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TRADE AND DEVELOPMENT REPORT 2021

FROM RECOVERY TO RESILIENCE: THE DEVELOPMENT DIMENSION

40th ANNIVERSARY EDITION

UNITED NATIONS

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Report by the secretariat of the
United Nations Conference on Trade and Development

UNITED NATIONS
Geneva, 2021

United Nations Publications,
405 East 42nd Street,
New York, New York 10017,
United States of America

Email: *publications@un.org*
Website: https://shop.un.org/

This publication has been edited externally.

United Nations publication issued by the United Nations Conference on Trade and Development.

UNCTAD/TDR/2021
Sales No. E.22.II.D.1
ISBN: 978-92-1-113027-0 eISBN: 978-92-1-001027-6 ISSN: 0255-4607 eISSN: 2225-3262

IT'S THE END OF THE WORLD AS WE KNOW IT: SURVEYING THE ADAPTATION LANDSCAPE

III

A. Introduction

July 2021 was the hottest month ever recorded on the planet, following on from the hottest year in 2020 which, itself, came after the hottest decade on record. Intense heatwaves, increasingly powerful tropical cyclones, prolonged droughts, rising sea levels, spreading diseases are just some of the threats accompanying the unrelenting rise in global temperatures, bringing with them ever greater economic damage and human suffering. And worse is to come. Even if we get our mitigation efforts together within this decade and manage to keep the global average temperature rise to 1.5°C above pre-industrial levels by the year 2100, the extreme climate events in 2021 serve as a foretaste of what an additional 0.4°C to the average global temperature has in store for communities and countries across the planet.

On current trends, global heating will trigger tipping points in the Earth's natural systems, leading to irreversible changes that will reshape life in this century (IPCC, 2021). Even assuming economic collapse can be avoided, the loss of output over coming decades will be significant everywhere, but particularly in the developing world (SwissRe, 2021); hundreds of millions of people will be forced to move within and across borders (Rigaud et al., 2018) with large parts of the tropical world outside the limits of human adaptation (Zhang et al., 2021); food production will change dramatically (Kuma et al., 2021); access to ever scarcer sources of fresh water will trigger increasing geo-political tensions (WEF, 2019). In short, barring intense action to curb greenhouse gas (GHG) emissions, parts of the planet will simply become uninhabitable for future generations (Wallace-Wells, 2018).

To date, the global policy response to the climate crisis has been divided between mitigation and adaptation measures. *Climate mitigation* focuses on slowing down and reducing emissions of greenhouse gases (GHG), through a mixture of more efficient energy use and the replacement of fossil fuels with renewable sources of energy. *Climate adaptation* centers on harnessing resilience and protection mechanisms to minimize the negative impact of climate change on lives and livelihoods (Ge et al., 2009). While, in practice, the two sets of measures are often difficult to separate, in much of the agenda-setting discussion on climate, adaption has remained a poor cousin of mitigation efforts. This is proving short-sighted and increasingly costly, particularly for developing countries.

The consequences of continued neglect have become more apparent in the aftermath of the health pandemic as talk has turned to building resilience in the face of a global shock. Up until now, climate adaptation policies have been driven by a mixture of the procedural politics surrounding climate conferences, a technocratic approach to policy design and an undue faith in the efficiency of markets to price the way to a sustainable future. The aim has been to meet internationally agreed targets through a better assessment of climate-related risks and their improved management using insurance and other market-based mechanisms. While this approach has yielded some positive results, it has offered too little, too late and no longer stands up to the scale of environmental shocks and the economic damage they are causing.

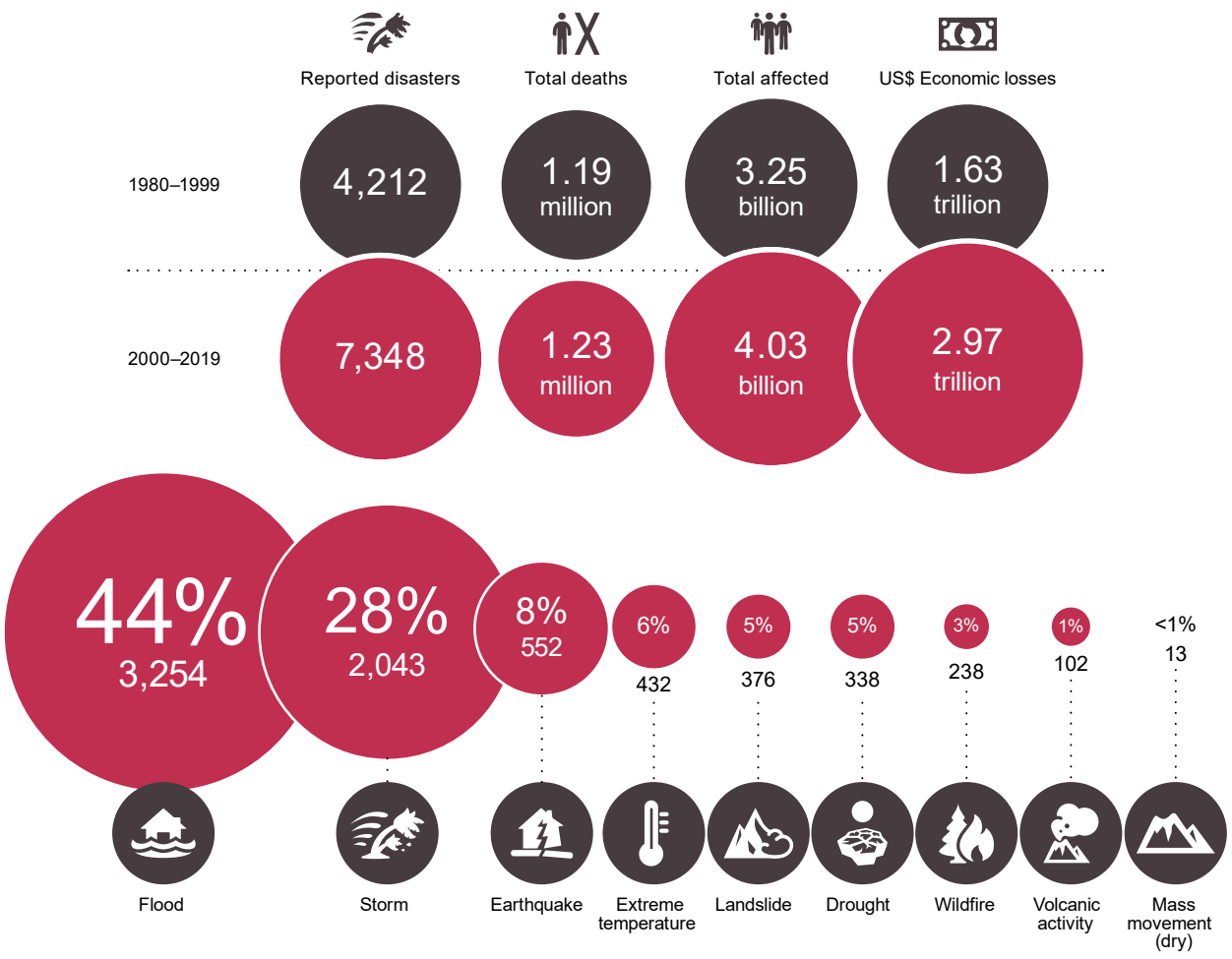
The chapter is structured as follows. Section B takes account of the measure of the challenge, focusing on the damage to regions and countries around the world and the scale of investment required to meet it. Section C discusses some of the limits of the existing institutional architecture to manage the adaptation challenge. Section D considers how framing the adaptation challenge as one of risk management distracts from the need to position adaptation measures in the context of economic transformation.

B. Measuring up to the adaptation challenge[1]

The economic impact of climate change comes both through a steady deterioration in the environmental conditions required for everyday life, such as access to water, air quality, and tolerable working temperatures, as well as through shocks that are more temporary in nature, such as wildfires, storms and floods, albeit often with more immediate and devastating consequences. The latter are, arguably, easier to gauge and have certainly garnered more attention. According to the United Nations Office for Disaster Risk Reduction Human Costs of Disaster Report, between 2000 and 2019, 7,348 major recorded disaster events claimed 1.23 million lives, affected 4.2 billion people (many on more than one occasion) with global economic losses totaling US$2.97 trillion (CRED and UNDRR, 2020). The numbers are clearly on a rising trend (Figure 3.1).

These disasters cannot be solely attributed to a changing climate. Still, there is no doubting a strong

FIGURE 3.1 Disaster impacts 2000–2019 relative to 1980–1999



Source: CRED and UNDRR 2020.

connection to their increasingly devastating impact (IPCC, 2021).

Emergency Events Database (EM-DAT) data show that storms cost more than any other disaster type in terms of recorded economic damage ($1.39 trillion), followed by floods ($651 billion). In 2020 alone, more than 50 million people were impacted by flooding, droughts and storms (UNEP, 2020). About three-quarter of climate-induced disasters were attributable to floods and storms while heatwaves are becoming more intense and widespread, inducing costs to large swathes of populations in developed and developing countries. Major monsoon floods and tropical cyclones affected more than 2.2 million people in China and 9.6 million in South Asia, including Nepal, India and Bangladesh that cost more than $20 billion in damage across these areas. At the regional level, economic losses in the Americas accounted for 45 per cent of the total losses, followed by Asia (43 per cent) between 2000 and 2019. In the Americas, the U.S. accounts for 78 per cent of total losses with $1.03 trillion in economic losses over the same period, reflecting higher income and replacement costs than in other countries. In Asia, China and Japan account for 38 per cent and 35 per cent of the region's total losses respectively in this timeframe (CRED and UNDRR, 2020).

The damage also follows a clear economic divide. High-income countries tend to have lower numbers of people adversely affected and killed by disaster events, but incur much larger financial losses in absolute terms. Low-income countries report low, but increasing, financial losses per capita and relatively high death tolls per disaster event. Lower-middle and upper-middle income countries make up most disaster events, deaths, and total numbers of people affected; however, they also account for most of the world's population, with Asia standing out as having incurred the largest number of disasters. However, despite making up most of the world's financial losses, high-income countries have the smallest losses as a percentage of GDP. In comparison, least developed countries and Small Island Developing States (SIDS) had the highest losses compared to GDP; the proportion of economic losses is three times higher in low-income compared to high-income countries (CRED and UNDRR, 2020).

Estimates by economists of the rolling damage from climate change have been made with the addition of damage functions to standard growth models. These have produced surprisingly benign results in terms of the loss to global output, even with significant temperature rises, albeit with a steadily worsening assessment as these models have become more complex, integrated and refined (Nordhaus, 2018). Indeed, in his Nobel lecture, William Nordhaus, who has done much to advance "integrated assessment models", concludes, that "economic growth is producing unintended but dangerous changes in the climate and earth systems… (with) unforeseeable consequences".

While using such models to estimate the potential damage is, consequently, a difficult business, their aura of quantitative rigour, precision and reliance on a variety of strong assumptions to allow the modeling to proceed, raises questions about their relevance to the climate challenge (Ackerman, 2018). Even in their more sophisticated versions, these models have been criticized for ignoring tipping points (Keen et al., 2021) and feedback loops (Kikstra, et al., 2021) which leads them to underestimate the scale and persistence of the potential damage from climate change. Moreover, they have little to say about structural inequality or historical patterns of development, particularly the evolving asymmetries in the global economy that shape growth prospects in many developing countries.

There is a further tendency to underestimate the potential threat by distinguishing between manageable and unmanageable system responses and focusing almost exclusively on low-income countries, particularly in tropical regions and coastal states, because of the greater dependence of economic activities on natural ecosystems, which are seen as more difficult to manage than activities and sectors in higher income countries. This dichotomy runs the danger of downplaying, or ignoring altogether, how policy decisions, at all levels of development, can have a profound effect in exacerbating climate threats, including in rural economies with a heavier reliance on the natural ecosystem. As discussed in the previous chapter, the widespread adoption of structural adjustment programmes has resulted in the erosion of public services and investment and tied many developing economies to an even greater dependence on commodity exports, making them even more vulnerable to external shocks. Moreover, this dichotomy, while recognizing the climate-related stresses that some developing countries are already facing, runs the further danger of underestimating the wider damage facing many middle and higher-income developing countries, and indeed, advanced economies, as temperatures rise towards (and above) 1.5°C.

A full picture of the costs and damages of climate change is further complicated by significant under-reporting of data about the economic losses in many developing countries. For instance, one source of discrepancy in the data available concerns heatwaves. According to the Emergency Events Database (EM-DAT), only two heatwaves were recorded in Sub-Saharan Africa between 1900 and 2019 that lead to 71 fatalities (Harrington and Otto, 2020). By contrast, the same database has registered 83 heatwaves in Europe between 1980 and 2019 that resulted in over 140 000 deaths and in more than $12 billion in economic damages. This shows major gaps in data collection, appropriate infrastructure and resources available to national agencies and an overreliance on external parties to collect data in developing regions. What is not in doubt, however, is that the greater the temperature increase the greater the threat of catastrophic events (Figure 3.2).

