15. Tackling climate change in low- and middle-income countries

Elizabeth Robinson and Chukwumerije Okereke

Designing and implementing action to address climate change is one of the most important public policy challenges of our time – and particularly acute for low- and middle-income countries (LMICs) around the world. One aspect of that challenge is to tackle climate change without exacerbating poverty. Although there is widespread agreement that LMICs need economic growth to reduce poverty and build resilience to climate change, there are few – if any – precedents on how to achieve this kind of development at scale, and still less agreement on how to go about it. In this chapter we highlight the importance of providing access to low-carbon energy, ensuring food security, protecting nature and biodiversity, and improving adaptation and resilience. We also recognise that any action to tackle climate change needs to be considered within the principles of equity and climate justice. As such, we frame our exploration of 'what works' within a sensitivity to national political economy dynamics and the need for effective national institutions. LMIC policymakers must also contend and engage with international political and economic structures and institutions. All told, while there are several promising initiatives around the world, the reality is that we still lack shining examples of countries that have successfully achieved low-carbon and resilient development. Evidence of 'what works' in LMICs is sparse.

I. Introduction and context

In 1989, atmospheric carbon dioxide was 352 ppm (parts per million), compared to pre-industrial levels of around 280 ppm, and although the drivers and likely impacts of climate change were already clearly understood, tackling climate change was not a priority for LMICs, nor was it addressed

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by the Washington Consensus. Fast forward to 2025 and it is clear that climate change is one of the most pressing public policy issues of our time. Atmospheric carbon dioxide has exceeded 420 ppm, and the diverse impacts of climate change, ranging from glacial melt to sea-level rise, droughts, cyclones and wildfires, now pose significant challenges to global livelihoods, and human and natural systems.

The Washington Consensus focused on economic growth, and critics urged a greater focus on poverty reduction. Today, a different perspective is needed – one that recognises the continued importance of economic growth and poverty reduction, but focuses on building climate-resilient societies along growth pathways compatible with global net-zero. However, with few if any precedents of low-carbon development at scale, there is little clarity or agreement on what works and how the sometimes conflicting objectives of economic growth and climate change mitigation can best be reconciled.

LMICs are home to approximately 6.82 billion people, or around 85% of the world's total population. These countries, including China, are responsible for less than half of historical carbon emissions, but around 66% of current emissions, driven primarily by China and a handful of other countries, and this share of emissions is increasing.[1] While some LMICs already have emissions considerably higher than the global per capita average, others barely register, mainly due to a lack of access to energy. Indeed, low-income countries account for 9% of the global population but just 0.6% of emissions.[2] As such, how LMICs prioritise efforts to tackle climate change will differ considerably.

Pursuing economic growth in the context of climate change is a global policy priority, but one that is particularly challenging for LMICs, many of which have limited institutional, technical, and financial resources and capabilities, as well as weak adaptive capabilities and often a high dependence on rain-fed agriculture. If LMICs follow economic growth paths similar to those taken by today's high-income countries, which were driven in no small part by the burning of fossil fuels, it will be impossible to limit global warming to less than 2°C with dire consequences for all nations. As a result, a central challenge of climate policy is how to effectively tackle climate change while allowing for accelerated economic development in LMICs, which brings issues of equity and justice to the centre of international politics and diplomacy.[3]

Despite the appeal of concepts like green growth and low-carbon development, the challenge of decoupling economic growth from greenhouse gas (GHG) emissions is daunting. According to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), only a few countries have achieved a sustained decoupling of their economies. Other researchers doubt that such decoupling exists at all.[4]

Under the banner of 'degrowth' scholarship, a growing number of academics argue that economic growth can never be consistent with the emissions reductions required to meet the goal of limiting climate change to 1.5°C, as stated in the Paris Agreement.[5] But even degrowth scholars make

exceptions for development and GHG emissions growth in the 'Global South'. Particularly for lower-income countries, economic growth is considered necessary to enable countries to adapt and build resilience to the increasing negative impacts of climate change. While climate vulnerability is a complex concept, it retains a strong correlation with economic development. Some of the most climate vulnerable countries in the world, such as the Central African Republic, the Democratic Republic of the Congo, Chad, Nigeria, and South Sudan, are also some of the poorest countries in the world.

Given the current global emissions trajectory, the reality is that limits to adaptation will almost certainly be breached and urgent action on climate change is required from all countries to limit the potential.[6] It is also evident that climate change is already making growth in LMICs, and any associated poverty reduction, more challenging. It is reducing labour supply, affecting labour productivity, compromising crop yields, increasing food insecurity, and harming health, particularly of the poorest and most vulnerable.[7]

In the next section we set out the climate policy landscape in LMICs. Section III then presents a framework for improving climate policy in LMICs, which addresses what might be considered the core fundamentals, such as political will and leadership, and national institutions and capacities. There follows a section on national plans and strategies, which brings us to some of the practical actions individual LMICs can take to tackle climate change. It would be remiss of us not to also address the global context, and in particular why the principles of global climate and economic justice matter if LMICs, and the world more broadly, are to be able to tackle climate change. Indeed, in the context of globalisation and international cooperation for climate action and sustainable development, it is clear that action will be required at national, continental, and global scales.

