase in the income of households, has not enhanced high-return entrepreneurial investment, has not substantially contributed to women's empowerment, and has not increased investment in children's schooling.³ Actually, in several cases, microfinance has increased the financial vulnerability of households (Hulme, 2000; Ghosh, 2013).

In the LDCs with a more developed conventional banking system, access to credit for relatively large companies may be easier as long as the rate of non-performing loans is not very high. Credit availability for these companies is important for structural transformation, as it can affect their ability to undertake productive investment and expand. Credit availability and the success of industrial policies are often interlinked. As far as broader financial services are

² LDCs typically grant licences to foreign entities to provide financial services and become part of the domestic financial sector, as long as they satisfy specific regulatory requirements.

³ For a review of some empirical evidence on microfinance that covers several developing countries, see Abdul Latif Jameel Poverty Action Lab (2018).

concerned, an interesting development over the last years is that mobile phone payment systems have become more popular across several LDCs. The providers of such systems are typically non-bank institutions that are not subject to regulation. This poses risks to financial stability (Oduor and Kebba, 2019).

Domestic financial institutions typically hold a significant proportion of the national sovereign debt in LDCs. This creates strong links between the financial system and the government. State-owned banks have traditionally played an important role in the financial systems of LDCs. However, many of them have been privatised over the last decades as part of IMF and World Bank structural adjustment programmes.

The COVID-19 pandemic has created pressures on the financial systems of LDCs, as evidenced by an increase in non-performing loans among households and firms. This has deteriorated the liquidity and solvency position of financial institutions, and in many countries, government and central bank interventions were necessary to stabilise the financial system. However, the ability of LDCs to rely on counter-cyclical macroeconomic and financial interventions for stabilising their economies during the pandemic has been significantly restricted by their limited policy space and the shallowness of their financial systems (UNCTAD, 2021c). The latter implies that a significant proportion of companies did not have access to formal financial support measures.

Most central banks in LDCs have multiple targets, which include, for example, price stability, financial stability and exchange rate stability. Central banks might support economic development, directly or indirectly, and might have explicit financial inclusion targets.⁴ They also typically have tight links with governments and manage public debt.

The implementation of monetary policy faces several challenges in practice. For example, the rise of private and public debt in recent years has placed pressure on central banks to maintain low interest rates, ensuring manageable interest payments for households, firms and governments. However, complications arise when this debt is foreign-denominated. In these cases, a low interest rate environment might be conducive to currency devaluations, which can create debt repayment difficulties (Christensen and Schanz, 2018). Devaluations can also create inflationary pressures that can undermine price stability objectives.

As far as financial regulation is concerned, most LDCs rely on microprudential frameworks, i.e., frameworks that focus on the exposure of the financial system to individual institutions' risks. The use of macroprudential approaches – which focus on the importance of building buffers for protecting banks from systemic risks – is less common in LDCs (Christensen and Upper, 2017). Although LDCs are not members of the Basel Committee on Banking Supervision, they often have an incentive to implement Basel Committee-related regulations to signal to foreign investors that the country's financial system is stable (Oduor and Kebba, 2019).

Apart from capital and reserve requirements, financial regulators in LDCs often use credit controls⁵ that set ceilings and floors for the expansion of credit to specific sectors and activities. These controls are not only employed to achieve monetary policy and financial policy targets, they are also used for supporting countries' developmental and industrial policy targets. This differs from the practices of central banks and financial regulators in developed countries, whereby fiscal and monetary authorities do not typically act in a coordinating manner.

The institutional environment of fiscal-monetary-financial policy coordination that characterises many of the LDCs might be more conducive to addressing the climate crisis than the institutional framework that can be found in high-income countries, where central banks are asked to act independently of what other public authorities do – climate mitigation and adaptation require even more policy synergies than those with traditional economic targets. For example, the decarbonisation of specific sectors can happen more quickly if green subsidies and regulatory interventions are combined with more favourable financing conditions for the companies and sectors that need to reduce their environmental footprint.⁶ However, a significant challenge that policy coordination frameworks face is that in some cases, specific tools need to be used to achieve more than one target – for example, credit controls might need to be used to achieve both development and financial stability targets. This means that a careful design of these policy tools is necessary to ensure that multiple targets can be achieved and trade-offs are minimised.

⁴ For the role of financial inclusion in central banking, see Tissot and Gadanez (2017).

⁵ For a historical account of the use of credit controls by developed countries, see Bezemer et al. (2023).

⁶ For the importance of policy coordination for achieving climate targets, with specific reference to China, see Dikau and Ryan-Collins (2017).

3. Climate economic effects in LDCs and climate finance injustice

Climate change can affect the macroeconomic environment through several channels. A distinction is typically made between physical and transition channels. Physical channels refer to the macroeconomic effects of climate-related events that can affect both the supply-side and the demand-side of economies (Batten, 2018; NGFS, 2019). On the supply side, climate change can decrease agricultural productivity, affect the ability of people to work and destroy infrastructure necessary for production. On the demand side, consumption and investment spending can decline as a result of climate-induced uncertainty. Climate-related events can also disrupt trade leading to lower exports.

LDCs are particularly vulnerable to these physical effects. Their economies are highly dependent on climate-vulnerable sectors, such as agriculture, forestry and fisheries. They also lack the financial capacity to recover quickly from climate events. Climate change can thus lead to lower economic growth, higher unemployment and higher inflation. It can also lead to climate induced capital outflows that can increase the cost of borrowing, both for the public and the private sectors (Beirne et al., 2021; Kling et al., 2021), as well as cause exchange rate devaluations or depreciations.

Additionally, the global low-carbon transition can have important implications for LDCs. Broadly speaking, transition effects capture the economic disruption that might result from climate mitigation policies, green technologies and consumption patterns. In the case of LDCs, the potential effects from the implementation of climate policies in the Global North are of particular importance. For instance, the introduction of a carbon border adjustment mechanism (CBAM) by the European Union could lead to a reduction in the carbon-intensive exports of LDCs to the European Union (see UNCTAD, 2021a). For those LDCs in which the European Union is an important export partner, such climate policies can lead to a reduction in the sales of sectors that are at the core of the productive capacities, generating stranded assets (i.e., assets that can no longer be used in a profitable way). This can be detrimental not only for those who work in these sectors, but also for employees and entrepreneurs in other sectors that are connected with the impacted sectors through supply chain networks. There can also be adverse effects on government revenues, and therefore, on the public debt of LDCs. Domestically, the introduction of mitigation policies – such as carbon taxation – could lead to inflation and a reduction in employment in carbon-intensive sectors, with significant distributional effects. However, climate mitigation policies can also have some beneficial economic effects for those LDCs that export the metals and minerals necessary for green investments – even though there is a risk that they might, at the same time, enhance ‘green extractivism’ (i.e., they might lead more intensive resource and labour exploitation).⁷

A distinct channel for LDCs (and more broadly, developing and emerging market countries), which is linked with both transition and physical effects, is what can be called the climate finance injustice channel. This channel is associated with the way that global finance is now reacting to climate change, and the adverse implications that this reaction might have for the Global South.

There are two sources of climate finance injustice. The first one has to do with the so-called Wall Street Consensus (Dafermos et al., 2021b; Gabor, 2021). Powerful financial institutions in the Global North, which have for many decades supported the activities of fossil fuel companies, have seen the development of climate infrastructure in the Global South as an opportunity to increase their financial returns. Through the Maximising Finance for Development agenda (see World Bank and IMF, 2017), multilateral organisations – like the IMF and the World Bank – have supported this appetite and developed tools that can derisk financial investments in climate infrastructure.⁸ These tools can, however, deteriorate the financial position of Global South governments: the latter are asked to guarantee private investments and provide subsidies that can increase public debt (e.g., due to contingent liabilities). Hence, governments in the Global South are asked to become financially burdened for investments that are, to a great extent, necessary because of decades of carbon-intensive production and consumption in the Global North. This can exacerbate climate injustice.

⁷ For an analysis of green extractivism, see Voskoboynik and Andreucci (2021).

⁸ For the implications of this agenda for Least Developed Countries, see OECD (2020).

The second source of climate finance injustice is associated with the incorporation of physical risks into the credit models used by credit rating agencies and financial institutions. This incorporation has been actively supported by central banks and financial supervisors in the context of protecting the financial system from its exposure to climate risks (Dafermos, 2022). However, this practice is very problematic from the perspective of climate vulnerable countries. According to a climate credit risk analysis, the perceived physical risks of financial investments in these countries are high. Hence, credit rating agencies are likely to downgrade them; this would discourage the global financial system to invest in their bonds, making it more difficult for the government and the private sectors of climate vulnerable countries to invest in climate adaptation and cover climate-related losses. Therefore, the Global North financial institutions – which have a significant responsibility for the climate crisis – are reinforcing financial fragility in the Global South because they wish to protect themselves from the crisis that they have generated.