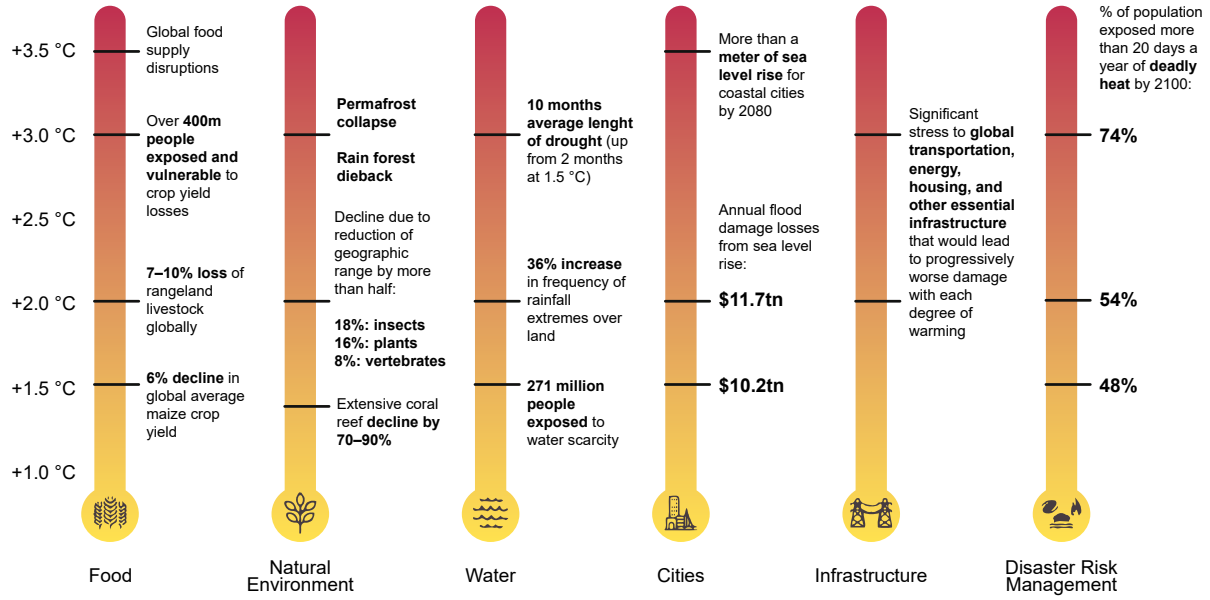
1. Slowing growth, widening gaps

The consequences of rising global temperatures reflect existing structural inequalities within and across countries. The historical responsibility for global greenhouse gas emissions (the principal cause of global warming) lies squarely with the developed nations, which account for around two-thirds of the cumulative total of emissions in the atmosphere compared with just 3 per cent for Africa.[2] And while some developing economies like China, India, Brazil and South Africa have rapidly rising emissions, on a per capita basis they are still behind advanced countries and even the consumption-related emissions of their richest citizens are below their counterparts in advanced economies (Oxfam, 2015).

For many developing countries, rising global temperatures are already compounding a vicious development cycle that has been constraining resource mobilization, weakening adaptive capacities and widening income gaps for decades. Developing countries with underfunded health care systems, underdeveloped infrastructure, undiversified economies and missing state institutions are more exposed not only to potentially large-scale environmental shocks but also a more permanent state of economic stress as a result of climate impacts.

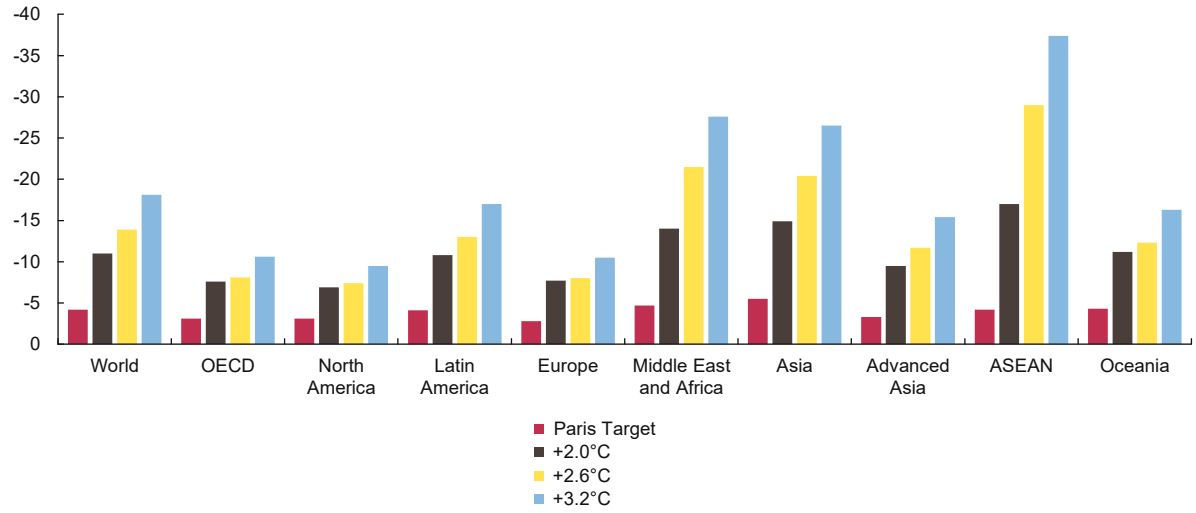
On one estimate, warming temperatures have already, over the period 1961 to 2010, slowed economic growth of (relatively poorer) countries in the middle and lower latitudes, with median losses exceeding 25 per cent over large swaths of the tropics and subtropics where most countries exhibit very high likelihood of negative impacts (Diffenbaugh and Burke, 2019). As Figure 3.3. clearly shows, this situation will only get worse, with rising temperatures hitting growth prospects in developing regions the hardest; and all the more, the higher the increase above the 1.5°C target.

FIGURE 3.2 The Risk of Catastrophic Events Increases with Temperature



Source: World Resources Institute, adapted from the IPCC and others.

FIGURE 3.3 **Mid-century GDP losses by region generated by global warming**
(per cent)



Source: SwissRe, 2021.

On some accounts, poverty is a better gauge of the impact of climate change, given the compounded vulnerabilities of the poorest sections of society to shocks, their lack of assets to fall back on when they are hit and the constraints they face in building up adaptive capacity (Hallegatte, 2018). While levels of extreme poverty have been declining since the start of the new millennium, climate change is projected to aggravate poverty, notably in the particularly vulnerable developing countries, and create further islands of deprivation in countries with rising inequality, at all levels of development (IPCC, 2019). The World Bank estimates that between 68 million and 132 million people will become impoverished by 2030 due to the accelerating impacts of the climate crisis, and that 143 million people could be forced to internally migrate by 2050 (World Bank, 2020; Rigaud et al., 2018).

Because the vulnerability of the poorest sections of society is multidimensional, so are the channels through which climate change will impact them. Climate change is expected to induce shortages in food supplies and increase agricultural prices exposing millions more people to hunger and water deprivation by 2050 (Global Commission on Adaptation 2019). The onset of the pandemic which is estimated to have increased the number of people facing hunger and malnutrition by 129 million is a foretaste of what is to come (WFP, 2021). Sub-Saharan Africa will suffer the most, with lower agricultural yields, driving up food insecurity. Likewise in South Asia, especially areas like Bangladesh and India which are among the most vulnerable countries to natural hazards, as many as 30.6 million will suffer increased poverty levels, compared to East Asia and Pacific (11.8 million people on average), and Latin America and Caribbean (1.9 million people on average) (World Bank, 2020).

The rural poor are particularly sensitive to sea level rises and other extreme weather patterns, especially since the incidence of rural poverty is higher across the board. However, the growing numbers of urban poor in the developing world are also vulnerable given precarious housing conditions and limited access to public services (World Bank, Chapter 1, 2012).

2. *Sectoral and regional impacts*

The impact of climate change, and the nature of the adaptation challenge, will vary across regions and sectors of the economy, making a one-size-fits-all response inappropriate. Extremely hot days are expected to primarily increase in the tropics, where temperature variability across years is lowest. Dangerous heatwaves are thus forecast to occur earliest in these regions, and they are expected to become widespread at 1.5°C global warming rise (IPCC, 2018). As the most food insecure region, Sub-Saharan Africa is likely to face deepening challenges. In South Asia, more intense and frequent tropical cyclones, accelerated heatwaves and a rising sea level will continue to generate adverse impacts on the region. Climate-induced disasters

in Latin America and the Caribbean will reduce developmental progress. Middle East and North African countries face acute water shortages, where as many as 60 per cent of the region's inhabitants already experience a serious lack of water. East Asia and the Pacific, which have a quarter of the world's population, already suffers from the most severe storms, cyclones and inundation globally, and will likely face the highest levels of climate-induced displacements.

Large portions of populations in low-lying coastal zones – 84 per cent in Africa, 80 per cent in Asia, 71 per cent in Latin America and the Caribbean and 93 per cent in the least developed countries (Neuman et al., 2015) can be especially affected. Critical infrastructure assets and networks like ports, airports, railways and coastal roads will also face devastation by rising sea levels which will cause permanent or even repeated damage and will impede access to food, materials, and other income-generating supplies to people and businesses.

SIDS are being particularly affected. For instance, in 2016 Category 4 hurricane Matthew in the Caribbean caused over $1.1 billion in infrastructure damage in Haiti (ECLAC, 2018, p. 27). Similarly, in 2017, almost 90 per cent of building structures on Barbuda were damaged or destroyed by Category 5 Hurricane Irma, which led to a complete evacuation of the island (UNDP, 2018). In the Fiji islands, as many as 30 369 houses, 495 schools, and 88 health clinics and medical facilities were damaged or destroyed and approximately 540 400 people, or approximately 62 per cent of the population, were significantly impacted by the cyclone (Government of Fiji, 2016). Heavy precipitation and consistent rainfall can cause considerable damage to the structural integrity and affect operations of coastal transport infrastructure such as roads, energy, communications, water and sanitation.

For SIDS especially, their middle-income status does not take into account the high risk and economic damage from extreme weather episodes. Caribbean SIDS are among the most indebted in the world, and the level of public debt to GDP is particularly severe in Antigua and Barbuda, Barbados, Grenada, Jamaica and Saint Kitts and Nevis (ECLAC, 2020). This acute level of debt means that they increasingly rely on external financing to meet domestic adaptation needs. SIDS are marginalised through their lop-sided incorporation in the international economic system, failed structural adjustment programs and intensifying financialization. They are, on average, considered 35 per cent more susceptible to economic and financial shocks (UNCTAD, 2021).[3] There has been little movement in this respect from donor countries, lending agencies and the private finance sectors to address the peculiar climate risks that SIDS face, and illustrated, once again, by their lack of coordination on specific debt relief measures in response to Covid-19 shock.

TABLE 3.1 Top ten countries and territories by economic losses as % of GDP
(2000–2019)

Countries and territories	*Economic losses*
Dominica	15.0
Cayman Islands	9.1
Haiti	8.0
Grenada	7.8
Turks and Caicos	5.8
Bahamas	4.3
Guyana	3.6
Puerto Rico	3.5
Belize	3.4
Samoa	2.1

Source: (CRED and UNDRR, 2020).

The International Labour Organisation (ILO) estimates that thermal stress will result in an economic loss of $2.4 trillion and 80 million jobs worldwide by 2030 (Kjellstrom and Maître, 2019). There will, however, be uneven distribution of these adverse outcomes, with South Asia and Africa particularly hard hit (Kjellstrom and Maître, 2019). By 2050, costs of climate change impact to urban areas will have risen to more than US$ 1 trillion. Therefore, the need to increase adaptation actions in cities and to invest in solutions that have benefits is higher than ever before.

There is a further risk of severe ill-health and disrupted livelihoods for large urban populations due to inland flooding in some regions (IPCC, 2014). The IPCC notes that mortality and morbidity are very likely during periods of extreme heat, particularly for marginalised urban populations and those working outdoors in urban or rural areas. Food insecurity and the collapse of food supply chains are linked to warming, drought, flooding, and precipitation variability, particularly for lower-income

and impoverished populations in urban and rural environments. Threats increase for those without adequate essential infrastructure and services or who live in shoddy housing and exposed areas. In urban and rural regions, wage-labor-dependent poor households that are net consumers of food are expected to be particularly affected due to increases in food prices, including in areas with relatively food insecure populations such as Sub-Saharan Africa.

3. The Economic Costs of Adaptation

Adaptation costs are typically higher for high-income countries in absolute dollar value terms, but costs are higher relative to gross domestic product for low-income countries. Traditionally, adaptation needs have been measured by the gap between what might happen as the climate changes and the desirable response to meet related shocks (IPCC, 2014). In their initial NDCs, 46 countries included assessments of their adaptation costs totaling $783 billion by 2030 (Bhattacharya et al., 2020). These costs include project financing, income support, technological support, and capacity-building but despite the formal global goal on adaptation enshrined in the Paris Agreement and elaboration in the Cancun Declaration, no single, straightforward metric (or even set of metrics) exists that could be employed to translate the global goal on adaptation into a measurable target (and baseline) at the global level (UNEP, 2020). This is usually because adaptation actions are often defined at the local level and with relevant stakeholders within a country.