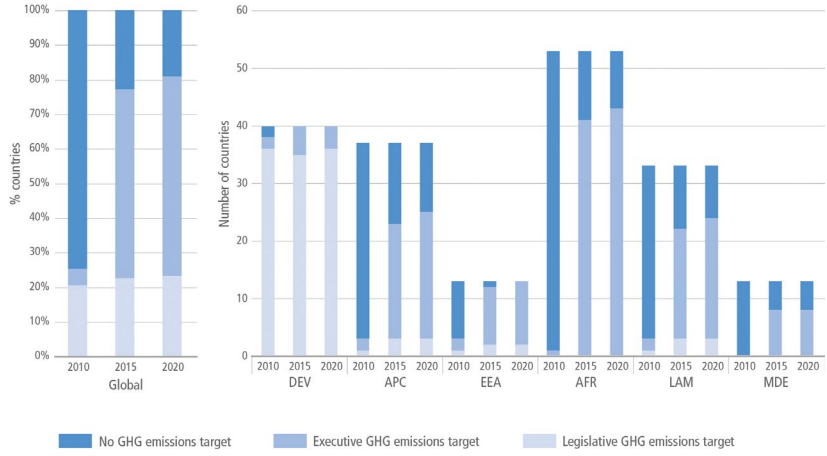
II. Climate policy landscape in LMICs

There are currently few if any precedents on how to do low-carbon development at scale. However, across the many LMICs there are certain climate institutions and policies that offer examples of good practice for policymakers. There is certainly no lack of climate policy initiatives. Indeed, the IPCC Report shows that climate laws and targets grew exponentially in lower-income countries between 2010 and 2020 (Figure 15.1).

In recognition of their economic circumstances, the climate policy approach of most LMICs has tended to focus on adaptation and mitigation, while attempting to achieve development. Nevertheless, the characteristics and emphases differ significantly depending on local and national priorities.

In low-income countries, issues of social justice and poverty reduction are key thrusts of climate policy, while for higher and middle-income countries the key pillars are low-carbon innovation and emissions reduction.[8] The focus on poverty reduction resonates with the Washington Consensus, which supported reorienting public expenditure towards pro-poor priorities.[9]

Figure 15.1: Number of countries with national climate emission targets in 2010, 2015 and 2020



Source: Figure 13.2 (b) in IPCC (2022)[10] reproduced with permission.
DEV = Developed countries; APC = Asia and developing Pacific; EEA = Eastern Europe and West-Central Asia; AFR = Africa; LAM = Latin America and the Caribbean; MDE = Middle East.

Indeed, given that the poorest countries tend to be the most affected by climate change and the least able to adapt, tackling climate change in LMICs will require increased attention to pro-poor policies. The OECD has suggested that the best way for LMICs to adapt to climate change is to integrate adaptation responses into development planning, and to explicitly link this planning with finance.[11] But what this means in practice is not always clear. Suggestions include that development and adaptation funds should be coordinated, which requires institutions and mechanisms to enable such coordination. One way some countries have sought to address this is through 'national funding entities', which now exist in more than a dozen countries.[12] Other suggestions include that, where there are either synergies or trade-offs between development and climate change, these need to be addressed and understood explicitly; and that adaptation will be more successful if people are empowered and participate in determining national plans.[13]

But there is great variation among LMICs when it comes to climate policy. One recent study described some of the highest emitters among LMICs, such as Brazil, Indonesia, Mexico, Vietnam, India, and China, as 'climate developmentalists', whose approach to climate policy comprises 'a mixed set of attempts at incorporating climate mitigation measures into broader schemes for state-led development whether through regulation or industrial policy for emerging clean technologies'.[14] These countries are further characterised as having medium-to-high state capacity and institutionalisation of scientific expertise. The same study also coined the term 'carbon centralist' for countries

like Iran, Turkey, and Saudi Arabia, whose approach to climate policy is claimed to be more tokenistic, with greater emphasis on energy security and only marginal greening of their growth.

It may be that the expansion of climate policy in LMICs is motivated less by a desire to mitigate climate change and more by the pursuit of co-benefits – that is, the indirect influence of climate policy on a non-climate objective, such as diminished air pollution or energy security.[15] In the case of India, for example, researchers have emphasised the importance of energy security and social justice for climate development.[16] And in Vietnam, economic restructuring, energy security, and access to finance and technology have been cited as motivations.[17] In many cases, LMICs might establish national climate policy frameworks to signal credibility and attract climate finance.[18] There may also be subtle coercion and diplomatic pressure from international development partners.[19]

But while it is encouraging to see LMICs actively announcing and implementing climate action, there remains ample opportunity for further acceleration in the robust implementation of their climate initiatives, highlighting the potential for even greater positive impact on a global scale. There is a need, therefore, to understand the drivers and barriers of climate policy – and to understand what works.