4. A classification of climate central banking tools for LDCs

Although recent years have seen a growing consensus in the need for central banks to incorporate climate change into monetary policy and prudential regulation and supervision, there is no consensus on how exactly to do so (Dafermos, 2022). There is also an ongoing debate on which central banking climate tools are the most appropriate. For the remainder of this paper, a distinction is made between three types of tools that central banks in LDCs can potentially use: (i) climate-adjusted analytical frameworks; (ii) climate risk exposure tools; and (iii) climate mitigation and adaptation tools.

The purpose of climate-adjusted analytical frameworks is to enhance central banks' understanding of the way that the macroeconomy can be affected by climate change, as well as of the implications that the climate effects have for the conduct of monetary policy. Climate risk exposure tools aim to reduce the exposure of financial institutions to climate-related financial risks. Climate mitigation and adaptation tools intend to contribute to the reduction of greenhouse gas emissions and help the financing of climate adaptation investment. Examples of tools for each of these categories are described below.

4.1 Climate-adjusted analytical frameworks

Climate-adjusted macroeconomic projections

The macroeconomic projections, which central banks have traditionally considered when making their monetary policy decisions, do not incorporate the impact of climate change on the macroeconomy. Climate-adjusted macroeconomic projections take explicitly into account the impact of the physical and transition effects of climate change on the both the demand- and supply-side of macroeconomies, paying attention to domestic and global channels.

For example, climate change can have a significant impact on inflation. Schnabel (2022) has recently made a distinction between "climateflation" and "fossilflation". Climateflation refers to the increase in prices that can be caused by the adverse effects of droughts, floods, hurricanes, and other climate-related events on the supply of goods and services (see also Beirne et al., 2020). Fossilflation is a type of inflation that can result from the increase in the price of oil, gas or coal due to carbon pricing policies domestically or abroad. In climate-adjusted macroeconomic projections, such climate effects need to be explicitly analysed. The central banks in LDCs also need to pay explicit attention to the macroeconomic implications of the climate finance injustice channels described in the previous section. For instance, they should consider the possibility that the costs of borrowing may increase as a result of the incorporation of physical risks into the evaluations of credit rating agencies.

However, the development of modelling tools that can be used for conducting such projections is a challenging task due to the unique features of climate change (see e.g., NGFS, 2019 and Battiston et al., 2021). In LDCs, proper modelling tools are unlikely to be available in the near term and necessary data are typically missing. Therefore, climate-adjusted macroeconomic projections could be of a qualitative nature: monetary authorities could identify the main channels through which key variables can be affected under different climate scenarios, and analyse the implications of these channels for macroeconomic and financial stability.

Climate-adjusted frameworks of monetary policy transmission

Climate change can affect several transmission channels of monetary policy. First, climate change can affect the ability of central banks to control inflation through changes in the policy interest rates (see NGFS, 2020). For example, climate-related events may make banks less willing to provide credit to an economy. In that case, a reduction of the interest rate might be insufficient for stimulating the economy if inflation is below the target. In addition, as recent food and energy crises have illustrated, an increase in inflation that could stem from factors that central banks have limited control over (as is the case with climateinflation and fossilflation), and can render the interest rate an ineffective tool for achieving inflation targets. Second, climate change can affect the ability of central banks to control exchange rates through changes in interest rates and the use of foreign currency reserves: international investors may be unresponsive to monetary policy interventions in the case in which an economy is hit by climate shocks. Therefore, monetary authorities might need to update their conceptual understanding of the transmission mechanisms of monetary policy. If this update leads to conclusions that call into question the effectiveness of existing tools, the way that these tools are used might need to be revised.

4.2 Climate risk exposure tools

Climate stress testing

Climate stress testing exercises allow central banks and financial supervisors to evaluate the exposure of the financial system to transition and physical risks under different potential climate pathways. These climate pathways capture different assumptions about global decarbonisation efforts in the coming decades. Following the NGFS scenarios (see NGFS, 2022), those typically considered in climate stress testing exercises are: (i) a hot house world scenario in which climate policies remain unambitious; (ii) a disorderly transition scenario in which climate policies become ambitious after 2030, causing an abrupt transition to a low-carbon economy that is characterised by significant financial losses; and (iii) an orderly transition scenario whereby the transition starts now and is smooth. Climate stress testing exercises have recently been conducted by several central banks and financial supervisors, including the Bank of England, the Banque de France/ACPR, the DNB and the ECB (see Vermeulen et al., 2018; Alogoskoufis et al., 2021; Banque de France/ACPR, 2021; Baudino and Svoronos, 2021; Bank of England, 2022; ECB, 2022a).

Running climate stress testing exercises requires sufficiently granular data about the regional and sectoral decomposition of bank credit, as well as innovative modelling approaches. A significant challenge for central banks and financial supervisors in LDCs is that they do not typically collect such data. Moreover, they might not have the capacity or human resources necessary for running these exercises.

Climate risk financial disclosures

Central banks and financial supervisors can ask financial institutions to report their exposure to transition and physical risks. The Task Force on Climate-related Financial Disclosures (TCFD) has often been used as a reference for reporting climate-related risks (see TCFD, 2019). In the absence of detailed data about the exposure to physical and transition risks, financial institutions can use the loans to carbon-intensive sectors and the loans to climate vulnerable regions (relative to total loans) as proxies for their exposure to transition and physical risks, respectively. However, the analysis of climate-related financial risks without the use of scenarios might be misleading.

Climate-risk adjusted capital and reserve requirements

From a microprudential perspective, the exposure of banks to climate-related financial risks needs to be reflected in their capital and reserve requirements. For example, banks have provided loans to households and non-financial corporations that might default on their debt because they might suffer financially due to an increase in carbon taxes or because of climate-related events that damage their assets. Hence, banks need to hold higher capital against these loans to be able to address solvency pressures. They might also need to increase their reserves to deal with liquidity pressures linked with climate risks.

4.3 Climate mitigation and adaptation tools

Climate-adjusted capital and reserve requirements

From a climate mitigation perspective, capital requirements for various types of loans can be differentiated on the basis of the climate footprint of the underlying activities. Climate-adjusted differentiated capital requirements can take the form of green supporting and dirty penalising factors (Dafermos and Nikolaidi, 2021, 2022). In the case of green supporting factors, the capital requirements for loans used to finance climate mitigation activities decline in order to incentivise the provision of such loans. In the case of dirty penalising factors, the capital requirements on dirty loans increase to make it more costly for banks to provide such loans. Reserve requirements can be adjusted based on the greenness/dirtiness of the total assets of banks (see also Campiglio, 2016; Volz, 2017)

Additionally, the green supporting factor can support the financing of climate adaptation: banks would hold less capital against loans that are linked with climate adaptation projects. These projects are associated, for example, with investments in wind-resilient buildings, the use of drought-resilient seeds, climate-induced firm relocation, or the development of digital business models that reduce the reliance on physical climate-vulnerable assets. Moreover, banks' reserve requirement ratio could be inversely linked to the proportion of climate adaptation loans in the overall portfolio of banks.

Climate-adjusted refinancing operations

Through refinancing operations, central banks provide liquidity to commercial banks. The idea behind the adjustment of refinancing operations based on climate mitigation targets is to make the interest rate on central bank loans a function of the greenness/dirtiness of the balance sheet of commercial banks:⁹ the higher the proportion of green loans and the lower the proportion of dirty loans to total loans, the lower the interest rate at which a commercial bank can get a loan from the central bank. This can incentivise banks to decarbonise their assets. Banks can also pass the change in the central bank interest rate on the interest rates that they charge their borrowers, affecting thereby the demand for green and dirty loans. In similar lines, refinancing operations that are adjusted based on climate adaptation targets would imply a lower interest rate for commercial banks that provide more loans that support climate adaptation projects.

Climate-adjusted financial supervision

Through financial supervision, banks can be instructed to demonstrate engagement with green finance. This can, for example, include (i) the submission of climate transition plans, whereby banks can explain how they intend to make their operations and lending practices climate-aligned (Dikau et al., 2022); (ii) the reporting on the progress banks have made in supporting climate mitigation and adaptation; and (iii) the requirement that banks have separate units that deal with climate-related issues.