Despite these uncertainties surrounding detailed accounting of the adaptation challenge, there is no doubting the consequences of its neglect. In the run up to the Copenhagen COP in 2009, the UNFCCC estimated that annual worldwide costs of adapting to 2 degrees of warming would be between $49 to $171 billion by 2030, with developing countries facing a $34 to $57 billion bill. A decade later, the delay in responding has been costly. Annual adaptation costs in developing countries are now estimated at $70 billion, reaching $140–$300 billion in 2030 and $280–$500 billion in 2050 (UNEP, 2020). Current funding reaches less than a half of current needs and will not reach the 2030 target without a fundamental change of track. Admittedly, adaptation finance and adaptation costs are difficult to compare and estimate for a number of reasons (Pauw et al., 2020; UNEP, 2020 figure 4.1). Most developing countries make their mitigation and adaptation contributions conditional upon receiving international support (finance, technology transfer and/or capacity building.[4]

In general, Pauw et al. (2020) point out that cost estimates for adaptation among the 60 countries they survey varied in terms of quality, sources, estimation techniques with only some fully provided and several others with partial sector-based costs in their NDCs. However, given the available estimates, the adaptation finance gap is widening in relation to costs. As extreme events become more frequently, the gap will be considerable and overall costs will likely to increase if we consider the possibility of indirect and unpredictable costs. The major quantitative shortfalls, along with gaps in technical know-how and human resources, remains a binding constraint on implementation of climate action plans (UNEP, 2020), particularly for the least developed countries (see Box 3.1), where the ongoing impacts of climate change and poorly devised responses impede longer-term efforts that address key sectoral goals (see table 3.2).

The Global Commission on Adaptation has noted that even countries which have made use of multilateral and domestic public finance in response to COVID-19 pandemic – amounting to upwards of US$10 trillion – have not sufficiently incorporated climate resilience in their recovery programs (Saghir et al., 2020; UNEP, 2020). A recent analysis by the World Resources Institute demonstrated that only 18 of the 66 countries surveyed had explicitly incorporated physical climate risk, adaptation and resilience in their stimulus packages, whether selectively, in specific interventions, or holistically, as a central aspect to their strategy.[5] The 12 countries that specifically cited climate risk management interventions as a primary objective of stimulus spending were Bangladesh, Barbados, Colombia, Fiji, Kenya, Kiribati, Nepal, Niger, the Philippines, South Korea, St. Lucia, and Vanuatu. It is notable that apart from South Korea, all of these belong to the V20 and all face binding financial constraints on mobilizing resources.[6] The benefits of investing in adaptation are however clearly advantageous to both developed and developing economies, but definitely more urgent for developing countries whose climate risks are rising and becoming more complex over time.

Box 3.1 National Adaptation Programmes of Action (NAPAs)

Least Developed Countries (LDCs) face disproportionate exposure to climate change and environmental degradation, while these nations also have the least resources and institutional apparatus to recover from climate change impacts. Multiple stressors, such as unequal socioeconomic conditions, high vulnerability, and precarious institutional systems combine to produce low adaptive capacity to impacts of climate change.

Acknowledging this situation, National Adaptation Plans (NAPAs) were launched at the COP7 held in Marakesh in 2001, to address the immediate and urgent adaptation needs of LDCs regarding climate change and sustainable development. Each country's NAPA provides a special funding window and adaptation planning guidance to support LDCs to jumpstart their adaptation plans, tailored to the unique contexts of these nations. Through the NAPA process, LDCs identify priority activities with regard to adaptation to climate change, and propose adaptation projects based on greatest areas of need and urgency, especially those needs for which further delay could increase vulnerability or lead to increased costs at a later stage (Least Developed Countries Expert Group, 2002).

One key objective of NAPAs is to better understand climate variability at a local and regional level and to identify urgent action needed to build adaptive capacity. Strategies do exist at the community level for dealing with climate variability and extreme events. NAPAs therefore involve both expanding current coping range and enhancing resilience to current climate variability and extremes. National Adaptation Plans are then established to develop and implement strategies and programmes to address medium- and long-term adaptation aligned with broader sustainable development objectives. The associated Least Developed Countries Fund (LDCF) operated by the Global Environmental Facility (GEF) supports NAPA implementation, in correspondence with and guidance from the Conference of the Parties (COP). However, the LDC Fund was under-resourced, preventing timely development and implementation of NAPAs. As a consequence, many countries were unable to translate the NAPA plans into clearly defined implementation programmes.

The synthesis of adaptation objectives into national development planning means aligning poverty reduction strategies and overall sustainable development objectives with an understanding of geographical, social and physical criteria of climate change impacts. Eight focus areas were found to be important: 1) conducting a participatory needs assessment; 2) having a clear mandate; 3) having a clear road map for the NAPA process; 4) identifying how adaptation can be integrated into development strategies; 5) establishing effective institutional supports and arrangements; 6) ensuring open, ongoing dialogue with relevant stakeholders especially marginalised communities; 7) continued assessments for climate risk and vulnerability; and 8) assessing capacity needs for all aspects of the NAPA process, including comprehensive monitoring and evaluation (M&E).

By December 2017, all LDCs had submitted NAPAs and began undertaking their implementation. A review of these programmes suggests their key strengths and successes as well as some challenges, when considering the overall impact of NAPA on building more inclusive, resilient communities, and contributing to sustainable development.

Against this backdrop, there are three key aspects to successful adaptation highlighted by these programmes.

1. Integrating adaptive capacities

Developing the capacity for working at a level of complexity that is commensurate with climate change, and then integrating this with sustainable development processes—itself another complex undertaking—is a very difficult task; yet it appears to be a key factor in successes. Bearing these layers of complexity in mind, LDCs have focused on the challenge of integrating climate change adaptation into national poverty reduction policies and programmes and sustainable development programming. This challenge has been met in various ways, such as, via setting up a climate change adaptation focal point or designing multidisciplinary teams which house the quality and degree of capacity needed for working in an integrative manner, and also promoting and enabling regional synergies for adaptation. For example, in Zambia, a climate change facilitation unit was created to be responsible for harmonizing climate change action within the country, as a way to operationalize the degree of integration needed for effective adaptation. NAPAs that are well-integrated with sustainable development processes at a national level seem to do so by building on the existence of government endorsement and commitment to implementation of these sustainability outcomes. Likewise, Samoa used an integrated approach to combine its priorities identified under the NAPA and strategically plan the implementation of these priorities in line with its national development strategy and policies, in an integrated project with adaptation activities across "four sectors identified in the NAPA, namely: (i) climate health; (ii) agriculture and food security; (iii) ecosystem conservation; and (iv) early warning systems" (Least Developed Countries Expert Group, 2012, p. 55). Developing such integrative adaptive capacity to bring responses to climate change into national and

subnational planning processes, engaging with a complexity that is more commensurate with the climate change issue itself, appears as a key factor for success amongst NAPAs to date.

2. Scaling adaptation

Urgency and expediency lie at the core of the NAPA concept, and as such, scaling the impact of these programmes is important for their success. The Least Developed Countries Expert Group (2009, p. 30) points out that "Scaling up adaptation is an emerging concept, and can only be fully realized if properly planned… Scaling up also recognizes the linkages between systems both in space and over time, and if implemented properly, would lead to lasting impacts and sustainable benefits." Current research agrees that this cannot just include *scaling out* into greater numbers of initiatives or in replicating projects in greater quantity. Additionally, *scaling up* adaptation efforts into changed institutions and structures is important (Moore et al., 2015), particularly relevant in instilling adaptation objectives in all aspects of development planning. For example, during the implementation of the first NAPA project in Benin, this translated into mainstreaming adaptation practices across sectors, strong national and local coordination, and active involvement of local authorities at the very beginning, which in turn facilitated the mobilization of co-financing and cross-sectoral management (Least Developed Countries Expert Group, 2012, p. 26). 'Scaling up' inserts adaptive thinking and design into the very institutional structures that guide and shape development for the country and in particular specific focus areas with a clear mandate. In addition to scaling out and up, *scaling deep*—into changed values and worldviews—also matters (Moore et al., 2015); such as in fostering ownership and uptake of adaptive practices by local communities and actors. Cambodia for example, undertook a year-long awareness raising campaign with farmers and authorities in target districts in the largely agrarian economy of the country (Least Developed Countries Expert Group, 2012, p. 30). This focus on 'scaling deep' to promote greater awareness and attention to values was carried out alongside other projects for strengthening policy and science in vulnerable regions and building the adaptive capacity with various climate resilient agricultural practices. Such a three-pronged approach to scaling out, scaling up, and scaling deep may be a key component for NAPA success.

3. Adaptation towards Transformation

An important link has been made between climate change adaptation and transformation in the fifth assessment report of the Intergovernmental Panel on Climate Change (IPCC, 2014). This stemmed from the acknowledgement that there is a range of adaptive responses, including those that are more reactive and incremental through to actions that are more deliberate and transformative. Some researchers argue that adaptation approaches which merely make adjustments to current development practices risk extending and even reproducing unsustainability and maladaptation. Researchers also note that the vast majority of proposed adaptation strategies aim to inform the short-term tactical decisions for incremental change (Eriksen et al., 2021) but may not account for how climate impacts interconnect with wider processes of change (Ensor et al., 2019). IPCC 2018 underlined this saying "Limiting warming to 1.5 C would require transformative systemic change, integrated with sustainable development [and] would need to be linked to complementary adaptation actions, including transformational adaptation" (Masson-Delmotte et al., 2018, p. 16). The NAPAs that work across this range of adaptive responses, extending into that of transformational adaptation, are therefore better set up for success (IPCC, 2014(O'Brien, 2018). These are inherently long-term processes of change and have multiplier effects in building adaptive capacities and involve new sectoral alignments to meet adaptation goals.

The effective design and implementation of NAPAs depends on their integration into existing national development planning so that climate adaptation can be integrated as a coherent aspect of overall sustainable, equitable development, across regions. Yet often development institutions are not necessarily well set up for such *cross-thematic, cross-programmatic integration*; this constitutes a second major challenge that NAPAs face. The work by the Least Developed Country Expert Group (LEG) to support regional synergies assists in this regard, as well as the UNFCCC's Adaptation Committee which aims to strengthen synergistic engagement with national, regional and international organizations, centres and networks (Least Developed Countries Expert Group, 2015, pp. 16–17).

C. The disarticulated architecture of climate governance

Developing economies have borne the brunt of the adverse effects of rising global temperatures, with worse to come. However, given their marginalized position in the current architecture of global

environmental governance, or more accurately, the unwillingness of negotiating partners to address their concerns, they have not received the required multilateral support to face the adaptation challenge (including for loss and damage). The lack of bold and generous leadership has given rise to a lack of trust which further weakens the international cooperation needed to address the climate challenge in all its dimensions.

Moreover, and unlike the mitigation challenge where the big investment push to transform energy systems, is common to all countries, the wide-ranging measures across activities and sectors in response to the adaptation challenge (Table 3.2), vary from country to country depending on local circumstances, ruling out a one size fits all policy approach and underscoring the importance of allowing governments the space to tailor policies to those circumstances.[7]

The ongoing health pandemic, which has focused attention on strengthening resilience to shocks, may yet catalyse a transformation in the climate adaptation challenge, while a series of extreme weather events in 2021, which hit communities in advanced as well as developing countries with unprecedented losses, has made news headlines. The latest IPCC Report leaves no doubt that more threats to lives, livelihoods and (social and physical) infrastructure will materialize in the near future. Consequently, it has become apparent that properly financed adaptation strategies are vital not only for survival of island nations, but for the protection of human habitats across the planet and at all levels of development.

The Paris Agreement, adopted in 2015 and entered into force in 2016, is intended to enhance the implementation of the UN Framework Convention on Climate Change (UNFCCC) and included, inter alia, an objective "of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal",[8] where adaptive capacity refers to the stock of assets which can be drawn upon to support adaptation at a future point (IPCC, 2014). The goal will be achieved by all Parties committing to periodically communicate their nationally-determined contributions (NDCs), including their mitigation

TABLE 3.2 Potential areas of intervention for climate adaptation

Sector	*Adaptation measures*
Urban areas	Creating flood-adapted and resilient infrastructural networks and built environments where people live closer to work or work in safe environments to eliminate excessive transport costs and time, and ensure equitable patterns of work, and to provide emergency safe havens or evacuation sites in the event of floods or extreme weather events.
Water	Using and improving rainwater harvesting techniques Improving water storage and distribution facilities and arrangements Investing in irrigation amenities, adjusting drainage management systems, altering tillage practices to preserve water Desalinization Enhanced irrigation plotting, links to farmlands, and efficiency
Agriculture	Adjusting planting/ harvesting periods and increasing crop varieties Crop redeployment, forage, and tree species Improved land management systems and techniques, for example, erosion management and soil protection through tree planting Improving land tenure arrangements for small farmers and rural indigenous communities
Infrastructure	Improved levees and change in building patterns Creation of wetlands as a buffer against sea-level rise and flooding Climate-proofing of essential public physical infrastructure Creation of accessible and resilient public emergency shelters and evacuation sites
Health	Improved capacity to surveil and manage disease outbreaks Improved water and sanitation amenities and management Climate-proofing frontline community public health infrastructure Ensure accessible public health services in times of climate-induced emergencies
Transport	Development and relocation of transportation networks and systems Improved coding and planning methods for transport infrastructure to cope with warming and damage
Energy systems	Reinforcing generating facilities and grids against flooding, windstorms and heavy rainfall cycles Developing and deploying decentralized, off-grid, micro- or community-based renewable energy power generation facilities

Source: Adapted from UNDESA, 2008.

and adaptation actions, consistent with equity and common but differentiated responsibility and respective capabilities in light of different national circumstances. Parties also committed to reporting on the progress of implementing their NDCs through the Paris Agreement's enhanced transparency framework. Parties' subsequent NDCs under the Paris Agreement would be informed by regular global stocktaking of the state of progress.