III. Framework for design, implementation and improvements in climate policy in LMICs

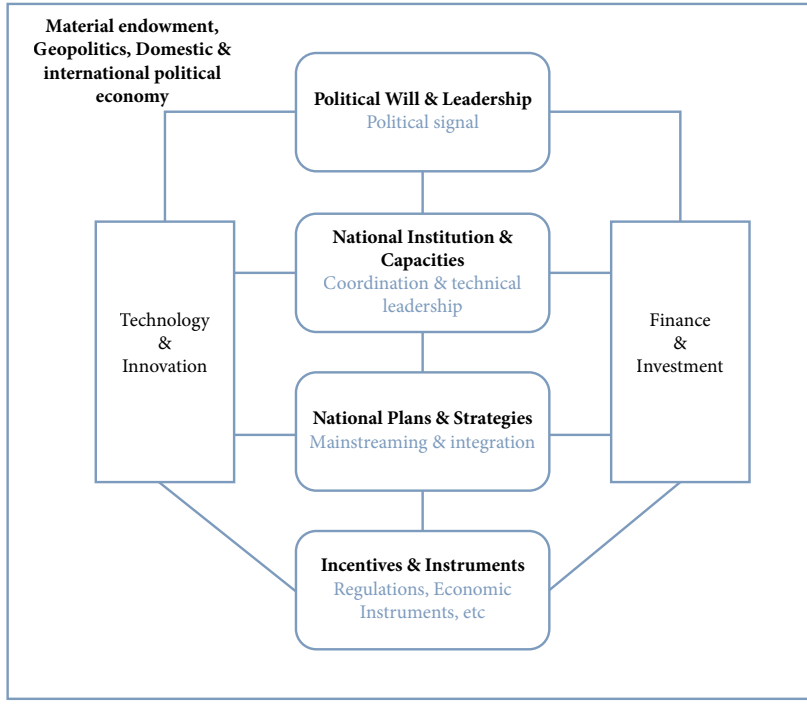
The literature offers a variety of different frameworks for studying efforts by higher and lower-income countries to design and implement climate policy.[20] They focus variously on institutions and governance, structural factors, such as economic wealth and natural resources, or sociocultural dimensions including lifestyle, behaviour, and norms.

Based on a literature review and our own experience working with stakeholders on climate policy development in the Global South, we suggest the framework in Figure 15.2 as a basis for the design, implementation, and improvement of climate policy in LMICs. The rest of the chapter uses the framework to explain some of the most important innovations and challenges in tackling climate change in the Global South.

1. *Material endowment, geopolitics, domestic and international political economy*

Some of the key factors that shape LMIC climate policies are resource endowments and geographical location – and the related political economy dynamics that come with them. As such, it is important to situate climate policy in the context of multiple policy objectives for sustainable development.[21]

Figure 15.2: A framework of the key drivers and barriers of climate action in LMICs



Source: authors.

Fundamental reform of the global economic system

Reform of the World Trade Organisation (WTO) and international trade regimes that disempower poor countries is needed to promote greater equity between the prices of raw materials and primary commodities exported by developing countries and the high-value goods, capital goods, and equipment that they import. Evidence from countries like Mali, Mozambique, Nicaragua, and Ethiopia show the difference that fair trade can make to the incomes and livelihoods of farmers around the world and provide an indication of how fairer terms of trade could help increase economic growth and resilience to climate change in poor countries. (However, these non-governmental organisation-led initiatives are no substitutes for fundamental reforms at the level of WTO rules.)

Reform of intellectual property rights regimes will also be needed to ensure that poor countries benefit from the global innovation that is driving the green transition. Recent IPCC reports have found, for example, that while the prices of many renewable technologies have fallen dramatically in the last five years, in some cases to levels that make them competitive with fossil fuels, access to these technologies remains a major challenge for low-income

countries. Alongside such reform, there is a need for investment to build the research and innovation capabilities in lower-income countries to enable them to develop manufacturing capabilities for the technologies that are driving the green transition.

The need for changes to international political economy dynamics

Some critical political economy and postcolonial scholars argue that low-income countries will struggle to take radical climate action unless there is a fundamental change in both global economic structures and models of international cooperation to emphasise climate justice.[22] Any discussion of how to tackle climate change in LMICs must consider the historical context.