Climate-adjusted credit controls

Broadly speaking, credit controls refer to policies that directly affect the quantity or price of credit (Bezemer et al., 2023). As noted above, such policies have been used extensively in LDCs. In the case of climate mitigation credit controls, central banks or financial supervisors can instruct banks to provide a minimum amount of lending to specific green activities (perhaps at a subsidised interest rate) or place a ceiling on the amount of lending provided to certain carbon-intensive activities. In the case of climate adaptation credit controls, banks can be instructed to provide a specific amount of lending to households or companies that engage in climate adaptation investments.

Climate-adjusted central bank portfolios

Central banks can use their own portfolios to support climate mitigation and adaptation (see NGFS, 2020). For instance, they could create a revolving scheme from their own funds to directly support climate-related projects. In principle, this could be extended to monetary policy portfolios; however, central banks in LDCs do not typically

⁹ See van't Klooster and van Tilburg (2020) for a proposal on how the Targeted Longer-Term Refinancing Operations (TLTROs) of the European Central Bank (ECB) can become green.

conduct corporate quantitative easing programmes due to the very limited role of corporate bond markets in these countries.

5. How can central banks in LDCs select and use climate tools?

In the case of central banking climate tools, 'one size does not fit all'. The central banks in LDCs can select among the different tools previously described by using several criteria and taking into account country-specific contexts. The main criteria that could be used are:

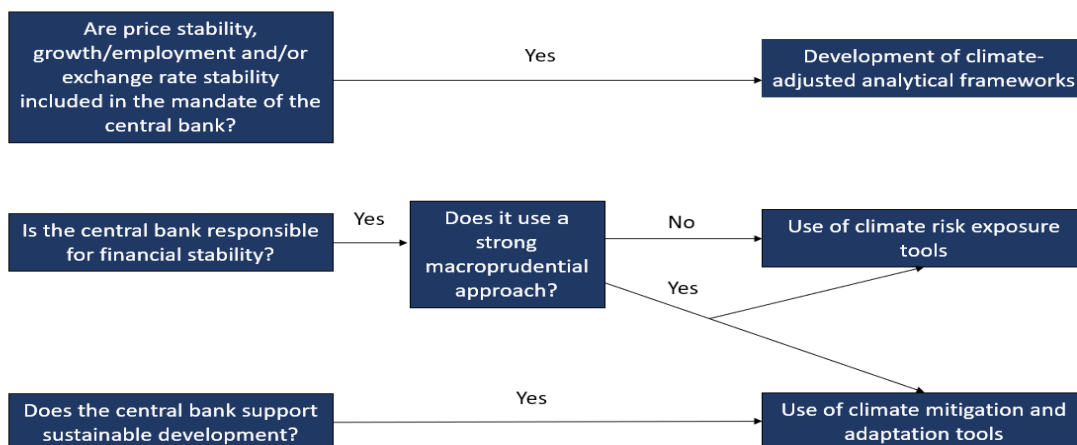
- (1) To what extent are the tools consistent with the central bank mandates?
- (2) How effective can the tools be in practice and are there side effects that might undermine other targets?
- (3) Can the tools be implemented in a meaningful way?

5.1 The role of mandates

Central banks in LDCs can use their mandates as a guideline to identify which climate tools they can potentially use. Figure 1 shows the link between mandates and climate tools. Central banks need to consider developing climate-adjusted analytical frameworks if they target macroeconomic variables, such as inflation, employment and exchange rate. This is because all variables can be affected by the physical and transition effects of climate change. Given that all central banks in LDCs target at least one macroeconomic variable, the development of climate-adjusted analytical frameworks needs to be considered as an option by all central banks.

The next question is whether financial stability is included in the mission of an LDC central bank. If yes, it is necessary for the central bank to consider using climate risk exposure tools to protect the financial institutions of the country from exposure to risks. However, an additional issue is to what extent the central bank uses a macroprudential approach to financial stability, and, whether the version of macroprudential approach used can be characterised as 'weak' or 'strong'. The key feature of a macroprudential approach is the emphasis on how the financial system works as a whole, and the systemic risks that are created at the macro level. In the fragile version, the feedback effects of the financial system on the macroeconomy are not explicitly considered in practice. In the strong version, these feedback effects are deemed to be particularly important, in line with the concept of double materiality (see Dafermos, 2022; Dafermos and Nikolaidi, 2022).

Figure 1: Central bank mandates and climate tools



A strong macroprudential approach requires the use of climate mitigation and adaptation tools, as depicted in figure 1. For example, if banks in an LDC provide a sufficient amount of finance for climate adaptation, the companies and households will be more protected from climate-related events and the probability of defaulting on their debt decreases. Hence, the financial system as a whole will be less exposed to physical risks. Also, the provision of more finance for decarbonisation projects due to the use of climate mitigation central banking tools can make domestic industries less vulnerable to climate policies that might be implemented in other countries (like CBAM). As a result, the domestic financial system can become less exposed to transition risks. Overall, if climate mitigation and adaptation tools are used in an effective way, they can improve the climate resilience of the financial system.

The use of climate mitigation and adaptation tools is also recommended when a central bank in an LDC has supporting sustainable development as a target, as these tools can contribute to the achievement of such development.

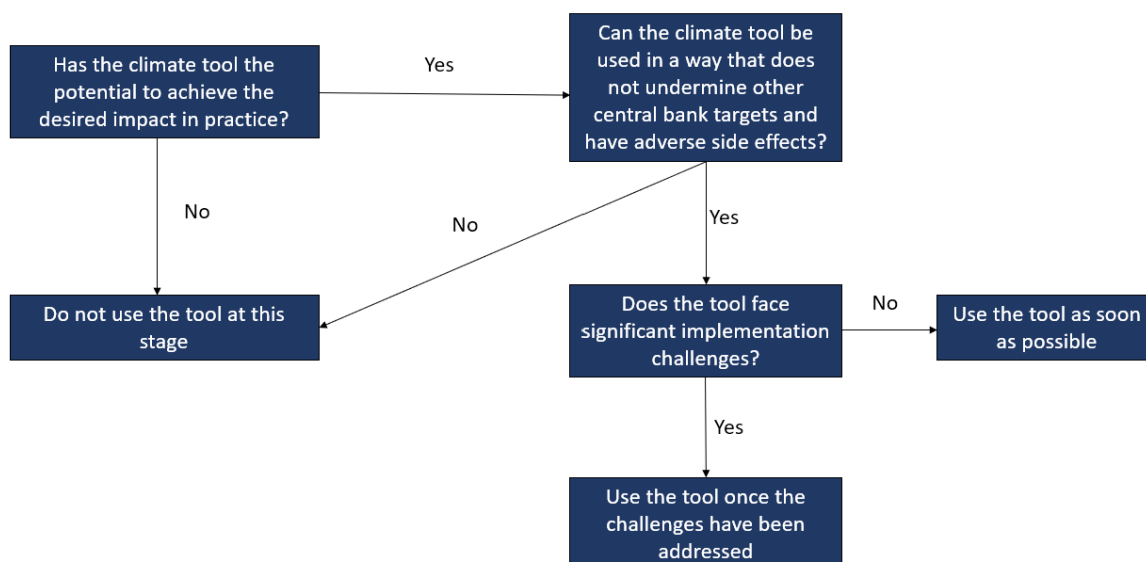
More broadly, it is important to highlight that the use of mandates for identifying potential climate tools does not have to be a static exercise. Governments can consider modifying the mandates of central banks to make them support climate-aligned development.

5.2 Transmission channels, target consistency and side effects

The existence of a specific mandate is a necessary, but not a sufficient condition for using certain types of climate central banking tools. Once potential climate policy tools have been identified, central banks need to examine a range of other issues before they decide if it makes sense for them to use a specific tool (see figure 2).

An initial important question – to what extent a specific climate tool has the potential to achieve the desired impact in practice? For example, in an economy in which formal credit constitutes only a small proportion of the total credit given to households and firms, the introduction of climate mitigation credit controls might have a very small impact on emissions. Hence, if central bank authorities believe that a specific tool does not fit the structure of the economy, they should not use the tool, at least at this stage.

Figure 2: Assessing a central banking climate policy tool



If the tool has the potential to achieve the desired impact, the next question is whether its use might undermine other targets, especially primary ones. For instance, at a specific point in time, a central bank might wish to achieve a certain increase in the provision of credit to support economic growth and achieve a specific inflation target. The introduction of climate criteria in credit controls and refinancing operations might reduce credit to carbon-intensive

sectors. Therefore, the central bank needs to evaluate to what extent the increase in green credit can counter-balance this in order for the total credit to remain the same.