In 2010, the 16th Conference of the Parties (COP 16) established the Adaptation Committee as the principal body under the UNFCCC – and the United Nations system more broadly – to provide comprehensive expert advice on adaptation action and support for targeted measures.

It is the sole body under the Convention whose work regularly addresses all facets of the adaptation challenge in a comprehensive manner (United Nations, 2019). The Intergovernmental Panel on Climate Change (IPCC) has subsequently distinguished between incremental and transformational adaptation; the former "maintains the essence and integrity of a system or process at a given scale," whereas the latter "changes the fundamental attributes of a socio-ecological system in anticipation of climate change and its impacts."

The foundational principle of climate negotiations regarding equity under the UNFCCC remains "common but differentiated responsibility", which recognises different levels of responsibility for the climate crisis and for solving it, including transfers of finance and technology from developed to developing countries. Still, tensions in climate negotiations continue around the appropriate scale of transfers among states, as well as the possible adverse impact of policy decisions in advanced countries, with respect to trade measures, intellectual property rights, etc., on the climate response in developing countries (see further Chapter V). Moreover, in the multi-layered framework of decision-making and management around the climate challenge other actors, at different levels of government, from the private sector, civil society and the scientific community, are involved in advancing a common agenda.

The political forces that have delayed action on mitigation have been extensively discussed, whether framed as an incentive problem linked to the pressure of bridging short-term and long-term decisions (Carney, 2015), a public good problem subject to free riding (Stern, 2006) or a "global commons" problem subject to the undue influence of vested interests, particularly the "winners" from the carbon-based economy (Standing, 2019). Arguably, disagreements around climate mitigation are the main reason why the nexus between national and global decision making has been the focus of attention in climate discussions. Disagreements over the extent to which all Parties should take on mitigation commitments were among the causes of the delays in negotiating a successor to the Kyoto Protocol. The Copenhagen Climate Conference broke down on the failure to deliver such commitments and a further six years were required before the Paris Agreement was signed, on the basis of Nationally Determined Contributions (NDCs) reflecting a just and fair way of operationalising "common but differentiated responsibility and capacities."

The issues of power, conflicting policy preferences, resource allocation, and administrative tensions are no less involved in the adaptation challenge, albeit played out more visibly along the national and sub-national decision-making nexus than is the case with the mitigation challenge (Dolsak and Prakash, 2018). Global monitoring and analysis can certainly help identify those marginalized regions and communities with particularly high levels of vulnerability, including in developed countries. In Nepal, for example, framing of the Himalayan region as particularly vulnerable has prompted external support for its National Adaptation Programme of Action (NAPA).[9] But the national level is still the focal point for mobilizing resources for adaptation action, including for the international community, and remains key for translating global ambition on adaptation to effective action. In this context, the climate challenge is difficult to disentangle from the longstanding development constraints on resource mobilization and which must now include an understanding of the way climate variables constrain development policy at the national level. However, policymakers can still draw some important lessons for the adaptation challenge from the experiences of developing countries over the last four decades of adjusting to exogenous economic shocks:

- If left to make the adjustment themselves, countries will likely be forced to squeeze down incomes, which would result in a prolonged and destabilizing adjustment process, increasing poverty levels, damaging long-term growth prospects and adding to further vulnerabilities.

- Economies that are more diversified (both sectorwise and geographically) tend to show greater

resilience with respect to external shocks and recover more quickly, as do economies that are more strategically integrated in the global economy.

- Societies with greater equality are better able to manage shocks by distributing the burden of adjustment and avoiding the possibly dangerous conflicts that adjustment can trigger.

In this context, the challenge for states is, in part, recognizing adaptation as a cross-cutting issue which needs to be mainstreamed across a variety of line ministries, for example, finance, environment and agriculture. For example, in Malawi, Tanzania and Zambia, institutional structures and availability of resources influence the levels of staff motivation and capacity to design and implement adaptation policies and programmes (Pardoe et al., 2018). The effects of neoliberal policies, burdensome debt instruments and in many cases costly institutional realignments reduce the availability of domestic resources to implement appropriate adaptation policies that further give rise to a reliance on donors for operational budgets (Ciplet and Roberts, 2017; UNCTAD, 2017, 2019). This overreliance limits the capacity of the state to take determined adaptation actions and points to the need for local specification of decisions, increased resource mobilization, and mobilization to change structures over time. In such circumstances, the capacity to act is constrained and leads to selective implementation of adaptation policies (Pardoe et al., 2018).

Global and national level adaptation agendas are likely to require implementation at sub-national levels where local public institutions and civil servants link the state with citizens and thus must negotiate the different interests and trade-offs involved (Funder and Mweemba, 2019). In the context of irregular availability of resources, and particularly where the central state has a weak record of delivering on policy promises, these "interface bureaucrats" have to navigate the different interests involved and be willing to accommodate local priorities in implementation. Representatives of responsible ministries may also have to negotiate space to act within the context of local governments and to engage traditional governance relations through local political leaders (Funder et al., 2018).

A more technocratic framing of adaptation has often tried to sidestep the need for politics of representation that uncovers differential local vulnerability (Ojha et al., 2018). In this case, many developing countries have raised concern that the top down-mandated participatory processes involved in national climate adaptation policy development contribute to reinforcing existing levels of vulnerability (Nagoda and Nightingale, 2017) and led to calls for greater commitment to locally-led adaptation (Soanes et al., 2021; Mikulewicz, 2018).

Community-based adaptation has a long history as a way of enabling local collective action to address climate risk (Forsyth, 2013). However, community-based adaptation, while potentially offering an alternative option to technocratic fixes, is also inherently political. It can therefore drive or delay changes that take into account systemic risk of climate change. Community spaces are subject to local level power structures and uneven power dynamics among different actors that need to be considered when delivering public and other sources of finance to projects. This has generated particular effects on participatory development approaches adopted by the donor community (Dodman and Mitlin, 2013). These outcomes are part and parcel of a broader approach to economic governance embedded in much climate policy thinking that has fragmented the state and created asymmetries of power and resources and limited the necessary structural changes and equity to communities most in need (Ciplet and Roberts, 2017; Perry, 2020).

The importance of recognising local political economy dynamics in interpreting and fine-tuning an adaptation agenda to suit those circumstances also highlights the diversity of the interested parties involved. At the sub-national level, it is not only local governments, communities and grassroots leaders, but also non-state actors that play a role in implementing adaptation measures. Given resource constraints in many developing countries, the role of multilateral and bilateral donors working in partnership with international NGOs and local civil society organisations often play a key role. Although it tends to receive less attention, in some cases the private sector is also included within coalitions for adaptation. In Kenya, for example, the Climate Change Act encourages collaborations to support climate response, and there are some examples of multi-stakeholder partnerships involving SMEs (Gannon et al., 2021). However, regardless of the composition, the establishment of partnerships and coalitions is itself a way of (re) producing uneven power relationships at local level that may lead to maladaptation (Naess et al., 2015).

Donors can also play a crucial role in adaptation policy development, especially the financing of

projects and disbursements of funds and have to be engaged more than in an arms-length manner. Donor support drives the implementation of global agendas and plays a key role in shaping the emergence and evolution of the national adaptation agendas in several SIDS in the Caribbean and Pacific regions (Perry, 2020; Robinson and Dornan, 2017). Still, as discussed further in subsequent chapters, the use of ODA for climate adaptation carries its own specific challenges linked to policy conditionalities attached to accessing such support, all the more so in the absence of effective multilateral monitoring and assessment of that support, especially including local communities and grassroots organizations.

The recent Leaders' Summit on Climate change hosted by US President Joe Biden held in April 2021, placed a particular emphasis on climate resilience and environmental justice as a major pillar of international support. The US Government has committed to make investments "in underserved and marginalised communities, including indigenous communities, in Canada, Mexico, and the United States to prepare them for climate-related impacts". The plan would focus on small island communities and locally-informed adaptation strategies that draw on culturally-sensitive knowledge and data. In addition, the President proposed providing funding for community-based organizations in the US and abroad to drive local solutions to climate impacts.[10]

Three specific initiatives have been proposed or enhanced, including: (1) the Local2030 Island Network, which connects U.S. island territories with others around the world; (2) the Energy Transitions Initiative – Global**,** which will seek to support the transformation and resilience of island communities in the Caribbean and Asia-Pacific regions; and (3) the Pacific Climate Ready project and Caribbean Energy and Resilience programs to support SIDS to promote climate-resilient development. At the recent Climate Adaptation Summit, the United Kingdom launched the Adaptation Action Coalition, a group of leading nations that will collaborate with the Race to Resilience initiative and the UN Climate Action team at the COP26 in 2021. Comprising Egypt, Bangladesh, Malawi, the Netherlands, St. Lucia and the UNDP, the Coalition will aim to accelerate efforts to turn political commitment to action on the ground that support the most marginalised and impacted countries.[11]

To what extent these initiatives will prove effective, and how quickly, is a question not only of political will at all levels of decision-making, but of material resources. The challenge of mobilizing resources is discussed in the next chapters. But decision-making, itself, rests on the kind of conceptual framework used to design climate adaptation strategies. The next section addresses this issue in more depth.

D. Climate adaptation: Risky business?

Adapting to the vagaries of the natural world has been part of the human condition for millennia. As early hunter and gatherer societies transitioned to more sedentary patterns of life, rural societies learnt how to deal with unanticipated environmental events through crop diversification, water storage systems, etc. Equally, the benefits of living in low lying coastal regions have forced human settlements to adapt to the threats that those local climatic conditions can bring, through the development of storm warning systems, flood response mechanisms, etc. Not all attempts at adaptation have succeeded. However, most of those failures have been confined to specific geographical locations and to singular climatic events. By contrast, the contemporary adaptation challenge is both widespread and connected to a wider set of deep-seated social and economic vulnerabilities that have emerged in recent decades (*TDR* 2017; Gallagher and Kozul-Wright, 2019).

The increasing damage from economic shocks, both before and after the GFC, from more frequent extreme climate events, and now from a health pandemic have highlighted the lack of preparedness of policy makers to the inherent fragilities and crises of the contemporary global economy. In response, governments, at all levels of development, have been told to strengthen their resilience to shocks by improving their data gathering and risk assessment techniques to better protect existing assets and by providing temporary financial support when shocks materialise. This approach is appealing because no new methodologies and frameworks appear to be needed. Rather, adopting and adapting already operational approaches is seen as providing a rapid response to the threat to lives and livelihoods.[12]

One review (Sherman et al., 2016) of the different approaches to the adaptation challenge has

distinguished between: (1) technocratic risk management (TRM), (2) pro-poor vulnerability reduction (PPVR), and (3) sustainable adaptation (SA). The first two tend to be closely aligned as they tend not to question the underlying development model and the resulting structure of the economy, and instead aim at conserving and protecting the existing assets and the current structure of the economy.[13] That can be termed a conventional, incremental, or a technocratic approach to climate adaptation.

In the technocratic approach, adaptation is seen as the result of mostly technical interventions which are implemented without properly regarding power relations, conflict dynamics or political contexts. Consequently, adaptation measures mostly comprise disaster risk reduction, ecosystem management, agricultural practices, water management, meteorological and early warning system improvements, social safety nets, insurance, and microfinance. That way, adaptation is retrofitted into development assistance. These may provide partial resilience now but by using scarce resources for adaptation to current climate hazards, these interventions preclude other future-oriented interventions and lock in path-dependent dynamics which reproduces current vulnerabilities. Dilling at al. (2015) show that there is no guarantee that adapting to current climate variability would automatically reduce the vulnerability to future climate change.

The use of risk assessment is a well-established tool of economic policymaking where different choices carry different outcomes in terms of benefits and costs. Assuming the alternative outcomes can be calculated with some degree of precision, then policy makers can prepare in advance for the costs of the chosen path through the adoption of various hedging and coping strategies. In measuring the potential costs, economists have distinguished between idiosyncratic risks that are one-off or local in nature, and tend to carry smaller potential costs, and covariant risks, which are more widespread or systemic, tend to be less predictable and carry larger costs. As noted earlier, drawing on conventional economic models tends to focus attention on idiosyncratic risk and ignore systemic risk, paying little attention to longer-term structural trends and tending to underestimate the scale and complexity of the climate challenge, particularly in developing countries.

The extension of this approach to the adaptation challenge can be more explicitly traced to the Sendai Framework for Disaster Risk Reduction that the United Nations General Assembly adopted in 2015 as a blueprint for disaster-related resilience and reacting to human-made hazards (UNGA, 2015). The 2015 adoption of the Paris Agreement also emphasized this approach with its focus on the reduction of risks related to climate change (Opitz-Stapleton et al., 2019).