In the past, rich countries tended to focus on giving poor countries aid and loans that enable these countries barely to subsist, rather than removing the structural barriers that hold these countries from achieving self-reliant economic growth.[23] The great majority of LMICs depend on the export of raw materials for their economic growth. In return, they must import high-value goods from advanced countries, the consequence of which includes large trade deficits and weak currencies.[24] Often, the policy recommendation from institutions, such as the World Bank, has been for lower-income countries to export more, to undergo structural adjustment programmes, and to stabilise their exchange rates by issuing more dollar and euro-denominated debt. But these prescriptions have resulted in more external debt and more poverty – the so-called 'poverty trap'.[25] The persistence of this dynamic between richer and poorer countries has denied many LMICs the ability to achieve the food and energy sovereignty that is fundamental to self-reliant economic development, and ever more important for building resilience in the context of climate change.

Another aspect of the global economic system is debt, which sees some indebted LMICs pressured to invest in fossils fuels in order to enable repayment. If oil and gas prices subsequently fall, this can actually increase debt, or even result in stranded assets. New research shows that the world's poorest countries are spending an average of 16.3% of their revenue on debt service – the highest level for 25 years. Previously, the United Nations revealed that 54 of the world's poorest countries are on the brink of default, with several LMICs having debt of up to 42% of their gross national income. This means that poor countries are having to sacrifice investment in infrastructure, energy, and food security in order to pay debt – precisely when such investments are needed to address climate change.

Compounding these issues is a trade system that reinforces unequal levels of consumption by shifting resources from poorer, low-consuming countries to richer, high-consuming countries. Several LMICs are still struggling under unfair resource extraction contracts and terms of trade inherited from colonial relations.[26] Globalisation, while providing some benefits to LMICs, has broadly enabled rich countries to use cheap labour from poor countries

to produce goods, to flood the markets of poor countries with manufactured and processed products, and to make it difficult for low-income countries to develop the manufacturing capabilities they need for self-reliant growth. One example of this is how, in part because of agricultural subsidies in Europe, beef and milk imported from the Netherlands can be cheaper than the equivalent produced in Botswana, Zimbabwe, or The Gambia. In the same vein, it is striking that that the Democratic Republic of the Congo holds large deposits of some of the critical minerals like lithium and cobalt needed to manufacture solar panels and electric cars but has no local facility to produce solar panels and or lithium batteries.

2. *Political will and leadership*

While leadership is important in any form of collective decision-making and implementation, it is particularly needed for the urgent and complex challenge of societal transformation demanded by climate change. This will not only require rallying resources and stakeholders, but also implies managing potential winners and losers from the transition. Strong leadership is needed to build coalitions and address resistance that can be expected from entrenched interests.

Commentators on green growth in Africa have emphasised the role of government leadership.[27] For example, Carlos López, then Executive Secretary of the UN's Economic Commission for Africa, said it is futile to expect green industrialisation to happen spontaneously in Africa without bold measures by governments.[28] Top-level leadership is required to map pathways to green industrialisation if a country is to progress from tweaking at the margins to achieving lasting structural transformation. Such articulation would, without a doubt, require redesigning national growth strategies, formulating and implementing clear, coherent and consistent long-term policies, mobilising resources, and investing in relevant innovation and infrastructure.

Effective vision articulation and framing is a core aspect of leadership. This entails clear identification of the problem to be solved, the identification of plausible alternatives and the means of achieving them, then formulating narratives that will focus the mind. To give one example, political leadership from China's Premier Xi Jinping has been identified as instrumental in China's engagement with climate action.

3. *National institutions and capacities*

National institutions structure the process of climate mitigation policymaking and shape its ambition and performance. They need to have policies in place that are not only national in scope, but also specifically address regional and local climate challenges. At the same time, however, their remit extends beyond national borders, fostering collaboration and cooperation with other countries and international organisations to ensure a coordinated response to climate change.

Many LMICs have what are termed 'weak institutions', which make any efforts to mitigate and adapt to climate change less likely to be effective. Improving these institutions will be central. That requires not just reform of institutions, but improvement on the rule of law, greater ease of doing business, increased transparency, and the elimination of inefficient subsidies. Such reforms might well be needed anyway – but facing climate change, the need is still greater.

The challenges faced by national institutions in climate policy implementation are significant. They include the need to adapt institutional systems to handle new situations and changing climate conditions, the allocation of adequate financial and human resources for policy implementation, the coordination of efforts across government departments and agencies, and the engagement of stakeholders at all levels of society.

4. *National plans and strategies*

Low-carbon energy security, affordable low-carbon transport, food security, nature and biodiversity, investment in adaptation and resilience – all of these are essential for net zero compatible growth in LMICs. To achieve them, countries will need climate finance and debt reduction, and the international community will need to provide cooperation and confront historical structures. Though context specific, climate and development will need to be addressed in an integrated way, with adaptation responses incorporated into development planning. We provide some concrete examples of policy areas before returning to the remaining categories in the framework.

Energy security through efficient low-carbon development

Energy, as a driver of growth, is central to economic development in LMICs. It is also inseparable from discussions of climate change. Although energy was not a focal area for the Washington Consensus, a critical question for the 21st century is how countries can generate the energy to power economic growth while transitioning away from fossil fuels. In LMICs, policies will need to focus on efficient low-carbon development: reducing the use of fossil fuels, rapidly expanding renewable energy, and improving energy efficiency.