It is also important for a central bank to take into account the extent of reduction in the credit provided to carbon-intensive sectors that could undermine developmental targets and cause adverse distributional effects – for example, many poor people might work in carbon-intensive industries. In such cases, the isolated use of climate mitigation central banking tools is not suggested. Such tools should only be used if they are accompanied by other fiscal, industrial and social policies that ensure the target of reducing emissions will not undermine social and developmental targets. If coordination with other policies is not possible, the use of these tools should be postponed until coordination has been put in place.

Another case in which some side effects might arise is the establishment of floors for the provision of credit to specific sectors or activities that are important from a climate perspective. Although this higher credit availability might be beneficial for achieving climate mitigation objectives, too much reliance on credit can lead to the over-indebtedness of companies and defaults, undermining central banks' financial stability objectives.

Challenges related to the so-called Tinbergen rule should also be considered (Dikau and Volz, 2021b). According to this rule, there is a risk for central banks to have too many targets and too few tools. Such a risk exists, in particular, in the case of climate mitigation and climate adaptation tools. The best way to address that would be for the tools to be designed in a way that does not undermine the more traditional targets (see the example described above about credit controls and refinancing operations). If this is not possible, some trade-offs might arise.

5.3 Implementation challenges

If the monetary authorities of a country have specified that a certain climate tool can be used in a way that does not undermine other more important targets and does not cause significant adverse effects, then the final key issue is the implementation process. The implementation process includes several aspects, such as the design of the tool, the data requirements, the monitoring process and the update of the design of the tool. Some examples are discussed below.

The design of climate mitigation tools requires the identification of the climate footprint of activities and companies. This is not a straightforward task and involves data requirements that most central banks in LDCs might not be in a position to meet. In the climate finance policy landscape, the climate footprint has been identified through two approaches: (i) the use of taxonomies; and (ii) the use of micro data about emissions.

Several sustainable finance taxonomies are in the process of development around the world. Most of these taxonomies use the European Union's Taxonomy as a basis (see European Commission, 2020). One of their main purposes is to identify types of activities that are conducive to climate mitigation. Approaches that use micro data typically rely on information about the current and past emissions, and the decarbonisation plans of companies. For LDCs, the availability of such type of data is very limited. Therefore, the use of taxonomies might be a more feasible approach for LDCs. However, the mere reliance on a taxonomy might entail greenwashing risks: some companies might, in theory, engage in green activities, but in practice, their business models might generate a high volume of emissions. Taxonomies about climate adaptation activities are less developed. This poses some challenges to the implementation of climate adaptation central banking tools. An additional issue is that the distinction between climate mitigation and climate adaptation is not always clear-cut.

The implementation of climate risk exposure tools, such as climate stress tests, might also face several practical obstacles in LDCs. As highlighted above, central banks and financial supervisors might not have the capacity or human resources necessary to analyse climate-related financial risks. But even if these resources existed, it might take several years until proper data is collected and appropriate modelling approaches are developed.

6. The role of domestic and international coordination

6.1 Domestic coordination

Domestic coordination is particularly important for central banks using climate mitigation and climate adaptation tools. Although central banks can support climate-aligned development through these tools, their contribution to the achievement of climate targets can be maximised if they coordinate with fiscal and regulatory authorities, in the context of mission-oriented climate industrial policy approaches.¹⁰

For example, if a country has developed a green industrial policy that aims to support specific sectors, it would make more sense for the central bank to design credit controls, refinancing operations, and capital and reserve requirements in a way that is consistent with the purposes of these industrial policies.¹¹ Moreover, climate projects that require a significant amount of financing in order to be successful would benefit from the combination of bank financing with the provision of subsidies from the government. Additionally, the coordination between fiscal, monetary and regulatory authorities on issues like capacity building, the collection of data, the development of sustainable finance taxonomies, and the use of climate-related modelling can create complementarities, and significantly facilitate and accelerate the design and implementation of climate policies.

Policy coordination should also involve an active role for national public development banks, whose mandate might need to be updated to include explicit support for climate-aligned development. Moreover, governments can consider increasing the capital base of these banks in order for them to be in a financial position that allows them to play an enhanced role in the fight against climate change.¹²

Local communities need to be at the core of the design and implementation of climate mitigation and adaptation projects. For example, locally-led adaptation can strengthen the capabilities of local actors, can help to address trade-offs and conflicts between communities, and can reduce the overall risk of maladaptation (Soanes et al., 2021). The involvement of local communities in the design and implementation of climate projects is also crucial for dealing with corruption issues. Khan et al. (2020) have argued that climate adaptation projects that create dual-use infrastructure (e.g. cyclone shelters that can be used as schools and community centres or embankments that can be used as roads) are more likely to be supported by local communities and influential groups, reducing the possibility of corruption. Central banking climate tools can be designed in a way that incentivises such dual uses. Furthermore, it is crucial for the coordinating efforts on climate mitigation and adaptation to pay explicit attention to power imbalances and ensure that climate interventions result in equitable outcomes and do not adversely affect the poorest and the most vulnerable (Paprocki and Huq, 2018).

6.2 International coordination and climate justice

Global climate justice has not yet been at the core of discussions about climate change and central banking, despite the international agreement about the UNFCCC principle of common but differentiated responsibilities and respective capabilities. From the perspective of LDCs, three issues are particularly important.

First, although climate losses and damages are already high and expected to increase in the coming years, LDCs do not have the policy space to deal with these losses and damages. Limited policy space is a general feature of developing and emerging market economies (see Fritz et al., 2018; Prates, 2020; Löscher and Kaltenbrunner, 2022; UNCTAD, 2022), but is more pronounced in LDCs. This stems primarily from the fact that the currencies of these countries are at the bottom of the global currency hierarchy and their financial structures are susceptible to capital flights – this restricts their ability to conduct fiscal and monetary policies based on their national and local needs.

¹⁰ For the role of mission-oriented approaches to the green transition, see Andreoni et al. (2022).

¹¹ For the crucial role of industrial policies in LDCs, see UNCTAD (2021c).

¹² For the climate role of public banks see, for example, Mazzucato and Penna (2016), Marois (2022) and Zhang (2022).

Second, although climate adaptation can reduce climate losses and damages, the financing of climate adaptation investments is currently very low. Central banks in LDCs can support adaptation through the tools described above, but their capacity to make a big difference is limited.

Lastly, LDCs have an extremely small contribution to cumulative emissions and can only marginally affect the global warming pathway in the coming decades. Although the use of climate mitigation tools by the central banks of LDCs can be conducive to the achievement of their nationally determined contributions (NDCs), they are likely to have a very limited impact on global warming and, ultimately, on the physical effects of climate change on the LDCs' macroeconomies. This is why central banks in LDCs need to pay more attention to climate adaptation than climate mitigation.

The climate finance that has so far been provided and mobilised by developed countries to developing countries falls short of addressing climate justice issues: the annual overall amount is extremely small (less than USD 100 billion), with most of the financing in the form of loans (which exacerbates indebtedness problems). The contribution of adaptation finance to total climate finance is also very small, with no financing for losses and damages (OECD, 2022).¹³ This climate finance deficit is consistent with the broader development finance deficit that LDCs are facing. The development finance landscape of LDCs is, amongst others, characterised by inappropriate aid architecture and an overdependence on the private sector for mobilising financial resources (UNCTAD, 2019).

To address the climate finance gaps, several proposals have recently been made. These include debt relief programmes and debt-for-climate swaps (Volz et al., 2020; Thomas and Theokritoff, 2021; Essers et al., 2021), the transformation of special drawing rights (SDRs) (Mariotti, 2022), and climate reparations (Perry, 2021).¹⁴ Although these proposals can help address some of the climate-related financial challenges, they are unlikely to make a big difference in the face of the growing financial needs of LDCs as a result of the current global warming trends. Moreover, only one of these proposals (climate reparations) aims to explicitly address climate injustice issues.

Addressing the climate injustice and climate financing needs that LDCs are facing requires more fundamental transformations of the global financial architecture. Although it is beyond the scope of this paper to describe how such transformations should manifest, it can be highlighted that they should be characterised by the following two features. First, they should rely on a new type of international coordination that would aim at directly addressing climate injustice. Second, they should create mechanisms through which LDCs would have permanent access to resources that would allow them to financially cover the growing damages and losses, and adaptation spending; fragmented solutions are unlikely to work.

7. Country case studies

Having analysed the key issues about central banking and climate change, this section focuses on three LDCs to discuss the potential use of climate tools by their central banks –Bangladesh, Zambia and Madagascar. As Table 1 shows, these countries differ significantly in their GDP per capita, with Bangladesh being the richest country and Madagascar being the poorest among the three.