The weakness of extending a risk-based approach to the adaptation challenge is its reliance on pricing and other market-assessment techniques which bias the approach towards what is predictable and incremental in nature rather than what is uncertain and systemic and that tend to bend the discussion of the appropriate response to coping rather than transforming (UNDESA, 2008; Global Adaptation report, 2019). The IPCC, 2014 Synthesis Report (p.107) is an example: "Existing and emerging economic instruments can foster adaptation by providing incentives for anticipating and reducing impacts (medium confidence). Instruments include public-private finance partnerships, loans, payments for environmental services, improved resource pricing, charges and subsidies, norms and regulations, and risk sharing and transfer mechanisms. This weakness becomes particularly apparent when the understanding of the nature of shocks, and the appropriate response to them, is derived from financial market analysts, where episodic crises are seen as an idiosyncratic threat to existing asset positions, best dealt with by the more effective pricing of risk by adding another layer of market-based instruments (derivatives) which purport to reduce investor uncertainty. Such an approach, under the umbrella term of "de-risking" (*TDR* 2019) calls for the establishment of a 'low-risk' national investment climate through the deepening of capital markets, the creation of large-scale asset classes that can be securitized into safer financial products and the pursuit of transparent economic governance. Policy institutions and think tanks pushing a de-risking agenda have argued that it gives international financial institutions greater scope to attract private investment into otherwise unattractive investment opportunities, including in the area of climate adaptation.

Despite the differences in the nature of climatic and financial shocks, several common assumptions inform the risk-based approach to the adaptation challenges. First, in finance, risk is generally understood as involving a quantifiable divergence of actual from expected outcomes which, given sufficient information, can be effectively measured and properly priced. How much is spent on insuring against risk is then very much a matter of choice reflecting individuals' or communities' attitudes to spending money today in order to insure against damage materialising sometime in the future. Second, while risk drivers may be endogenous (i.e., driven by the behaviour and policies of

stakeholders), climate risk tends to be understood as exogenous (i.e. whose origin is outside of the system and therefore beyond the control of a national government or organisation), but predictable.

In the context of the global climate challenge, these core premises carry several critical limitations. The assumption of divisibility of risk overlooks the problem of systemic risk.[14] Despite revisions to financial regulation in the wake of the GFC, post-crisis reforms have underplayed the notion of systemic risk, while epistemic approaches to systemic risk are often contradictory and under-developed. For example, while it is often seen as an external threat caused by improbable and unpredictable exogenous events, systemic risk also arises from endogenous structural weaknesses in complex and highly interconnected systems (Goldin and Vogel, 2010), as well as political decisions. Climate change and accelerating extreme events present a range of complex, systemic risks which cannot be diversified and priced using traditional risk-management tools as they concern social, geo-ecological and political dimensions.

Reflecting this, a revised, "risk and resilience" approach has offered a more comprehensive framework around the complex, interconnected and systemic nature of risk (e.g., Opitz-Stapleton et al., 2019). In this way, based on recent events that are more severe than scientists' modelling predictions, climate risk is even more uncertain and less amenable to quantification and consequent management through traditional risk management instruments. Instead, to cope with complex risk that extreme weather events pose, we may need to shift our understanding from risk events to the *resilience of an impacted system*.

The resulting policy agenda proceeds in five steps: (i) understanding risks, especially complex systemic risks, by identifying the risk drivers and their potential impact; (ii) preventing and mitigating risk, i.e. by addressing the risk drivers by reducing the probability of shocks and avoiding the creation of new risk, especially through ensuring good governance and creating an enabling environment; (iii) reducing the impact of risk by enhancing resilience and lessening vulnerabilities; (iv) managing residual risk through risk sharing, including through insurance and safety nets; and (v) recovering and building back better by adapting to new realities and transiting towards more resilient and sustainable growth and development paths (United Nations, 2021).

The step towards a more integrated approach and systems-based view of policymaking marks an advance from narrow agendas focusing on single risk drivers and narrowly defined vulnerability indicators. Policy implications of this approach most prominently concern "buffering capacity" (Hallegatte, 2014; Caldera-Sanchez et al., 2016), "risk-informed development" (Opitz-Stapleton et al., 2019), or a "risk and resilience framework" (United Nations, 2021). The first two of these approaches are relatively limited and technocratic. "Risk-informed-development" actions emphasize increased understanding of complex risk and acting upon that knowledge. It also recognizes that all decisions involve trade-offs across different development objectives and stakeholders. Building "buffering capacity" emphasizes increased understanding and knowledge creation. But it targets *anticipatory* actions: those aimed at harnessing the ability to anticipate risk and evaluate potential impacts, and at stemming the build-up of vulnerabilities, especially in the domestic economy, to avoid adverse shocks from turning into crises.

Yet even this revised, evolutionary approach to managing climate risk suffers from limitations. If risk results from the *interaction* between threats and underlying conditions, building resilience means creating buffers, rather than changing the wider ecology of risks.

From an economic development perspective, the application of risk-resilience approaches suffers from at least three shortcomings. First, given its roots in financial risk management, the approach privileges a return to (pre-crisis) normality and stability over a dynamic vision of change and new trajectories. In the case of many communities, this 'normality' means a return to persistent inequality. Preservation, in other words, still takes priority over transformation which in the case of climate crisis, is not simply insufficient, but also counterproductive and leads to maladaptation. It occludes the role of a collective set of mobilising actors and policies that may pursue a different set of defined objectives and actions.

Risk-resilience approaches are especially problematic in the current political context, where new social contracts are needed to regain citizens' trust in public policies and multilateral efforts. Tackling current global challenges like climate adaptation requires a new vision of common goals rather than emphasizing the avoidance of risks and worst-case scenarios that emerge from current circumstances. This is, for example, recognised in discussions around a green new deal.

Second, the sequence of crises and the sharpening of inequality and exclusion around the planet suggest that it is not simply a matter of omissions

(insufficient information and instruments), but of commission. In the context of climate change, the rules and policies that make contemporary economic globalization and the associated vulnerabilities exclusionary and unstable have been institutionalised over a long period of time. Calculative private financial mechanisms of risk management are unable to address the spectrum of climate dangers, most of which include extreme events, indivisible in their impact and associated uncertainties. Instead, a strategic policy response needs to be built on "active precautionary measures to minimise worst-case risks," which is far beyond milder regulatory measures stemming from conventional probability approaches to risk management and institutional architecture (Ackerman 2017: 163).

Third and relatedly, risk-resilience approaches view the state mainly as a facilitator that sets the incentives and frameworks for self-regulating markets and private-sector initiatives. Within this framework, governments may play three key roles regarding risk (United Nations, 2021): (i) as a risk-bearer of last resort, such as by bailing out insolvent banks and corporates to limit contagion; (ii) as shaping the risk landscape for private investors and other stakeholders, such as by aligning incentives with SDG-relevant risks; and (iii) as seeking risks associated with long-term transformative investments, with a view to de-risking private-sector engagement in such highly uncertain ventures. Governments may also undertake risk-reducing investment to improve coping capacity by creating buffers in terms of increased human capital, social protection, digital infrastructure that improves connectivity and helps to bridge digital divides and, especially, by expanding fiscal space.

These three shortcomings are reflected in the current balance of power (and issues) that frame international efforts to address climate adaptation. Despite our growing knowledge about the threats from rising global temperatures and the resulting adaptation needs, technocratic fixes have so far failed to produce successful adaptation strategies in vulnerable countries (Boyd, 2017). This is, in part, because even if the requisite data is collected and the appropriate technology available, this never just comes "off the shelf" but is (re)produced through social rules (Jasanoff, 2013), including those constructed around intellectual property, which can make accessing and adapting the required technologies a difficult and expensive process for many developing countries. Coping with climate shocks is, moreover, strongly positively correlated with income levels and reflects changes in economic and social structures as countries diversify into more sophisticated and higher productivity activities. The establishment of institutional networks can also build synergies across those activities, and popular deliberation mechanisms can push for increasing the capacity and reach of developmental states to embrace the climate challenge (see next chapter and Gabor, 2020).

A more transformative approach to adaptation, however, will, as discussed in Chapter V, only be possible if the funding required to implement the institutional and structural measures is made available through appropriate mechanisms at both the national and multilateral levels.

E. Conclusion

This chapter has surveyed the scale and scope of the adaptation challenge and the institutional and policy environment that frames the responses to that challenge. It has set down some broad markers for policy action and reform, suggesting that not only should the political, epistemic and financing components of the climate challenge be addressed through a more integrated framework, but that a more developmental approach to climate is needed, given the persistent underestimation of the adaptation challenge in conventional climate action programmes.

Investing in adaptation will improve the resilience of both advanced and developing economies against rising global temperatures. But while responsibility for the threat resides principally with the former, the damage is felt disproportionately in the latter. Moreover, in many cases, their vulnerability to external shocks has been heightened by the imposition of market-friendly adjustment programmes that have reduced the capacity of the state to respond in a timely and effective manner. Improved knowledge, measurement and monitoring of the adaptation gap is certainly needed, as well as a better understanding of local political and power structures that can obstruct adaptation. The chapter has also shown why current risk-resilience measures drawn from financial markets are inappropriate for framing a transformative

adaptation agenda. Rather, retrofitting the developmental state and providing it with greener industrial policies will, as discussed in the next chapter, be critical to advancing such an agenda.

Notes

1 Adaptation is used here in a broad sense to refer both to managing the adverse effects of climate change, and the related issue of "loss and damage" incurred beyond what adaptation measures can address.

2 See https://ourworldindata.org/co2-emissions

3 See https://dgff2021.unctad.org/foreword/.

4 UNEP notes that estimating adaptation costs is a complex challenge; the stage and process of development changes adaptation costs which can be increased or decreased accordingly; incomplete knowledge about costs of adaptation for some sectors, notably for biodiversity and ecosystem services; indirect and unpredictable climate change impacts can change dynamics and increase certain costs; estimates based on autonomous actions, for instance, if farmers take certain measures that result in improved adaptation, can be severely underestimated, among other reasons. See list in Annex 1 in the Adaptation Gap Report (2020) at https://www.unep.org/resources/adaptation-gap-report-2020.

5 A draft copy of the report is available here: https://www.dropbox.com/s/ayqrjt2xphc7st2/WRI-Are%20COVID%20packages%20building%20resilience%20-%20Jan%2020%202021-%20DRAFT%20FOR%20COMMENT.pdf?dl=0 and cited in (Richmond et al., 2021).

6 The Vulnerable Twenty (V20) Group of Ministers of Finance of the Climate Vulnerable Forum is a dedicated cooperation initiative of economies systemically vulnerable to climate change. The V20 works through dialogue and action to tackle global climate change. Full membership available here: https://www.v-20.org/members.

7 The IPCC has considered adaptation transformation along three axes: (1) transformation inducing fundamental change through the scaling up of adaptation, conceived as a limited, technical intervention with transformative potential; (2) transformation as actions or interventions opened when the limits of incremental adaptation have been reached; (3) transformation seeking to address underlying failures of development, including increasing greenhouse gas emissions by linking adaptation, mitigation, and sustainable development (IPCC, 2014).

8 See: https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/new-elements-and-dimensions-of-adaptation-under-the-paris-agreement-article-7.

9 Support was provided by the Green Climate Fund (GCF), as well as a number of private and foreign government agencies. See here: https://napglobalnetwork.org/wp-content/uploads/2018/07/napgn-en-2018-nepal-nap-process.pdf.

10 See: https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/23/fact-sheet-president-bidens-leaders-summit-on-climate/.

11 See: https://adaptationexchange.org/adaptationActionAgenda.

12 For discussion of risk-resilience approaches in different scientific fields see, for example, Bhamra, Dani and Burnard 2011; Briguglio et al. 2011; Brinkmann et al., 2017; Renn et al., 2020.

13 The two approaches differ in how they conceptualize adaptation and development. The TRM approach sees them as separate (adaptation plus development), while the PPVR sees them jointly (adaptation as development).

14 The latter can be understood as a breakdown of the entire system as opposed to breakdown of its individual components, or a risk that cannot be diversified away (def).

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FROM DE-RISKING TO DIVERSIFICATION: MAKING STRUCTURAL CHANGE WORK FOR CLIMATE ADAPTATION

IV

A. Introduction

As discussed in the previous chapter, growth prospects in many developing countries are already under threat from climate shocks, with worse to come. Adapting to these shocks is a major policy challenge. The favoured approach has so far emphasised "de-risking" development through a variety of market-based coping measures and relying on the public sector as a benevolent insurer of existing assets. While these may help address some of the immediate consequences of climate shocks, in particular for vulnerable populations, the only lasting solution is to reduce the dependence of developing countries on a small number of climate sensitive activities through a process of structural transformation that can establish more resilient economies.

The success of today's advanced economies, as well as in the catch-up economies of East Asia, rests on sustained economic growth closely tied to structural transformation. At its core, this involves two sets of combined and cumulative processes: a vertical shift in the production structure from the primary sector to manufacturing (and on to high-end services) on the one hand, and a more horizontal move of resources from lower- to higher-productivity and more capital-intensive activities within and across sectors. Together, these processes have, in almost all successful development experiences, facilitated a more diversified pattern of economic activity, raised productivity and led to an improvement across a broad set of social indicators, including poverty reduction.

More diversified economies are also less vulnerable to external shocks which are likely to disrupt the growth and transformation process (OECD/WTO, 2019). This has, in recent years, been apparent with the heightened vulnerability of primary export dependent economies to economic shocks that originate elsewhere in the global economy but it is also the case with climate shocks. Indeed, in many developing countries, particularly those located in tropical and sub-tropical regions, vulnerability to economic and climate shocks are compounding each other, locking countries into an eco-development trap of permanent disruption, economic precarity and slow productivity growth. Breaking out of that trap implies that the climate adaptation challenge in the developing world needs to be approached from a developmental perspective.