Enabling the green transition is the falling cost of renewable energy. But LMICs face many challenges if they are to take part in the renewable energy 'revolution'. These include access to finance, vested interests, and valid concerns over the tax base. Perhaps unsurprisingly just 1.4% of the electricity in low human development index (HDI) countries is produced from renewables, compared with 9.5% in very high HDI countries.[29] As a consequence, many oil-producing and oil-importing countries continue to follow – and even subsidise – fossil-fuel economic development pathways, despite the fact they may be suboptimal over the longer run and have immediate negative health impacts on top of the global implications for climate change.

Given that many African countries in particular have an urgent need for energy for economic development and poverty reduction, and a high dependence on biomass, there is a compelling, if controversial, argument for some African countries to exploit natural gas reserves in the short-to-medium term. Yet the evidence on the benefits of fossil-fuel growth is mixed. Experiences from countries such as Nigeria, Libya, Ghana, and Mozambique make clear that exploiting fossil fuels does not necessarily translate into greater economic growth.[30] Meanwhile, there is evidence showing that fossil fuel exploitation can both slow economic growth and increase environmental degradation in many countries. Rent seeking, Dutch disease,[31] and increasing potential for corruption are frequently given as explanations. One study found that, 'across LMICs real income per capita falls as proved oil and natural gas reserves increase. For all developing countries that have experienced an increase in reserves over 1980 levels … real GDP per capita is lower'.[32]

This question is perhaps particularly pertinent for new oil producer countries, such as Senegal and Guyana, the latter having discovered recoverable crude oil reserves in excess of 8 billion barrels since 2015. It is an open question as to whether oil discoveries will 'transform Guyana from a small irrelevant economy to one of the most dynamic in South America', especially given that Guyana lacks strong governance.[33] Cautionary tales come from neighbouring Venezuela, and more distant Angola and Nigeria. More promising tales – for economic growth if not the climate – come from the US, Canada, and Norway.

Recently, a number of countries have called for a Fossil Fuel Non-Proliferation Treaty. There have even been calls for a global fund to support LMICs that commit to keep fossil fuels in the ground.[34] Such discussions around supply-side climate policy will be central to an orderly and just transition away from fossil fuels.[35] LMICs interested in restricting fossil fuel supply can look to the governments of Belize and Costa Rica, which have put in place partial or total bans or moratoria on the exploration and extraction of oil and gas. Research suggests such efforts are more likely to be successful when the rationale combines the protection of biodiversity and ecosystem services, rather than simply climate conservation; when the local benefits are clearly articulated, and not simply the global ones; and, somewhat surprisingly, when external compensation is not sought.[36] This latter observation has troubling implications for a just transition, particularly for lower-income countries.

Beyond the matter of energy production, energy efficiency in LMICs also tends to be lower than in high-income countries. Improving this has the potential to reduce energy bills for consumers and commercial enterprises – but could also lead to demand rebound, again emphasising the importance of investing in low-carbon energy sources in parallel. Areas where the scope for energy expenditure savings has been demonstrated include transitioning from kerosene to solar lighting, which in one study in Kenya saw savings of 42%, and switching to more efficient cookstoves, which saw savings of 40%.[37]

However, there are many barriers to efficient energy investment that need to be overcome. Detailed roadmaps can be used to help target where and how energy use can be made more efficient for a specific country. Relevant policies include removing energy subsidies; metering consumption; improving reliability of energy supplies; and increasing access to credit. Where electricity consumption is reliable, with regular and enforced billing, energy efficiency revolving funds have been shown to aid countries' efforts to increase energy efficiency, though there is to date insufficient assessment of their effectiveness.[38]

Decarbonising transportation

Globally, the transport sector contributes around a quarter of CO2 emissions.[39] Decarbonising public transport could therefore contribute to global mitigation efforts, and has national level health co-benefits through improved air quality. What's more, the policies and technologies needed already exist.

Because reliable access to low-carbon electricity is a prerequisite to decarbonise public transport,[40] an intermediate strategy is to invest in mass transit systems that reduce emissions by encouraging people out of their cars. Improving fuel efficiency and electrification of public transportation can then reduce emissions further. Bus rapid transport (BRT) systems have the advantage of being relatively quick to implement compared with light rail transit and can be decarbonised over time through the introduction of electric buses, as is being planned in Mexico City, for example. Places that have successfully introduced BRT include Bogota, Colombia, where, even if the primary rationale for introducing a BRT system was to ensure lower-income urban households had cost-effective transport, once the BRT was implemented air pollutants were found to have fallen by 40%. Brazil, Chile, and India are in the process of electrifying their bus fleets, facilitated by innovative finance and improved procurement practices.[41]

A number of complementary policies can speed up the transition to a decarbonised transport sector. These include tax reforms to support the purchase of low-carbon vehicles, waiving of import fees, congestion pricing for internal combustion engine vehicles, and emissions standards, in addition to public awareness campaigns.[42] That said, lower-income countries may face both financial constraints and infrastructure limitations.