¹³ For additional limitations of the global climate finance architecture, see African Development Bank Group (2022).

¹⁴ For a discussion on additional proposals, see van Tilburg et al. (2022).

Table 1: Key economic and natural disasters statistics – Bangladesh, Zambia and Madagascar

	Bangladesh	Zambia	Madagascar
GDP per capita, current US\$, 2021	2,155	1,037	488
Export structure by product group, 2021	Manufactured goods (94%), other (6%)	Ores and metals (73%), manufactured goods (11%), all food items (8%), other (8%)	All food items (41%), ores and metals (32%), manufactured goods (21%), other (6%)
Top 5 export partners, 2021	US; Germany; UK; Spain; Poland	China; Switzerland, Liechtenstein; Namibia; Democratic Republic of the Congo; Singapore	France; US; China; Japan; Canada
Personal remittances (% of GDP), 2020	6.75	0.73	2.9
Gini, last available year	32.4	57.1	42.6
Manufacturing, value added (% of GDP), 2021 (Bangladesh, Zambia), 2020 (Madagascar)	21.24	9.42	9.72
Domestic credit to private sector (% of GDP), 2020	39.16	15.19	16.42
Annual deaths from natural disasters per 100,000 people, 1990-2022 average (Bangladesh, Zambia), 1991-2022 average (Madagascar)	4.29	0.03	0.46
Number of people affected by natural disasters per 100,000, 1990-2022 average (Bangladesh, Zambia), 1991-2022 average (Madagascar)	4,663	5,578	2,176
Total annual economic damages from natural disasters (% of GDP), 1990-2022 average (Bangladesh, Zambia), 1991-2022 average (Madagascar)	0.92	0.03	0.57

Source: Our World in Data [natural disasters per 1,000 people; number of people affected by disasters per 100,000 people; and total economic damages from disasters (% of GDP)]; World Bank [Gini coefficient, manufacturing, value added (% of GDP), domestic credit to private sector (% of GDP)]; UNCTAD [GDP per capita, export structure by product group, top 5 export partners, personal remittances].

Note: Natural disasters refer to all geophysical, meteorological and climate events including earthquakes, volcanic activity, landslides, drought, wildfires, storms, and flooding. The last available years for the Gini coefficient are 2016 for Bangladesh, 2015 for Zambia and 2012 for Madagascar. For Zambia and Madagascar, there are missing data for several years between 1990 and 2002.

Bangladesh Bank has taken many innovative initiatives for the promotion of green financial investments over the last decade and is considered one of the leading central banks in green finance.

The Bank of Zambia has not taken any specific climate finance initiatives, but the monetary and financial tools that it uses could potentially be transformed to promote climate adaptation and mitigation. Crucially, Zambia is characterized by a high production of copper, which creates several economic opportunities due to the global growing demand for renewable energy technologies.

Madagascar is particularly vulnerable to climate change and has a unique biodiversity. Due to its shallow financial system, the central banking climate tools are less likely to be effective.

7.1 Bangladesh

Economic environment and climate change

Over the last decades, Bangladesh has seen a significant increase in its GDP and has managed to reduce its poverty rate. Similar to other Asian LDCs, Bangladesh has experienced a substantial increase in labour productivity growth, a rising share of manufacturing in output and employment, has increased the specialisation in manufacturing exports, and is one of the top LDC exporters (UNCTAD, 2020). The ready-made garment sector has significantly contributed to the industrialisation of the economy, and has been the main driver of the increase in the country's exports.¹⁵ Moreover, services now play a more prominent role in the overall macroeconomic activity; the large flows of remittances have strengthened Bangladesh's external position.¹⁶ Crucially, the government's deficit and debt have remained relatively stable. Due to its economic and social progress, in 2021, Bangladesh was recommended to graduate from the LDC category in 2026 (IMF, 2019; Ministry of Finance, 2021; UNCTAD, 2021c).

Industrial policy has been at the core of economic policy making in Bangladesh for several decades. The government developed its first industrial plan in the 1980s. Since then, industrial policy plans have been developed and updated on a regular basis. The industrial policy tools that have been used include subsidies, discounted interest rates, import tariffs, rebates taxes for research and development, public procurement rules, and targeted public investment (Roy, 2017).

Although industrial policy has played an important role in enhancing growth, special attention should also be given to the evolution of the political settlement of Bangladesh.¹⁷ Khan (2017) argues that the political settlement of 'competitive clientelism' – which has emerged since the 1990s – has been conducive to the expansion of the economy, including the ready-made garment sector: the two-party competitive clientelism has created political stability and stable expectations that have been beneficial for private investments. However, economic expansion transpired at the cost of a high-level of corruption. It has also relied on the exploitation of labour, which is exemplified by the very low wages and trade union density in the ready-made garment sector (see Ahmed et al., 2014).

Also, in line with other Asian LDCs, the industrialisation of Bangladesh is of a shallow form (UNCTAD, 2020). It over-relies on the ready-made garment sector, making the economy vulnerable to developments in this industry. There is also a risk that the industrialisation process might be disrupted when Bangladesh graduates from LDC status and loses the preferential treatment that LDCs have in importing markets.

Bangladesh is one of the most climate-vulnerable countries in the world. Hence, its economic performance is highly susceptible to global warming. The country suffers from a growing severity and frequency of climate-related events, such as riverine floods, flash floods, storm surges, and cyclones. It also suffers from salinity intrusion, which is expected to increase as a result of rising sea levels, and from heat waves and droughts that will likely become more common and severe as global warming increases (Goosen et al., 2018). Its climate vulnerability is enhanced by the

¹⁵ Most of the top export partners of Bangladesh are in Europe (see table 1).

¹⁶ In 2020, personal remittances were equal to 6.75% of GDP (see table 1). During the period 2002-2017, Bangladesh and Nepal experienced the highest number of years with current account surplus among all LDCs, for which data are available (see UNCTAD, 2019: 16).

¹⁷ According to Khan (2018), a political settlement refers to an institutional structure and a distribution of power between organisations (including political parties and bureaucratic mechanisms) that are reproducible over time.

flat and low-lying topography, the high population density, and the reliance of a significant proportion of the population on climate sensitive sectors, such as agriculture and fishing (Huq and Ayers, 2008). Coastal and riverine communities are particularly vulnerable, due to their direct exposure to climate-related events and their low adaptive capacity. Women in Bangladesh are disproportionately affected by food insecurity and water scarcity (Chowdhury et al., 2022). As table 1 shows, about 4,600 per 100,000 people have been affected by natural disasters on an annual basis over the period 1990-2020, while the annual economic damages as a proportion of GDP have been close to 1% for the same period.

Due to its high-climate vulnerability, Bangladesh has a long history in engaging with adaptation planning. The key national plans for climate adaptation are the National Adaptation Programme of Action (NAPA), which was published in 2005 and updated in 2009, and the Bangladesh Climate Change Strategy and Action Plan (BCCSAP), which was released in 2009 and is in the process of being updated (Groom, 2012; Zamudio and Parry, 2016; Ministry of Environment, Forest and Climate change, 2021). These programmes focused on several areas, such as food security, disaster management, climate-resilient infrastructure, and capacity building. Despite its low contribution to global emissions, Bangladesh also has the ambition to achieve a substantial reduction in its emissions, in line with its NDCs. Bangladesh's mitigation plans focus on supporting renewable energy projects that aim to improve the efficiency of existing power plants, reduce deforestation, enhance the use of solar energy in agriculture, and improve waste management, amongst others (Ministry of Environment, Forest and Climate change, 2021).

Financial system and use of climate tools by Bangladesh Bank

The financial system of Bangladesh is bank-based, with the presence of non-bank financial institutions (NBFIs) relatively limited (Habib, 2019). There are currently 61 scheduled banks that include state-owned commercial banks, specialised banks, several types of private commercial banks, and foreign commercial banks. The number of NBFIs is 34 – most were initiated by private domestic initiatives and joint venture initiatives (Bangladesh Bank, 2022).¹⁸ The bond market in Bangladesh remains underdeveloped. A traditional weakness of the Bangladesh financial system is the presence of high non-performing loan ratios. These ratios have been particularly high in specialised banks and state-owned commercial banks (Habib, 2019).