Not all past experiences, no matter how attractive, can be easily adapted to contemporary realities. The main problem with turning to history for successful growth experiences is their reliance on fossil fuel-based development paths. Today, developing countries confront the dilemma of having to pursue economic development while keeping emissions and resource consumption within the ecological limits of the planet.

This challenge, in turn, necessitates new strategies that pursue structural transformation in a climate constrained world. As that world wakes up to rebuilding economies after the Covid-19 shock, an opportunity to formulate, agree and implement a set of new policy choices that combine developmental and ecological concerns should not be missed.

Developing country policymakers face this challenge from a position of disadvantage in terms of their

ability to mobilise domestic resources, the structural constraints on expanding those resources and their weak or missing institutional capacities and skills, many of which only emerge along with a successful development process. One possible countervailing advantage of economic latecomers is being able to draw on technologies already developed in more advanced economies to help speed up their transformation. This, however, is easier said than done, and an extensive literature has discussed the obstacles to technology transfer facing developing countries, obstacles that are becoming more pronounced in the face of binding environmental constraints.

At one level, many developing countries are less locked-in to fossil fuel-based technologies and to vested interests in public decision-making that may hamper change. Instead, they can build their urban environments, manufacturing industries, energy and transport systems in less carbon-intensive and more environmentally sustainable ways. At the same time, the fragmentation of production processes through the spread of global value chains along with the tightening of intellectual property rights over recent decades are posing even greater obstacles for developing countries in accessing the technologies needed to make that transition, at the same time as they are becoming more exposed to the adverse consequences of a warming climate and the threat of the eco-development trap.

Policy strategies associated with the East Asian development experience – often summarised as the "developmental state" model (e.g., UNCTAD 2016; Wade 2018) – can provide useful guidance in this regard (Poon and Kozul-Wright 2019). Those strategies, which yielded rapid industrialisation and productivity growth in East Asia in the 1980s and 1990s (and earlier, but more ephemerally, in Latin America), include elements of economic planning and targeted industrial policies, as well as the space required to establish a well-defined national interest, experiment with different policy options and define and negotiate economic priorities across a variety of stakeholders (UNCTAD 2003; Beeson 2006). At the same time, it is clear that today, not only has that space narrowed under the pressures and constraints of hyperglobalization, but the priorities and related trade-offs introduced by adding the environmental dimension of development further complicate efforts to emulate the developmental state model.

This chapter analyses the challenge of structural transformation in the climate-constrained world. It is organized under two broad headings. The initial sections discuss developmental challenges in a historical and comparative setting, using the dual economy model of Sir Arthur Lewis (1954) as a heuristic device to examine how achieving economic development through structural transformation in a climate-constrained world may work, identifying some of the limitations of the original idea. The second examines in more depth how such limitations may be overcome today. It distils policy experiences from successful industrializations and identifies a set of policies (industrial, food and energy security) that can help guide structural transformation while addressing the climate crisis. Taken together, such policies form part of a green developmental state agenda that can respond to developing country priorities in the climate constrained, post-Covid global economic system.

B. The Lewis model of development for a climate-constrained world

One of the best-known models of economic development was provided by Arthur Lewis (1954). Lewis argued that the driver of economic development was capital accumulation, conditioned by a movement of labour - the abundant production factor in a typical developing country - from the "traditional" or "non-capitalist," low-productivity sector, to the "modern" or "capitalist" sector, characterized by higher productivity, higher wages, and the use of reproducible capital (essentially machines and equipment).

The key condition for this mechanism to work is the existence of surplus labour in the traditional or non-capitalist sector. This surplus ensures that, during an extended period of labour migration, wages in the capitalist sector remain constant because the inflow of workers exceeds demand at the prevailing wage in this sector, determined by the subsistence wage in the traditional sector plus a fixed margin. The resulting surplus of output over wages in the modern sector is captured by the capitalists as profits. The capitalist sector grows, as with ongoing labour migration and constant wages the share of profits in national income rises and parts of the profits are re-invested in the modern sector. This profit-investment nexus gives rise to a virtuous circle of rapid productivity

growth, more and better paid jobs, higher household incomes and expanded markets, leading, in turn, to higher levels of investment and thus helping to further boost productivity (Akyüz and Gore, 1996). Once the labour surplus disappears,[1] i.e., an integrated labour market and an integrated economy emerge, rising wages lead to declining returns to investment, and slower growth. The rise in wages may be contained without lowering workers' living standards, by maintaining the availability of wage goods, especially food, at affordable prices which in most cases presupposes productivity and output growth also in agriculture.

A number of the assumptions underlying the Lewis model generated theoretical controversy.[2] In response, Lewis argued that the main objective of his work was not a refinement of abstract models, but an indication of how development, understood as a multidimensional process of economic, social and institutional change, could be tackled in a problem-solving way through instruments of public policy. [3]

A more serious criticism was the view of agriculture as a backward and inherently stagnant sector which ignited interest in a more positive and active role for agriculture development in structural transformation, including through rural institutions and incentives that would spur productivity growth.[4] Timmer (1988) considers that structural transformation starts with rising productivity in agriculture, leading to declining food prices, in turn enabling productivity growth and the development of internationally competitive activities in manufacturing. In other words, this perspective holds that structural transformation depends on rising productivity in both agricultural and non-agricultural sectors, and that the two are connected through backward and forward linkages.

Notwithstanding these criticisms, the Lewis model "remains relevant as an 'ideal type' or heuristic device for the study of economic development through which contemporary patterns of structural transformation and their implications for inclusive growth, wages, profits, employment and productivity can be examined" (Sumner 2018: 2).

One such examination relates to the use of the main elements of the Lewis model in the analysis of the successful development experiences in East Asia over the past four decades and their potential lessons for current developmental challenges. Although each country needs to tailor its development strategy to its own specific conditions, including historical, cultural and institutional background, certain key elements in the Lewis model, and reflected in the East Asian experience, remain of wider validity. Two of these - the role of capital investment and the capacities of the state – are particularly relevant for the discussion of development challenges in the climate-constrained world today. A third element, the concept of linkages, which was developed, in part, in response to its absence in the original Lewis model, can further enrich that discussion.[5]

1. Capital investment

Perhaps the most important feature of the East Asian development experience is the importance of capital investment as a driver of growth-enhancing structural transformation. An expanding modern sector can gradually absorb the labour surplus, while its higher level of productivity supports economic growth. Mobilizing sufficient capital in the initial stages of industrialization may require foreign finance but will increasingly be replaced by a reinvestment of profits into the expanding modern sector, creating a dynamic profit-investment nexus (Akyüz and Gore, 1996). When agriculture is brought into the analysis, it too can become a source of structural transformation as a potential (and often the only) sector to induce growth. Ranis and Fei (1961), argued that agriculture can serve industrialization by generating much-needed foreign exchange to finance imports of capital and intermediate goods, provide a stable domestic market for manufacturing output, and keep the cost of wage goods low (thereby boosting industrial profits and investment).

Capital investment in the modern sector is closely associated with productivity growth: due to scale economies in the modern sector, labour productivity growth is a positive function of the pace of output growth.[6] The positive relationship between capital investment and productivity growth can be boosted further by exports, an element not considered in the Lewis model. This is because increasing investment in sectors that export to developed countries allows production to shift towards products with high income elasticity, while expanding the modern sector requires a large volume of intermediate and capital goods whose imports must be financed with foreign exchange earned through exports. Otherwise, increased external borrowing would raise debt-service ratios which could, in turn, act as a constraint on the growth process.[7]

Similar to the assumption in Lewis (1954) that developing countries can draw on an ever-increasing stock of technologies for the purpose of catching-up with other countries, these mechanisms also imply that productivity growth through technological upgrading largely relies on the transfer, imitation and adaptation of foreign technology that has been successfully used in more advanced economies and whose effective use in developing countries are facilitated by building up domestic technological capacities, local R&D, and better skilled labour. This leads us to the second key element in the Lewis model: the role of the state.

2. State Capacity

In addition to market mechanisms, Lewis (1954) emphasizes the role of government policies as instrumental to solving a set of successive coordination problems that arise with a process of structural transformation. Specifically, the crucial question in dualistic economies is how to manage the relation between the traditional and the modern sector of the economy.[8] The ability of a government to conceive of and implement policy is defined as state capacity. In the developmental context, and specifically in the case of East Asia, the notion of state capacity includes "precise circumstances, tools, strategies and relationships that distinguish and effectively constitute different national approaches to successful economic development" (Beeson 2006: 444–445). Successful development outcomes, in turn, depend on the state's ability to institutionalise channels for continual negotiation of economic policies. These channels need to be, on the one hand, aligned with the national interest, but on the other, designed so that the state is not captured by vested economic interests.

Macroeconomic priorities of a developmental state are based on the proactive, pro-investment set of policies, as well as strategic collaboration and coordination between the private sector and the government. The latter is needed to monitor the interdependence between investment and production decisions. These decisions concern identifying the areas where the most significant constraints to investment are; how effectively to channel public and private investment to the high-productivity activities; and monitor whether these investments are managed in such a way as to sustain a high-wage future for citizens and to increase long-term productivity. Such disciplining of investment is ensured through monitorable performance standards and a withdrawal of governmental support that fails to achieve its objective within a given period of time, as well as through checks on rent-seeking of government officials and entrepreneurs.

While capital formation and stronger state capacity are key pillars of a development state model, there is not one but many variants, of the model, reflecting specific regional, historical and socio-economic factors (Haggard, 2018). And although the 1997–98 crisis in East Asia tarnished the model in some respects, it remains the case that "government signaled the direction, cleared the way, set up the path and – when needed – provided the means" to help countries in the region successfully transition to a sophisticated industrial economy with the active support of a developmental state (Cohen and de Long, 2016: 2).

Even in the agricultural sector, higher productivity is only achievable through significant state support in the form of agricultural extension programmes, such as R&D, and through providing physical infrastructure for water management and irrigation systems, construction of roads for market access, and stabilizing input and output markets through price support schemes (Ranis and Fei, 1961; Johnston and Mellor, 1961). State intervention also targets small to medium farms because of their higher effective demand for domestic production, as opposed to larger and more mechanized farms. These farms tend to use imported inputs for more capital-intensive production technology, which not only depletes foreign reserves but also breaks the forward-backward linkages that are a necessary feature of a cumulative growth process (Adelman, 1984).

Most importantly, state machinery is needed for reallocating the surplus created in the agricultural sector through taxation and manipulating the domestic terms of trade (i.e., to get the prices wrong) in favour of industry. In the absence of the strategic reallocation of the surplus by the state, there is no guarantee of mobilizing the privately owned agrarian surplus coming from millions of separate small and medium-sized producers to strategic sectors for structural transformation.

Externally too, pressures of global economic integration require enhanced state capacity to manage economic integration and protect vulnerable sectors of the economy (Beeson, 2006). While there are potentially strong synergies between investment, exports and productivity growth, particularly with respect to manufacturing activities, positive outcomes are not predetermined; when there is surplus labour, strong import competition, or the exit of less

productive firms, trade liberalization can result in declines in aggregate (economy-wide) productivity even as it raises productivity in the industrial sector or among trading firms (McMillan and Rodrik, 2011). The net impact ultimately depends on wider employment dynamics and on whether the productivity growth in industry is outweighed by a larger shift of labour and resources into low productivity work outside the sector. Evidence of such shifts underlie concerns about weak industrialization (including premature de-industrialization) in the developing world in recent decades (UNCTAD, 2003, 2016; Tregenna, 2009).

With the structure of the economy continuously changing under technological and external market pressures building a network of robust linkages, both domestically and internationally, becomes an even greater economic development challenge to which active industrial and trade policy must adapt accordingly.

3. Linkages

The immense appeal of the manufacturing sector lies in its potential to generate productivity and income growth, and because such gains can spread across the economy through production, investment, knowledge, and income linkages. As noted above, a strong link between profits and investment was assumed by the Lewis model and has certainly been key to the success of East Asian later industrializers. Such a link was, however, as much the outcome of active state policies as automatic market forces (Akyüz and Gore, 1996).

Several other linkages that can play an important role in establishing a virtuous pattern of growth and structural transformation deserve mention here. To begin with, expanding production can help build 'backward' linkages (to source inputs for production), and 'forward' linkages in so far as the produced goods are used in other economic activities (Hirschman, 1958). This relates, for instance, to domestically produced pesticides and simple agricultural equipment, as well as agricultural raw materials as inputs for domestic production. Intersectoral linkages emerge as knowledge and efficiency gains spread beyond manufacturing to other sectors of the economy, including primary and service activities (Tregenna, 2010). There also are additional benefits to be gained from adaptability linkages: in manufacturing, which lends itself more to the division of labour, there is a high degree of adaptability towards the use of inputs beyond the immediate industrial niche.

Investment linkages are created when investments in productive capacity, new entrepreneurial ventures, and the related extensions of manufacturing activities in one enterprise or subsector trigger additional investments in other firms or sectors, which otherwise would not occur because the profitability of a specific investment project in a certain area of manufacturing activity often depends on prior or simultaneous investments in a related activity (Rodrik, 2004). In turn, the coordination problem that may result from these interdependencies can be resolved by strategic collaboration between the government and business organizations or between the government and state-owned enterprises.