Sustainable agriculture

Agriculture accounts for around a third of all GHG emissions, and is central to the livelihoods of the rural poor in many LMICs. Any efforts to tackle climate change must therefore address the agricultural sector. Climate-smart agriculture, a catch-all phrase, refers to approaches that aim to increase agricultural productivity, reduce vulnerability, increase resilience, and reduce emissions.[43] Approaches variously include agroforestry, cover

cropping, crop rotation, and regenerative agriculture to improve soil health. Better water management will be essential, whether through the adoption of new technologies that monitor soil moisture, or a switch away from water-thirsty crops.

Each lower-income country will need its own adaptation roadmap for its agricultural sector. These will likely need to involve diversification and the development and introduction of climate-resilient crop varieties as a starting point. Thereafter, climate information services and climate-smart technologies and practices have the potential to transform food systems, particularly in African countries, making them more resilient and reducing emissions.[44] In terms of financial policy, there is evidence that weather-indexed crop insurance can help farmers adapt to climate change[45] – however, index insurance schemes tend to be heavily subsidised and do not necessarily endure.[46]

Meanwhile, as the climate changes, safety nets will become increasingly important, whether cash or in kind, to buttress food security.[47] Ethiopia's extensive experience with safety nets has demonstrated that efforts to protect food security and livelihoods can also reduce GHG emissions, and as such can be an important element of a country's nationally determined contributions (NDCs).[48]

Sustainable and resilient nature and biodiversity

LMICs can increase resilience to climate change through nature and biodiversity. Part of this will be achieved through the agriculture sector, as already discussed. Many LMICs also have considerable forests and conservation areas, which help protect critical habitats, biodiversity, and threatened species and ecosystems. However, the reality for many lower-income countries is that demands for improved food security may be at least partially at odds with protecting the natural resource base. Any trade-offs in this regard can be minimised in part through a better understanding of the spatial distribution of biodiversity and broader ecosystem services, combined with well-defined and enforced land-use planning.[49]

Ecosystem-based adaptation is defined by the Convention on Biological Diversity as 'the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change'.[50] Guidelines include the need to involve relevant stakeholders, to ensure a local context while linking to national frameworks, and to safeguard local communities against risks and costs.

5. *Incentives and instruments*

There is evidence that creating an environment for investors that is sufficiently stable, low risk, and profitable can produce results for climate action. Take Uruguay's success in decarbonising its electricity generation, which points to the

importance of 'clear decision making, a supportive regulatory environment and a strong partnership between the public and private sector', with an emphasis on ensuring investors have a secure environment.[51] Uruguay's Ministry of Finance played a central role, providing fiscal incentives, based on a 1998 law, that included 'value added tax exemption for specific renewable energy equipment; income tax reduction for renewable energy generation, energy efficiency initiatives and equipment, and net metering generation; and import duty exemptions for wind equipment and a reduction in duty for solar equipment'.[52]

Where such stability has not been achieved, multilateral development banks (MDBs) have an important role to play in de-risking climate-linked projects. The idea that MDBs, instead of financing projects outright, can use their capital to de-risk projects is not new. Such an approach can avoid the possibility of MDBs crowding out private investment, and indeed can conversely crowd in that investment.[53]

It is now frequently observed that renewable energy sources are lower cost than fossil fuels – and yet LMICs continue to invest in fossil fuels. One reason for this is that, in LMICs, the upfront investment costs and the cost of capital are high. De-risking these investments – shifting risk away from the private sector investor – has the potential to enable LMICs to follow low-carbon growth pathways.[54] In Chile, for example, the Green Climate Fund provided the Espejo de Tarapaca low-carbon power project with $60 million of direct 'anchor' equity to cover the last stage of development expenses and crowd in private investment.[55] For some countries, this de-risking can been seen as a substitute for a more stable domestic policy environment.

Carbon pricing is an important policy tool for tackling climate change, designed to address a clear market failure. With respect to energy, carbon pricing can play a role in both encouraging investment in renewable energy and in increasing energy efficiency. It also provides a source of revenue for governments and can ensure that businesses aligned with net zero are not at a disadvantage. Carbon pricing can be implemented through a carbon tax or an emissions trading scheme. Such schemes may be harder for LMICs to introduce as they are complex to design and implement.[56] But even carbon taxes, favoured by economists as an efficient solution to the climate crisis, may prove tricky to implement, due to potential impacts on vulnerable populations, regulatory capacity and political feasibility.