Microfinance has a long history in Bangladesh that dates back to the 1970s. Mia et al. (2019) made a distinction between four phases in the development of microfinance:

the 1976-1985 phase: microfinance was first developed through the establishment of the Grameen Bank that introduced the group-based lending method;

the 1986-1995 phase: several microfinance institutions were established and group-based lending was gradually replaced by individual lending;

the 1996-2005 phase: several innovations were introduced, and commercial and state banks started providing several microfinance services; and

the 2006-2015 phase: microfinance reached its peak and multiple borrowings and loan repayment problems increased.

The significant expansion of microcredit in Bangladesh over the last decades is reflected in the fact that, by 2013, at least 60 per cent of rural households received microcredit at least once in their lifetime (Osmani, 2016). Currently, microfinance programmes are operated by several financial institutions, and include programmes that support agriculture, small enterprises, ultra-poor households, and disaster management. Despite the widespread use of microfinance, it is unclear if its overall contribution to development and poverty has been positive. One of the adverse implications is that microfinance has increased the over-indebtedness of many households, undermining their economic position and long-run prospects. There is also evidence that microcredit has led to agrarian dispossession and has deteriorated the well-being of women, who in many cases, have been forced to take out loans for dowry purposes, bear the responsibility for repaying the loans – even though they may not use the funds – and are often abused and assaulted when they cannot pay installments (Paprocki, 2016)

¹⁸ Bangladesh Bank makes a distinction between (i) the formal financial sector that includes all regulated institutions, such as banks, NBIs and micro finance institutions, (ii) the semi-formal financial sector which includes institutions that are regulated but do not fall under the jurisdiction of the Bangladesh Bank and (iii) the informal financial sector that comprises private financial intermediaries that are completely unregulated.

The broad vision of Bangladesh Bank is to maintain price and financial stability, and to support inclusive economic growth, employment creation, and poverty reduction. It also has as an explicit target to support socially responsible and environmentally sustainable development initiatives. This suggests that it is in a position to consider all the climate central banking tools discussed in section 4.

Bangladesh Bank has taken several climate-related initiatives and has gained global recognition for being an early promoter of climate finance (Khairunnessa et al., 2021; Bose et al., 2021). In 2011, it issued the Environmental Risk Management (ERM) Guidelines for Banks and Financial Institutions, which is a form of green financial supervision.¹⁹ The banks were instructed to support climate mitigation in several phases. They were asked to inter alia: (i) establish a separate green banking unit; (ii) create supervisory committees to monitor progress on the support of green activities and allocate budgets for green finance; (iii) formulate sector-specific green financial policies; and (iv) publish reports on green activities using standardised formats.

Bangladesh Bank has also used green credit controls. Since 2016, it has set a 5 per cent minimum target of direct green finance for the total funded loan disbursements/investments of financial institutions.²⁰ Green finance refers to loans related to renewable energy, energy efficiency, alternative energy, liquid waste management and solid waste management (see Bangladesh Bank, 2022). Additionally, banks have been instructed to form a “Climate Risk Fund” and allocate at least 10 per cent of their Corporate Social Responsibility budget to this fund. Interestingly, Bank of Bangladesh has also tried to green its own portfolio – it established a BDT²¹ 2 billion revolving refinance scheme from its own funds to support projects on solar energy, biogas, and effluent treatment plants (Khairunnessa et al., 2021).²²

Options for the future

Bangladesh exemplifies how central banks can support industrial policy objectives in the context of climate crisis. By directing credit to specific activities that are conducive to climate mitigation, and assessing banks based on the financing they provide to green initiatives, Bangladesh Bank is in a position to support the industrial policy targets of the Government as they are gradually becoming greener. It is now widely argued that a high priority for the ready-made garment sector is to reduce its environmental footprint – this is important not only because of the environmental targets of Bangladesh, but because the satisfaction of environmental standards is increasingly essential for maintaining and achieving high shares in the global markets (Rab and Hoque, 2017). By offering better financing conditions to ready-made garment companies that improve resource efficiency, adopt energy and chemical waste management policies, and take other environmental initiatives, the banking sector in Bangladesh can support green development.

However, the limitations of green finance initiatives need to be explicitly considered. As highlighted in section 5, over-indebtedness and higher default rates for companies that engage in green activities are some potential side effects of green credit controls. Over the last years, the private sector’s stock of credit as a proportion of GDP has followed a rising trend, and it is now close to 45 per cent (see table 1). Therefore, Bangladesh Bank should carefully consider how climate mitigation tools can be designed, such that a further increase in the private sector’s indebtedness and defaults is prevented. At the same time, a significant challenge to the promotion of green finance is that the perceived credit risk of green loans is typically high and discourages the banking sector to provide a higher amount of green financing.

Another issue is that the vast majority of the climate initiatives of Bangladesh Bank have been confined to climate mitigation, with climate adaptation playing a less important role. Given the high climate vulnerability of Bangladesh, more emphasis needs to be placed on the development and use of climate adaptation central banking tools. This could include the more explicit incorporation of climate adaptation into financial supervision reporting and the use of explicit climate adaptation targets in credit controls. The developmental benefits of climate adaptation tools will be enhanced if more support is given to dual-use adaptation investments (Khan et al., 2020). The sustainable finance

¹⁹ These guidelines were updated in 2017.

²⁰ In 2020, Bangladesh Bank also set a 5 per cent green finance target for the total funded *term* loan disbursement/investment.

²¹ BDT is the Bangladesh taka.

²² For a chronological summary of the green finance initiatives, see Bangladesh Bank (2022).

taxonomy that is currently under development (Bangladesh Bank, 2020) is expected to strengthen the effectiveness of both climate mitigation and climate adaptation tools.

Special attention should also be given to the fact that in several rural climate vulnerable areas in Bangladesh, poor people – whose livelihoods have been disrupted by climate-related events – have been ‘forced’ to borrow from informal moneylenders, who typically charge extremely high interest rates and use predatory practices. Although climate adaptation finance initiatives that would induce banks and microcredit institutions to provide credit at low interest rates quickly after a climate shock would help prevent reliance on informal debt, such initiatives should not be viewed as substitutes for the lack of government support. This type of microcredit can also result in maladaptation: over-indebtedness can undermine the ability of vulnerable people to respond effectively to climate change (Jordan, 2021).

The Bangladesh Bank could more explicitly consider incorporating climate channels into its analytical frameworks. This is related to its macroeconomic projections and conceptual understanding of the macrofinancial effects of transition and physical risks. For instance, given that four of the top five exporter partners of Bangladesh are in Europe (see table 1), Bangladesh Bank needs to understand how the exports of the country – and, hence, macroeconomic and financial stability – could be affected by the implementation of the European Union’s Green Deal policies. Of particular importance is to improve its understanding of how the transmission mechanisms of macroeconomic and financial policies can be affected by climate events in Bangladesh. In addition, the Bank could set as a medium-run target the running of some climate stress testing exercises that would analyse – in a more integrated way – the risks related with both global and domestic climate-related developments.

7.2 Zambia

Economic environment and climate change

Zambia is a resource-based economy with very high inequality. It is one of the largest copper producers worldwide – its copper mining industry has a long history that dates back to the 1920s during the British colonial period. The GDP, foreign direct investment, exports and government revenues have a high reliance on the performance of the copper mining industry. Hence, Zambia’s financial position is very susceptible to changes in the copper market price and the global demand for copper (Sikamo et al., 2016; Unceta, 2021). In 2021, ores and metal accounted for 73 per cent of the country’s total exports (see table 1).

During the period 1964-1992, the share of the manufacturing sector in GDP steadily increased. However, it declined sharply in 1992 and has remained very low – in 2020, it was equal to 9 per cent (see table 1). To a great extent, this is related to the abandonment of import substitution policies (Chansa et al., 2019). Currently, the food, tobacco and beverages sector has the highest contribution to manufacturing output, while the last years have seen a significant decline in the activities of the textiles and leather sectors, primarily due to the competition from countries, such as China and Bangladesh. Zambia’s manufacturing sector is characterised by limited diversification, low levels of investment and the prevalence of outdated technologies (Republic of Zambia, 2018).

According to the 2018 National Industrial Policy, the priority sectors for Zambia’s industrialisation agenda are the following: processed foods; textiles and garments; engineering products; wood and wood products; leather and leather products; mineral processing and products; pharmaceuticals; and the blue economy. The provision of low-cost financing is at the core of the industrial policy. The expectation is that this financing will be provided both by the private financial system and the Development Bank of Zambia.