Income linkages emerge from rising wage incomes generated from industrial expansion; these add to the virtuous cycle through 'consumption linkages', when higher wages trigger higher food demand which, in turn, causes rising demand for domestic inputs to agriculture. Income linkages also operate through supplementary government revenues (i.e., 'fiscal linkages'), which may therefore expand public expenditure. The creation of such income linkages can strengthen the self-reinforcing aspect of industrialization through increasing domestic demand and therefore GDP growth.

The expansion of manufacturing activities and the diversification process more generally as key to successful transformation can be interpreted as the complex intertwining of these linkages and related feedback loops through a process of "cumulative causation" (Myrdal, 1957; Kaldor, 1957). However, one obvious caveat should be pointed out: historically the expansion of manufacturing has tended to rely on patterns of production that damage the environment through pollution and lead to degradation and overexploitation of natural resources and excessive carbon emissions associated with climate change. Indeed, a shift to services-based growth could be advocated precisely in order to avoid the environmental problems that have emerged in some rapidly industrializing countries. However, there are both strong analytical and empirical grounds to assume that the services sector needs to rely on strong intersectoral linkages and interdependencies with a mature manufacturing sector to itself upgrade (UNCTAD, 2016; Cherif and Hasanov, 2019). In any case, such problems are not intrinsic to the industrialization process: they depend crucially on the choice of technologies, policies and regulations.

C. Climate change, development and post-Covid recovery

The need for effective state capacity and active policy to manage structural transformation is amplified further by climate change, and so are the challenges of policymaking. A climate-conscious developmental state today must be able to balance the threat of climate change along with the longstanding goals of achieving economic growth and closing the economic and technological gaps with more advanced economies. At the most basic level, addressing climate change makes structural transformation a global task, in which the advanced economies must take the lead in undertaking profound changes in their patterns of production and consumption but where significant structural and technological changes are also necessary even in the least developed countries. But while climate-related structural transformation is needed to address the degradation of the global commons, targeted national policies (and resources) are needed to address the adaptation challenge countries are facing from the rising temperature already baked into current patterns of growth. Aligning these global and national challenges is neither straightforward nor automatic but requires strategic planning and policy intervention. In line with the discussion in the previous section, the integrated policy framework that is required can build around efforts to achieve more diversified economies.

The divergence between global climate objectives and immediate national interests is most evident for countries with large fossil-fuel sectors, as policies to reduce emissions will inevitably depress fossil fuel demand. Political short-termism in the wake of the pandemic can also lead some countries to attract polluting industries from countries with more stringent environmental standards and regulations, with the resulting proceeds providing income that could be used to reduce pollution later. Such a "grow-now-clean-up-later" suggests an environmental Kuznets curve, along which indicators of environmental degradation first rise, and then fall, with increasing per capita income (Stern, 2004). Such an approach may seem particularly attractive considering high uncertainty and considerable up-front investment related to pioneering green technologies that may be shouldered more easily by more advanced economies, as well as a way to force early industrializers to pay their historic debt for past pollution (UNCTAD, 2020a).

At the same time, the urgency to preclude the risk of catastrophic tipping points, combined with the more proactive policies that have been adopted to combat the Covid-19 pandemic, open up an accommodative terrain for action. As this Report argues in preceding chapters, responses to the Covid-19 pandemic offer an ideal opportunity for fresh thinking about the public policy agenda and for using stimulus and recovery measures in order to accelerate structural change towards a low-carbon economy. The big policy challenge lies in ensuring that these measures trigger more virtuous growth circles, initiating cumulative technological changes in low-carbon growth sectors, supporting economic diversification, and creating employment opportunities that will be maintained even as temperatures rise.

To examine how this more accommodative terrain may be used for these purposes, we extend the guiding principles of the Lewis model in relation to the climate adaptation challenges and outline possible policy impacts on structural transformation in three scenarios: (i) continuing with business as usual; (ii) focusing climate-adaptation action on changes in consumer behaviour and other factors affecting trade; and (iii) approaching climate adaptation in a cohesive, integrated manner.

Scenarios 1 and 2 are not mutually exclusive. They each contain a series of risks to development and equitable growth, which we analyse below. Our analysis suggests that only a cohesive, integrated strategy towards climate-oriented structural transformation will deliver the type of development sustainable in a climate-constrained world. Given that climate constraints require structural transformation to include a shift from high- to low-carbon technologies as a further crucial step, structural transformation in a climate-constrained world can only succeed when it is approached in an integrated, cohesive manner, with a universal shift towards low-carbon technology occurring alongside productivity growth, expanding employment opportunities, and rising living standards for all citizens throughout the world.

(a) Scenario 1. Business as usual as a constraint on structural transformation: the case of agriculture

Many developing countries are already experiencing the constraint of a changing climate on structural transformation and income growth. This is most

clearly the case where agricultural activity is still a major source of income, and where the dependence on temperature, precipitation and other climate variables is uniquely significant among economic sectors. These factors combine to undermine resource bases and cause a global loss of agricultural production (FAO, 2021a).

While great uncertainty about the net impact of climate change on global agriculture remains, evidence suggests that the agricultural and forestry sectors in developing countries are particularly vulnerable to climate change. Part of this results from within the agricultural sector. Due to significant emissions from fertilizer application, intensive livestock and manure management, and the burning of agricultural residuals and savanna for land clearing, industrial agriculture has contributed to soil overexploitation and degradation, as well as to desertification, deforestation, and water pollution.

At the same time, the greater importance of agriculture for their economies, and the smaller size of their farms, often occupying marginal land areas, can limit the ability of developing countries to cope with even small changes in temperature and precipitation. As a result, many developing regions will be exposed to significant reductions in agricultural output and in average yields of food items, as well as an erosion of arable land. Model simulations indicate that, depending on crop adaptability, climate change could cause yield losses of 5–25 per cent in food production that could trigger an increase in projected levels of average aggregated world crop commodity prices by 12–18 percent by 2050 (Rosegrant et al., 2021).

Especially in places where these features occur in situations of high or rising population density, climate change will impair economic activities in agriculture and forestry and increase the likelihood of social conflict, with both factors incentivizing large-scale migration from rural to urban areas. Contrary to the Lewis model, where rural-urban migration is voluntary and driven by sectoral differences in labour-market outcomes, this migration is involuntary. It may also be "pre-mature" (Godfrey, 1979) in the sense that labour migration is decoupled from productivity growth and instead results from degrading agricultural areas ocurring before the industrial sector is able to gainfully absorb the migrants, i.e., before migrants can find employment in activities with substantial profit and re-investment opportunities (e.g., Barrett, Ortiz-Bobea and Pham, 2021). Such pre-mature migration also can cause rising food prices, with adverse consequences on the purchasing power of urban workers and the international competitiveness of manufacturing firms. As a result, climate-change related labour migration causes a risk of swelling urban informal sectors with employment and income precarity and little potential for productivity growth.[9]

Some of these developments are already apparent in recent structural transformation experiences in Africa. Regarding agriculture, there is great heterogeneity across developing countries and the absolute climate-related loss of agricultural production over the period 2008–2018 was particularly high in Asia, with China accounting for more than half of the global loss. However, the severity of agricultural production losses is most evident when expressed in terms of the share of potential production: on this measure, African economies have lost up to 8 per cent, considerably higher than losses at the global level (FAO, 2021a). Moreover, agricultural development in Africa was driven not by productivity increases but mainly by area expansion and intensification that have resulted in widespread land degradation and soil nutrient depletion (Badiane, Diao and Jayne, 2021).[10]

Both these developments have contributed to people leaving farming. Yet the resulting decline of labour in agriculture as a share of total employment has not been accompanied by a meaningful growth of well-paying jobs in large-scale manufacturing activity. Rather, it has been accompanied by fast growth in occupations related to construction, food trade and personal care services, often in the form of informal urban activities. This means that premature labour migration from agriculture has been related to the rise of what Lewis (1979) had called an "in-between" urban sector (Diao and McMillan, 2018; Kruse et al., 2021).

In addition to persistent high inflation related to food price increases (Alper, Hobdari and Uppal, 2016) – including from lower-than-expected food production, the non-tradability of major food staples, and generally fragile agricultural sectors – an important reason why a large-scale modern manufacturing sector has not emerged in sub-Saharan Africa may be the nature of technologies available to African firms.[11] Recent evidence for Ethiopia and the United Republic of Tanzania indicates that the few large-scale manufacturing firms that exist in these countries have adopted significantly more capital-intensive technologies than would be expected in terms of these countries' income levels or relative factor endowments (Diao et al., 2021). This bias towards capital-intensive technology

may result from the spread of global value chains and the resulting homogenising effect on technology adoption around the world. To compete with production in much richer countries it became indispensable for African firms to adopt the capital-intensive technologies developed in advanced economies that allowed them to boost productivity but not to expand employment opportunities that could have absorbed labour migration from agriculture.

The existence of an "in-between" urban sector raises more general questions regarding the relationship between the informal sector and climate mitigation. Literature suggests that informal sectors facilitate a green economy, for example, in terms of waste management, recycling and processing waste into new products; agri-food markets by encouraging the use of local green technologies in smallholder farming and by providing better affordable food, which in turn may allow consumers to undertake green investments; use of biomass energy; the upgrading of housing and infrastructure where achieving greater energy efficiency often requires labour-intensive works; and in the form of home-based work that compared to formal employment requires less transport, space and utilities, including electricity (e.g., Benson, 2014; Chen and Raveendran, 2014; Özgür, Elgin and Elveren, 2021).

At the same time, the diffused and unorganized character of informal sectors make it more onerous for authorities to track and enforce environmental regulations. Given this circumvention of environmental regulation and the finding of an inverse relationship between environmental pollution and the intensity of government regulations, most informal economic activities intensify environmental degradation (Brown, McGranahan and Dodman, 2014). Moreover, informal manufacturing sectors are usually made up of small-scale firms that lack the capital base for investment in clean or energy-efficient technologies (e.g., Timilsana and Malla, 2021). But depending on the linkages between formal and informal enterprises, the circumvention of environmental regulation may sometimes be intentional, perhaps even enabled by the authorities, with formal enterprises outsourcing environmentally burdensome activities to informal enterprises to cut production costs and, in some cases, maintain international competitiveness.[12] Urban informality also tends to encourage informal settlements or slums. These areas suffer from the lack of decent sanitation services and facilities and their locations both create and expose their inhabitants to climate-related hazards, especially flooding and landslides.

Taken together, measures designed to achieve economic development through structural transformation in a climate-constrained world will need to achieve sufficiently productive agriculture to ensure food security at affordable prices. Such measures include, but are not confined to, halting deforestation and land degradation, and, at the same time, improving access to technology in manufacturing and in agriculture that would enable productivity growth and employment generation.

(b) Scenario 2. Environmental sustainability vs. structural transformation: the case of consumer behaviour and trade

Growing environmental concerns have increasingly been reflected, particularly in advanced economies, in consumer demands that firms prioritize social and environmental sustainability along their supply chains. Recent evidence indicates an increasing scrutiny from consumers and regulators regarding firms' environmental standards but also that most firms have yet to achieve sufficient visibility of their supply chains and put processes in place that would allow them to undertake meaningful action commensurate to their mission or purpose statements (Villena and Gioia, 2020).

A strengthening of environmental sustainability measures could adversely affect structural transformation in developing countries to the extent that, over the next three years, lead firms refocus on the manufacturing links in their supply chains, and, in particular, on improving environmental sustainability by moving some of those links onshore or make more localized as part of their general objective of reducing overall shipping miles (Oxford Economics, 2021). The likely extent of reshoring, in both the short and the long run, is still unclear (Barbieri et al., 2020). However, such measures are likely to hamper structural transformation through export-oriented manufacturing that has played an important role in the successful experiences in East Asia particularly because the supply chains with the highest end-to-end emissions include sectors such as textiles and garments, plastics, electronics, and automobiles (WEF, 2021).

Structural change through export-oriented manufacturing may also be harmed once it is realized that it is erroneous to believe that services is a low-emissions sector and that the increasing shift in consumption patterns of developed countries towards services is a means of decoupling economic growth from environmental damages. Emission accounts which

include upstream value-chain emissions in the form of inputs procured by service providers for five developed economies reveal that their services sector accounts for around one fifth of these economies' total emissions. This is because service provision requires inputs from manufacturing – electronics, pharmaceutics, materials and machinery – sectors that produce emissions and that often take the form of imported inputs and intermediates (Roberts et al., 2021).

While such trade-related consumer-based accounts are gaining importance, there is little evidence to suggest that global maritime transport is a main contributor to CO2-emissions. Indeed, other modes of transport, and in particular road transport, are significantly more polluting, with international maritime transport generating less than 10 per cent of the emissions of the transport sector (IEA, 2019).

Climate change can also hamper developing countries' manufactured exports by the damage that natural hazard events (such as sea level change, increased storm intensities and rising temperatures) cause to ports and maritime supply chains, which enable global commerce. Even though prospective damages are sizeable,[13] only a few countries have implemented required adaptation strategies. Uncertainties in climate projections, high upfront costs, and often unquantifiable benefits of adaptation measures imply that such investment can make a port more attractive for some time but eventually will prove to be no more than stop-gap measures because they do not solve the underlying cause of climate change (Becker et al., 2018). Nevertheless, many developing countries may be at a disadvantage as smaller ports are likely to have the least resources for required investments and may lose their local port functions in a process towards consolidation of port infrastructure at the regional level.