Some LMIC countries that have successfully introduced carbon pricing have hypothecated revenues to be reinvested in clean energy and emissions reduction more broadly. South Africa was the first African country to introduce a carbon tax, in June 2019, which covers around 90% of the country's GHG emissions not related to agriculture, forest, land use, or waste. To make the tax more politically acceptable, the country phased it in gradually and included an array of tax-free allowances and exceptions for low-income households.[57] This transition phase appears to have helped with the feasibility of a more stringent cap or price. In Chile, the political economy was seen as central; a pragmatic low tax rate was chosen, in part as a signalling device;

and health co-benefits were linked to the tax to boost acceptance.[58] Mexico implemented a carbon tax in 2014, followed by an emissions trading scheme in 2017, but these efforts have been described as being somewhat ineffective, due to the low tax rate and emissions caps being based on reported historical emissions.[59]

6. *Technology and innovation*

Technology and innovation are at the heart of efforts to address climate change in both higher and lower-income countries. Indeed, many of the national plans and strategies addressed in the previous section require new or improved technologies. For example, investments in renewable energy will require solar photovoltaic panels and wind turbines. More efficient energy solutions may require LED lighting or retrofitting. Climate-resilient agriculture will require new crop varieties, remote sensing, and data analytics to optimise the use of scarce resources.

Access to technology and the quality of technology innovation systems are some of the major differences between lower and higher-income countries. Lower-income countries will need to build local expertise and knowledge while formulating international collaborations. Evidence from Kenya has shown the impact of focused policy in driving local innovation. Innovations, such as solar-powered milk storage systems mounted on motorbikes, solar-powered portable kiosks that combine an integrated battery-charging station with a software platform, and pay-as-you-go cooking services, have revolutionised commerce in Kenya and helped the country in its quest for universal energy access by 2038. However, the vast majority of LMICs still lack access to technologies that are crucial to achieve decarbonisation at scale.

7. *Finance and investment*

Finance is central to tackling climate change in LMICs. Indeed, the question of how LMICs can access the finance they need has long been central to international discussion on climate governance and justice, although how this might best be done remains contentious and under-researched.

The idea of a just transition, following the principle of 'common but differentiated responsibility and respective capabilities', has been part of the climate narrative since at least as far back as the Kyoto Protocol and the Paris Agreement.[60] And it is clear that a just transition cannot occur without the provision of climate finance – but novel financing mechanisms are needed.

Recent research highlights the potential role of ministries of finance in driving climate action in both higher and lower-income countries. For example, Rwanda's Ministry of Finance and Economy attracted almost US$1.5 billion in climate finance, guided by its NDC, which addresses mitigation, adaptation, and resilience together.

Debt financing has long been a central element of 'development', and indeed reducing the debt burden through relief was an important element of the Washington Consensus. The poorest countries – those that are eligible to borrow from the World Bank's International Development Association (IDA) – are currently spending on average over 10% of their export revenues on servicing long-term public and publicly-guaranteed external debt.[61] Perhaps unsurprisingly, cutting the debt burden of LMICs has been shown to have the potential to boost growth and reduce poverty.[62] Moreover, debt and debt repayments, including those of the poorest IDA-eligible countries, are emerging as an important area where the imperatives for economic growth and climate justice overlap. High levels of debt and debt servicing reflect how past borrowing is exacerbating inequalities and making it harder if not impossible for LMICs to tackle climate change, whether that be tackling the negative impacts of climate change that are already harming these countries, adapting to ongoing climate change, or following a low-carbon growth pathway. Therefore, novel approaches to tackling debt are needed – and there is already evidence of how these might work.

Debt-for-nature swaps have long been advocated as a form of climate finance in lower-income countries, with the potential to increase investments in sustainable development.[63] In 2021, Belize completed a US$364 million debt-for-nature swap that lowered its debt by 12% of GDP; in exchange, it committed to protect 30% of its ocean and created $180 million of sustainable financing for marine conservation. These types of swaps are likely to be most effective for climate-vulnerable LMICs that are fiscally constrained due to high debt burdens.[64]

In 2015, the Nature Conservancy purchased roughly US$22 million of the debt of Seychelles, and in exchange Seychelles used money that would have been earmarked to pay off debt to invest in the 'blue economy', primarily in fishing and tourism. This investment has the potential to increase blue carbon sequestration and grow important economic sectors. Funding was used in part to create new marine protected areas, which protect corals and help fish stocks recover. Investment in mangrove protection can also enhance breeding grounds for marine animals, protect coastlines from storms, and capture blue carbon.

Such arrangements require a degree of conditionality, which some argue goes against sovereignty. Nonetheless, experiences with, for example, debt cancellation, suggest that conditionality can nudge countries to more effective outcomes – though the extent to which conditionality leads to better outcomes has been contested.[65]

IV. Conclusion

A number of lessons stand out for 'what works' with respect to tackling climate change in LMICs. Many are not new. For example, investment from the private sector is more forthcoming if risk and uncertainty are lowered;

meanwhile the extreme levels of debt that many LMICs find themselves in today, requiring high levels of serving, make it virtually impossible for these countries to invest in any type of development, low-carbon resilient or otherwise.