The COVID-19 pandemic had a strong, adverse effect on the Zambian economy. The GDP of the country contracted sharply because of the disruption in supply chains, the reduction in the demand for services and the falling global demand for copper. This had a negative impact on the fiscal stance of Zambia: the fiscal deficit and public debt increased (African Development Bank Group, 2021b) and Zambia’s sovereign credit rating was downgraded. Zambia’s economic outlook has also been negatively affected by a drought in 2019 and the increase in the price of fuels and fertilisers due to the war in Ukraine. As a result, the government has faced significant liquidity pressures that have led to a debt crisis. In August 2022, the Executive Board of the IMF approved a 38-month arrangement of about USD 1.3 billion, under the condition that Zambia will implement austerity measures and several fiscal policy and institutional reforms (IMF, 2022).

In terms of climate change, Zambia has been experiencing droughts and floods of increasing frequency and severity that have adversely affected food and water security (Republic of Zambia, 2015). It is expected that the rising atmospheric temperature will pose significant challenges to economic development due to the impact of climatic changes on agriculture, water, forestry, energy, wildlife, infrastructure and health. Of particular importance for the economy are the effects of climate change on roads and hydro-power production – Zambia’s electricity generation is predominantly hydro (Tembo et al., 2020). In terms of the effects of climate change on crops, the increasing delays or inconsistencies in the onset of rainfall are expected to have particularly negative impacts on the production of beans and maize – these effects are, however, heterogeneous among provinces (Hunter et al., 2020).

Zambia published its National Adaptation Programme of Action (NAPA) in 2007; several adaptation interventions were identified, such as water harvesting, crop adaptation, promotion of aquaculture, forest management and construction of watering points (Ministry of Tourism, Environment and Natural Resources, 2007). According to its Nationally Determined Contribution (NDC), Zambia is planning to reduce its emissions through the implementation of three programmes that focus on sustainable forest management, sustainable agriculture and renewable energy/energy efficiency (Republic of Zambia, 2015 and 2016). However, both the adaptation and mitigation plans cannot materialise without sufficient external financial support.

Importantly, Zambia has the potential to benefit from the global growing demand for renewable energy technologies: copper plays a key role in the development of renewable energy systems – it is an essential material component of electric vehicles. However, the growing demand for copper also poses environmental and social risks, in the context of green extractivism. Copper mining is conducive to air and water pollution and can lead to land degradation, having adverse effects on local communities. Moreover, the higher interest in copper mining due to the global shift to renewables can reinforce worker exploitation practices. This is exemplified by the poor labour standards that have been adopted by Chinese companies that have invested in the Zambian copper mining industry (see e.g. Gadzala, 2010).

Financial system and the role of the Bank of Zambia

Foreign banks dominate the banking system of Zambia. According to the Bank of Zambia (2020a), the proportion of the subsidiaries’ assets of foreign banks to the total assets of the banking sector was higher than 70 per cent during the period 2018-2020. The rest are local private banks and banks that are partially owned by the Government. Microfinance institutions are part of the formal non-bank financial sector. The majority of these institutions were established in the early 2000s. However, their provision of credit remains limited, especially to rural agricultural households. Several microfinance institutions collapsed in the past, contributing to the under-development of the microfinance sector (see Agri-ProFocus Zambia, 2014). Importantly, the financial system has recently been under pressure due to the rise in non-performing loans as a result of the COVID-19 crisis. The non-performing loans are traditionally high in the agriculture, forestry, fishing and hunting sector and this continued to be the case during the pandemic.

The primary objective of the Bank of Zambia is the achievement and maintenance of price and financial stability, with the aim of supporting sustainable development. To achieve this objective, the Bank of Zambia uses several monetary and financial policy tools. These include reserve requirements, credit controls, lending facilities, open market operations and prudential guidelines. Moreover, by selling and buying foreign exchange reserves, the Bank of Zambia aims at keeping the exchange rate at levels that are conducive to stability.²³ Interestingly, in April 2020, the Bank of Zambia introduced the Targeted Medium-Term Refinancing Facility (TMTRF), whose aim has been to support the liquidity of the financial sector during the COVID-19 crisis and encourage lending to non-financial corporations and households. The facility has specifically targeted the agriculture, manufacturing, energy, and tourism sectors (Bank of Zambia, 2020a).

The Bank of Zambia is one of the three main regulators of the financial system. It is responsible for the regulation and supervision of banks and other financial service institutions, while the Securities and Exchanges Commission (SEC) and the Pensions and Insurance Authorities (PIA) have the responsibility of supervising and regulating the capital markets and the pension/insurance industry, respectively.²⁴ The Bank of Zambia is now in the process of

²³ <https://www.boz.zm/monetary-policy-instruments.htm>.

²⁴ <https://www.boz.zm/financial-sector-development.htm>.

strengthening its microprudential and macroprudential supervision. For example, it is currently undertaking macroprudential stress tests, it has as a target to use Supervisory Technologies (SupTechs), it is customising the Basel III liquidity requirements, it intends to develop a microprudential stress testing framework and will establish and operationalise a Financial Stability Committee (Bank of Zambia, 2020b). The strengthening of the financial supervisory capacity of the Bank is part of the recent agreement of the country's authorities with the IMF. In the context of this agreement, steps have also been taken to make the Bank of Zambia operationally independent (IMF, 2022).

Can the Bank of Zambia use climate tools?

Given that the Bank of Zambia's mandate refers explicitly to the maintenance of price and financial stability, the discussion in section 5 suggests that the Bank can consider the development of climate-adjusted analytical frameworks and the use of climate risk exposures tools. For example, the Bank can start developing forward-looking macroeconomic projections that capture the macrofinancial risks and opportunities that arise from the global transition to low-carbon technologies, with a special emphasis on the increasing demand for copper. Given that China is its top export partner (see table 1), the monetary authorities of Zambia need to pay particular attention to the climate-related developments that can create both opportunities (e.g. higher demand for copper) and risks (e.g. green extractivism). The Bank could also incorporate climate change in its stress testing exercises.

The use of climate mitigation and adaptation tools might be more controversial and less straightforward. Although the Bank of Zambia has as an aim to support sustainable development, it considers that this can happen through the maintenance of price and financial stability, and not necessarily directly. The recent agreement with the IMF to make the Bank of Zambia operationally independent might make it more difficult for the Bank of Zambia to directly support climate mitigation and adaptation targets.

However, if at some point the Government decides to make climate-aligned development an explicit target for the Bank of Zambia, the Bank has several tools at its disposal that would allow it to support such a target. Given Zambia's high climate vulnerability and very low contribution to global cumulative emissions, it would make more sense for these tools to be adjusted with the aim of focusing primarily on climate adaptation. For instance, through credit controls, specific floors could be set about the provision of credit to climate adaptation projects; the TMTRF could be used to encourage the provision of credit to companies and households that can use it in a way that is in line with the national adaptation plans; or the reserve requirements could be lowered for those banks that increase the financing of climate adaptation investment. In order for these tools to be effective, particular emphasis should be placed on the development of criteria for the classification of climate adaptation activities that suit the Zambian context.

7.3 Madagascar

Economic environment and climate change

Madagascar is among the poorest countries in the world – a large part of the population does not have access to electricity. Agriculture and fisheries play a prominent role in its economy, while the manufacturing sector's contribution to GDP was less than 10 per cent in 2021 (see table 1). The country has a long history with sharp contractions and is particularly susceptible to economic fluctuations in developed countries and changes in commodity prices (IMF, 2016). The economic performance of Madagascar improved after 2015. However, the COVID-19 pandemic hit the manufacturing, mining and services sectors particularly hard, leading to a negative economic growth and a deterioration in the fiscal deficit (African Development Bank Group, 2021b and 2022). In 2021, Madagascar received a 40-month financing package from the IMF, which was accompanied by an agreement to take action to improve public debt sustainability (IMF, 2021).

Madagascar has extensive coastal zones that make it particularly vulnerable to climate change. It also has an exceptional biodiversity that is very susceptible to climatic conditions. Cyclones and droughts have, in the past, hit particularly hard, causing significant damage to crops, – fields destroyed by heavy rains, floods and stormy winds, and a deterioration of soil fertility. Cyclones have destroyed schools, health centres and nurseries. Irregular rainfall patterns have increased water stress. The expectation is that global warming will make cyclones more intense, increase rainfalls in most parts of the country, and deteriorate coastal erosion (Republic of Madagascar, 2015).

Antananarivo, the capital city, is particularly exposed to flooding, lacking appropriate water supply, sewerage and drainage infrastructure (Global Centre on Climate Adaptation, 2022).