That said, there are specific domestic policy areas where actions that were not considered in the original Washington Consensus are clearly needed. And in these cases, there is not always sufficiently granular detail on 'what works'. They include the energy sector, where all countries need to transition to low-carbon energy sources and improve efficiency; agri-food systems, which need to be more resilient to the changing climate, while also taking into account their own emissions; and the broader natural environment, which can increase a country's resilience to climate change, generate revenues, and contribute to mitigation. Furthermore, for many countries, implementing climate policies may be more feasible where the rationale for a policy is focused on something other than climate, such as biodiversity; or where there are clear co-benefits, such as the health benefits of reduced air pollution, that accrue to the individual country.

However, it is increasingly clear that a new narrative is emerging, driven primarily by scholars, policymakers, and practitioners based in or from lower-income countries, which emphasises justice, equity, radical reforms and institution building, and LMIC empowerment – and as such reflects a shift in the centre of gravity of power and decision-making. Many of the lowest income countries are struggling with decades of debt and structural adjustment programmes, imposed on them by powerful countries, which have weakened their economies and made them more dependent on foreign assistance and aid. Therefore, international political economic dynamics, and in particular the reform of international structures of trade and models of cooperation, may be even more important than national reforms if one wishes to see climate-resilient development in LMICs. Reframing the discussion of how LMICs can best tackle climate change within this new narrative brings into focus a new perspective on 'what works', and underlines where the driving force behind solutions needs to lie.

Notes

[1] Global Carbon Budget (2023) – with major processing by Our World in Data.

[2] Ritchie (2023).

[3] Roberts and Parks (2006); Okereke (2019).

[4] Parrique et al. (2019).

[5] Kallis et al. (2018); Buch-Hansen and Carstensen (2021); Dunlap and Laratte (2022).

[6] Dow et al. (2013); Mechler et al. (2020).

[7] Antonelli et al. (2021); Dasgupta et al. (2021).

[8] Urban and Nordensvärd (2013).

[9] Archibong et al. (2021).

[10] IPCC (2022).

[11] Abeygunawardena et al. (2004).

[12] Smith et al. (2011).

[13] Halsnæs and Verhagen (2007).

[14] Guy et al. (2023).

[15] Karlsson et al. (2020).

[16] Dubash (2013).

[17] Zimmer et al. (2015).

[18] Fisher et al. (2017).

[19] Okereke et al. (2019).

[20] Grubb et al. (2022).

[21] Dubash et al. (2022).

[22] Krause (2018); Harris (2009); Warlenius (2018); Roberts and Parks (2009); Okereke (2010); Eckersley (2016).

[23] Moyo (2009).

[24] Rogoff and Reinhart (2003); Atta-Mensah and Ibrahim (2020).

[25] Sachs et al. (2004).

[26] Johnson et al. (2021).

[27] Okereke and Agupusi (2015); Okereke et al. (2019).

[28] United Nations Economic Commission for Africa (2016).

[29] Romanello et al. (2022).

[30] Henri (2019); Dwumfour and Ntow-Gyamfi (2018).

[31] Dutch disease, referencing the natural resource boom experienced by the Netherlands in the 1950s and 1960s that led to the decline of the country's manufacturing sector, occurs when one sector, often the extraction of natural resources, 'booms', resulting in an increase in demand for complementary resources such as labour, additional spending, and strengthening of the country's currency, to the detriment of other exporting sectors.

[32] Barbier (2007).

[33] Panelli (2019).

[34] Larrea and Murmis (2018).

[35] van Asselt (2021).

[36] Tudela (2020).

[37] Fowlie and Meeks (2021).

[38] Fowlie and Meeks (2021).

[39] Romanello et al. (2022).

[40] Environment for Development (2023).

[41] Briceno-Garmendia et al. (2022).

[42] Environment for Development (2023).

[43] Chandra et al. (2018).

[44] Zougmoré et al. (2021).

[45] Mullins et al. (2018).

[46] Loboguerrero Rodriguez et al. (2018).

[47] Dasgupta and Robinson (2022).

[48] Loboguerrero Rodriguez et al. (2018).

[49] Griffiths et al. (2022).

[50] Midgley et al. (2012).

[51] Stern (2015).

[52] Coalition of Finance Ministers for Climate Action (2022).

[53] Uzsoki (2017).

[54] Steckel and Jakob (2018).

[55] Choi et al. (2022).

[56] Black et al. (2022).

[57] Qu et al. (2023).

[58] Pizarro (2019).

[59] Climate Action Tracker (2022).

[60] Chowdhury and Jomo (2022).

[61] World Bank (2022).

[62] Dijkstra and Hermes (2001).

[63] Thomas and Theokritoff (2021).

[64] Kyriakopoulou (2023).

[65] Kanbur (2000).

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