In 2010, Madagascar formulated a National Climate Change Policy, with the aim of reducing greenhouse gas emissions and increasing resilience to climate change (World Bank Group, 2021). According to Madagascar's Intended Nationally Determined Contribution (INDC), its climate mitigation efforts focus inter alia on the use of renewables, rural electrification, dissemination of improved stoves, the implementation of climate-smart agriculture, the large-scale adoption of agroforestry, the reduction of forest timber extraction, and biogas production from wastewater (Republic of Madagascar, 2015). Regarding the climate adaptation efforts, particular emphasis is placed on the development of early warning systems for cyclones, droughts, floods and other climate-related events (World Bank Group, 2021). Adaptation plans also include the management of water resources, the restoration of natural habitats and the use of resilient agriculture integrated models (Republic of Madagascar, 2015).

Financial system and the role of the Central Bank of Madagascar (BFM)

The Malagasy financial system primarily consists of banks and microfinance institutions. The number of pension funds and insurance companies is limited. The vast majority of banks are subsidiaries of foreign banks (IMF, 2016 and 2020). Despite its low size, the profitability of the banking sector is relatively high, and the solvency position of banks is generally strong. The interest rates that are charged by banks and microfinance institutions are very high, but not necessarily higher than the interest rates in other countries in the region. Crucially, a large part of the population has no access to financial services. Despite their low size, microfinance institutions provide financial services to several poor households. The provision of credit by microfinance institutions is restricted by the existence of low credit ceilings (IMF, 2016). In 2020, the private credit-to-GDP ratio was very low, equal to about 16 per cent (see table 1).

Before 2014, monetary policy was not very active in Madagascar. Over the last years, the Central Bank of Madagascar (BFM)²⁵ has played a growing, important role in the management of bank liquidity (IMF, 2020). The current mission of the BFM is to ensure the internal and the external stability of the currency.²⁶ The ultimate target of its monetary policy is to control the inflation rate. The BFM uses three key tools to achieve its aims. The first tool is the interest rate corridor system, whereby the interest rate on marginal lending facilities is the upper limit and the interest rate on deposit facilities is the lower limit. The second tool is a mandatory reserves system that aims to prevent excessive credit expansion. The third tool is a system of interventions in the money market that includes refinancing operations and liquidity withdrawals. The IMF has suggested the introduction of a repurchases operations (repos) regulatory framework that would enhance longer-term interbank lending and the development of a bond market (see IMF, 2020)

Can the BFM use climate tools?

Based on its price stability and exchange rate stability mission, the BFM needs to have an integrated understanding of how the external macroeconomic environment is changing as a result of climate change. Since the country is very susceptible to external factors, the BFM needs to develop a climate-adjusted analytical framework that allows it to understand (i) how global climate policies will affect the United States, Europe and China (the main export partners—see table 1); (ii) how the economy will be affected by climate events; and (iii) how the effectiveness of the monetary policy tools of the BFM might be impaired by climate change. Regarding the latter, global and national climate-related supply shocks might, for instance, create inflationary pressures that can reduce the effectiveness of the interest rate corridor system.

Financial supervision is currently weak, so any use of climate risk exposure tools might be premature. However, if financial supervision and regulation is strengthened in the future, the BFM could consider running some climate stress tests to evaluate the vulnerability of the Malagasi financial institutions to transition and physical risks. If at some point the government decides to identify sustainable development as a primary or secondary target, some climate adaptation tools could be used as well. For example, the BFM could link reserve requirements with the

²⁵ Banky Foiben'i Madagasikara.

²⁶ See <https://www.banky-foibe.mg/politique-monetaire-2>.

proportion of climate adaptation loans in the total loans of banks and microfinance institutions. In addition, some minimum credit targets could be set for the provision of climate adaptation loans.

7.4 Policy lessons

The key policy lessons from the previous case studies are as follows:

- The central banks of LDCs need to consider the use of central banking climate mitigation and adaptation tools when (i) sustainable development or a strong macroprudential approach are part of their mandates and (ii) their financial systems are sufficiently developed and used by a sufficiently large proportion of the population and the non-financial corporate sector. Conditions (i) and (ii) hold for Bangladesh, but not for Madagascar.
- Conditions (i) and (ii) are necessary, but not sufficient for justifying the use of central banking climate tools. For example, climate tools cannot be successful without the prior development of specific mitigation and adaptation criteria/taxonomies. Climate tools can also have adverse effects, if, for example, they lead to over-indebtedness and defaults. Such side effects of central banking climate tools should be seriously considered before the introduction of climate initiatives by central banks.
- If climate tools are introduced by the central banks of LDCs, it is essential to make sure that they are aligned with the targets of fiscal authorities and industrial policy. For example, if the Bank of Zambia decides to use climate tools, it needs to make sure that the financial system will continue to support the priority sectors that have been identified in the national industrial policy. Moreover, if there are explicit green targets in a country's industrial policy, any climate adjustments of monetary and financial tools should support these targets.
- Central banks should never be viewed as the 'fixers' of the climate crisis, substituting interventions that need to be made by governments, public authorities and international organisations. Central banks can only play a supportive role in the fight against climate change and they should always act in coordination with governments and other public authorities.
- Although microfinance can help to fill in gaps in the access to liquidity for people who are affected by climate-related events, the provision of loans should not be viewed as a substitute for the lack of government support to the climate-vulnerable population. Rich countries with a high volume of cumulative emissions need to create policy space for LDCs to spend on climate adaptation and to cover losses and damages.
- All central banks in LDCs need to develop analytical frameworks that allow them to identify how exposed their financial system and macroeconomies are to risks that might stem from the implementation of climate policies in other countries (especially their export partners) and climate-related physical events. However, due to the lack of resources, they might need support from the international community to do so.

8. Conclusions

This paper has focused on the role that central banks in LDCs can play in the climate crisis era, identifying three types of central banking climate tools: (i) climate-adjusted analytical frameworks; (ii) climate risk exposure tools; and (iii) climate mitigation and adaptation tools. It was emphasised that central banks in LDCs can select between these different tools through a two-step process that takes into account that one size doesn't fit all. In the first step, central banks need to assess to what extent their mandates are consistent with these tools. It was suggested that all central banks need to use climate-adjusted analytical frameworks due to the growing importance of the physical and transition effects in the new climate macroeconomic environment. Climate risk exposure tools require a financial stability mandate, while climate mitigation and adaptation tools can be used in the case of sustainable development targets or a strong macroprudential approach. In the second step, central banks need to evaluate the effectiveness of the transmission channels of the tools in their countries, the potential side effects and the related implementation challenges. In the case of climate mitigation and adaptation tools, the coordination of central banks with fiscal and regulatory authorities is of particular importance for maximising the beneficial effects of these tools for climate-aligned development and financial stability.

The importance of the 'one size doesn't fit all' approach was illustrated through three country case studies. The analysis in section 7 showed that Bangladesh Bank is in a position to use a wide range of climate mitigation and climate adaptation tools, drawing on its experience as a climate finance central banking leader. However, particular attention should be paid to over-indebtedness issues that might arise as a result of the use of these tools. The Bank of Zambia might not yet be in a position to use central banking tools for achieving climate targets. However, it would benefit from the development of climate-adjusted analytical frameworks and the use of some climate risk exposure tools. The BFM in Madagascar is still at the early stages of the development of its monetary and financial policy tools. At the same time, the access to banking services is limited for a very large part of its population. Therefore, the use of climate central banking tools would be premature. However, the development of climate-adjusted analytical frameworks would be beneficial given the high climate risks that the country is facing. Having said that, it is of particular importance to highlight that central banks should not be viewed as the 'fixers' of the climate crisis in LDCs. Addressing the climate challenges in LDCs requires fundamental structural transformations driven by democratically elected governments. Central banks can only play a supportive role in these transformations and should not be used as an excuse for the lack of interventions by other actors.

The paper also highlights climate justice issues associated with the way that financial institutions (including central banks) in the Global North are now engaging with climate change. We identified two sources of climate finance injustice. The first is linked with the Wall Street Consensus agenda that promotes the derisking of climate projects in the Global South, so that financial institutions in the Global North benefit from climate mitigation and adaptation projects, at the expense of the financial position of countries that have the lowest responsibility for the climate crisis. The second source of climate finance injustice has to do with the ongoing incorporation of physical risks in the credit models of financial institutions and credit rating agencies. This incorporation can increase the cost of borrowing for climate vulnerable countries, deteriorating even more their financial and fiscal position. Central banks in LDCs need to improve their understanding of how climate finance injustices can deteriorate macroeconomic and financial stability in their counties. More importantly, addressing these climate finance injustices requires fundamental transformations in the global financial architecture, which moves beyond the majority of the current proposals for closing climate financing gaps in the Global South.

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