Structural transformation through export-oriented manufacturing will also become more challenging if developed countries establish carbon border adjustment mechanisms (CBAMs), i.e., tax imported goods based on domestic carbon prices and the greenhouse gases emitted abroad to make them.[14] By imposing the same price on carbon emissions from domestic and foreign production, such mechanisms would set limits on the carbon content in traded goods. As such, they would be particularly onerous for the many developing countries that rely on coal-based electricity as an energy source for their manufacturing activities.

One major objective of CBAM is to avoid so-called "carbon leakage", i.e., a shift of polluting industries to jurisdictions with less stringent emission regulations that might occur with an increase in domestic carbon prices. Such increases are generally considered to be required to attain recently set tighter climate objectives – such as reducing emissions by 2030 from 40 per cent to 55 per cent, as adopted by the EU (European Commission, 2021a) – while not causing further de-industrialization in developed countries. This objective also indicates that securing manufacturing employment and activity play a central role in the climate measures of developed countries.

But should carbon border adjustment mechanisms be implemented, much of their impact on structural transformation in developing countries will depend on their detailed technical specifications, with one of the major legal challenges being to make these mechanisms compatible with WTO rules. However, independent of these details, the principle of these mechanisms is to impose on developing countries the environmental standards that developed countries are choosing. This goes against the principle of common but differentiated responsibility enshrined in the Paris Agreement. Moreover, should the revenues from these mechanisms be used in developed countries, rather than be invested in climate adaption in developing countries, they would turn basic principles of climate finance on their head.[15]

(c) Scenario 3. Low-carbon technology and structural change: the need for a cohesive approach

It has traditionally been considered that latecomers to structural transformation have an advantage over early industrializers because they can quickly and less riskily adopt technologies, methods of production, and management techniques that have been developed in advanced countries. The hypothesis of an "advantage of backwardness" postulates that the more distant a country is from the world's technology frontiers, the greater the potential benefits it can reap from this advantage (Gerschenkron, 1962). This is because adopting existing technology is easier and faster than relying on innovation, which is costlier, more uncertain and highly-knowledge intensive.[16]

However, a strategy of relying on the adoption of technology from advanced economies has become much less attractive because many of these technologies are related to burning fossil fuels. Developing countries that rely on importing carbon-rich technologies risk

getting locked into unsustainable production patterns and may have to face very high costs of switching to low-carbon technologies in the future, as the urgency of climate adaptation only increases.

Engaging in low-carbon technologies early in the process of structural transformation avoids the building of high-emission production structures and associated high switching costs in the future. Policy frameworks that mutually reinforce structural change and the adoption of low-carbon technologies reduce the risk of a technological lock-in, especially where low-carbon solutions allow for easy retrofit options and ensure interoperability with existing structures. Moreover, early engagement in low-carbon solutions provides opportunities for augmenting fixed assets in economic activities that can provide and rapidly scale up advantages in international production directed towards new and expanding markets, which either require compliance with high environmental standards or where consumers are willing to pay higher prices for products that emanate from environmentally sustainable production (UNCTAD, 2020a).

This means that, in a climate-constrained world, latecomers to structural transformation might enjoy an "advantage of backwardness" not because they can access proven technologies from advanced countries but because they face less switching costs from their lower level of stranded assets and locked-in carbon-intensive technologies. As a result, their technological challenge is less the gainful appropriation of technologies from advanced economies and retracing the steps taken by already-industrialized countries, than to raise the pace of capital formation by leapfrogging into new low-carbon technologies that are appropriate for their specific economic and ecological conditions.

One way to accelerate capital formation and leapfrog to carbon-low technologies relates to international technology transfer. However, literature suggests that the transfer of low-carbon technology on commercial terms works well among developed countries, while developing countries continue to be exposed to a range of economic, financial, and technical barriers – such as subsidies to fossil-fuel technologies, lacking access to appropriate finance, and an absence of energy efficiency regulations or other incentives for the adoption of low-carbon technology – that prevent private commercial transactions to take place between developed and developing countries (Trærup, Greersen and Knudsen, 2018). These findings are supported by evidence from trade data. While trade in low-carbon technologies (LCTs) has increased more than global trade over the past three decades, developed countries continue to account for most of both exports and imports of LCTs, even though China has become the world's largest importer and exporter of LCTs. China has also become the leader in foreign direct investment in renewable energy technology, i.e., the only category for which comprehensive FDI-data are available (Pigato et al., 2020).

An analysis of recent patent data (e.g., Corrocher, Malerba and Morrison, 2021) indicates a remarkable process of growth in green patenting in successful latecomer countries – especially China, but also the Republic of Korea, and Taiwan Province of China. Perhaps most importantly, the recent literature suggests that intellectual property rights (IPRs) do not have a positive impact on technology transfer to developing countries in recent years (e.g., Kirchherr and Urban, 2018). Indeed, a report on LCT transfer concludes that the "analysis presented in this report finds that strong IPR protections have no significant effect on LCT transfer from either high-income or developing countries" (Pigato et al., 2020: xxiii). This finding undermines the traditional case for strong patent protection, based on the argument that strong protection of IPRs promotes the transfer and dissemination of technology. Combined with the general need of a global sharing of the intellectual property that underpins LCT to achieve climate objectives, this finding supports calls for a general waiver of IPRs on LCT like that for Covid-19 vaccines, as further discussed below.

Leapfrogging to low-carbon technologies based on domestic efforts has the potential to yield important benefits in the long run. This is partly because improved environmental performance enhances the attractiveness of suppliers in supply chains, and because it provides opportunities to exploit early mover advantages, at least relative to other latecomers, as markets are not yet taken by incumbents and market entry barriers are lower because technologies are not yet protected by patents.

Many low-carbon technologies are intrinsically local because the nature of their energy source depends on an economy's specific ecological conditions. This implies that new low-carbon technologies have less of a need for retrofitting than new versions of fossil fuel-based technologies would have. Building structural change on fossil fuel-technologies now would be particularly exposed to the risk of asset stranding.

Technological leapfrogging as part of an integrated strategy that combines structural transformation and climate adaptation may rely on what has been called "green windows of opportunity" with features that markedly differ from traditional windows of opportunity for rapid structural change (e.g., Lee and Malherba, 2017). Considering that windows of opportunity for rapid structural transformation may result from "changes to the prevailing techno-economic paradigm, changes in market demand or major modifications to government regulations or policy interventions" (Lema, Fu and Rabellotti, 2020: 1195), case-study evidence indicates that, compared to traditional windows of opportunity, green windows of opportunities stand out due to a relatively more important role of government policies, strong knock-on effects on new market demand (e.g., through government procurement) and technological change (e.g., by inducing mission-guided public R&D programmes), and a relatively greater importance of local conditions and domestic markets (e.g., because of the intrinsically local character of related energy sources, mentioned above) even when the external environment and external market opportunities play an important role.

The greater role of government policies has been reflected in the well-known Porter hypothesis, which states that "properly designed environmental standards can trigger innovation that may partially or more than fully offset the costs of complying with them" (Porter and van der Linde, 1995: 98). Some studies have found only mixed support for this hypothesis in that environmental regulations induce innovation activity in cleaner technologies but that the direct benefits from these innovations do not appear to be large enough to outweigh the costs of regulations. It is important to note that this finding comes from analyses that study the impact of environmental regulations on firm competitiveness in isolation (Dechezleprêtre and Sato, 2018).

By contrast, a recent review of the literature on the impact of investment in clean technologies on sectoral production costs and productivity growth concludes that "most studies examining the relationships between green/clean technologies and productivity show a positive relation", that this is true especially for the manufacturing sector, that large firms have a greater capacity to make such investments, and that the "primary factors behind the growth of green/clean investment are policies and measures introduced by the government in response to environmental concerns, particularly global climate change" (Timilsina and Malla, 2021: 3, 39).

Leapfrogging towards low-carbon technologies also faces important challenges. Apart from building the required technological capabilities, an important challenge for public policies is to ensure that public investment crowds-in private investment in a way that capital accumulation supports structural transformation and employment generation. In other words, policy coherence – combining clear climate commitments with policy measures that demonstrate decisive following through on those commitments – is probably the most important single factor that supports an integrated approach to structural transformation and climate adaptation.

This poses questions as to what a pandemic-related greater permissiveness of proactive policies and the important role that government policy plays in the promotion of green paths to structural transformation imply for concrete policy measures and how these measures can be financed. This is the focus of the second part of this Chapter.

D. Policies to combine structural transformation and climate adaptation strategies

Neither climate mitigation, nor climate adaptation, are necessarily a drag on economic development. Instead, they can become cylinders in a new engine of growth, which emphasizes the simultaneous achievement of structural transformation (productivity growth, technological upgrading, more and better paid jobs) and the benefits of environmental preservation (avoiding the negative effects of global warming). The preceding discussion has also shown that, much like industrialization, addressing climate constraints requires far-reaching structural transformation of productive activities, where a climate-conscious structural transformation must include a shift from high- to low-carbon intensive activities. As such, diversification, not de-risking, needs to be put at the centre of the climate adaptation agenda.

This part of the chapter first discusses the impact of climate constraints on industrial policies. It then looks at complementary national policies, with an emphasis on fiscal policy and the role of central banks, and ends on discussing the role of the State in moving towards a low-carbon economy. International policy issues related to trade and finance are the subject of the next chapter.

1. Industrial policy revisited

The debate on industrial policy has a long history both in terms of theoretical background and forms of application.[17] Its recent return to prominence in policy discussions is less the result of new analytical insights, and more related to a reassessment of policies that were guided by the Washington Consensus. The lop-sided emphasis on government failures that allegedly cause proactive policies to harm rather than support development, has produced outcomes that have not only fallen short of their own promises but also of successful development experiences that relied on more interventionist policies, leading to a more generalized reappreciation of the role of the state and a related inspection of how industrial policy can be used best. Another reason is the growing recognition that the urgent large-scale transformations related to climate change adaptation cannot be achieved without active government support (e.g., Gallagher and Kozul-Wright, 2019; European Commission, 2021b). Given that moving towards a low-carbon economy implies a reshaping of economic structures, applying key principles of successful industrial policymaking can provide valuable insights for climate change adaptation policies.

Industrial policy may be defined in numerous ways, but most definitions refer to "targeted and selective government policies to shift the production structure towards activities and sectors with higher productivity, better paid jobs and greater technological potential" (UNCTAD, 2016: 176). Green industrial policy has a wider scope. It aims not only at shifting the economic structure towards higher-productivity activities, but at aligning productivity-enhancing structural transformation with shifts from high carbon-intensive to low carbon-intensive resource-efficient activities, and particularly at exploiting the synergies between these two processes of structural transformation.[18]

The greening of industrial policies comes with additional challenges. Of greatest importance among these additional challenges are that green industrial policy (i) provides a clear normative direction towards "good" technologies that can guide a conscious steering of investment and technological change towards low-carbon activities; and (ii) has significantly greater ambition. This greater ambition is reflected not only in aiming at transforming the entire economy and doing so with considerable urgency in a short period of time to avoid environmental tipping points, but also in its need for broader economic and societal support in the face of higher global temperatures and a more disruptive climate, as further discussed below.

The traditional challenges related to structural transformation combined with these two additional challenges call for a results-driven framework and an approach to industrial policy where policymakers aim at shaping markets and "have the opportunity to determine the *direction* of growth by making strategic investments, coordinating actions across many different sectors, and nurturing new industrial landscapes that the private sector can develop further" (Mazzucato and Kattel, 2020: 312; emphasis in original). In this approach, transformations that unlock the synergies of industrialization and shifts towards low-carbon activities may be considered a global public good, which is generated collectively by a range of actors and in whose generation both the state and the private sector, as well as ordinary citizens, have active roles to play.

The remainder of this section discusses the implications of this perspective of green industrial policy for the objectives of policymakers and for basic principles of effective policymaking aimed at these objectives.

(a) Selected objectives of green industrial policies

i. Energy security

Avoiding the worst effects of climate change makes it imperative to succeed in a large-scale transition to clean and renewable energy. It has been estimated that reaching net-zero carbon emissions by 2050 will involve a reduction of fossil fuel-based energy from almost four-fifths of total energy supply today to around one-fifth. In its stead, wind, solar, geothermal, hydro and bioenergy would have to provide two-thirds of the total (IEA, 2021). The clean-energy transition will arguably have the biggest impact on structural transformation because fossil fuel-based energy has been the backbone of industrial activities.

Most technologies needed to achieve the transition to clean energy and the resulting deep cuts in global emissions by 2030 are today commercially available (Pollin, 2020) and their adoption has already contributed to a large reduction in the cost of energy production over the last decade. According to IRENA (2021), costs of electricity from utility-scale solar photovoltaics (PV) fell 85 per cent between 2010 and 2020, and most of new wind and solar projects produced cheaper energy than coal plants in 2020. Lazard (2020) estimates that onshore wind and utility-scale solar energy became cost-competitive with conventional generation of energy several years ago on a new-built basis, and that the cost of storage of renewable energy has also diminished rapidly. Based on recent trends, further reductions of costs can be expected regarding renewable energy production and storage. In the same vein, Mathews (2020) argues that the costs of solar PV have been falling by 28.5 percent for every doubling of production.

Obstacles to achieving further transformation have been mainly social and political (Pollin, 2020). Especially in developed countries, these obstacles include the high cost in the form of stranded assets that would be implied by disrupting environmentally unsustainable technological pathways. One result of attempts to avoid such costs may be the continued large subsidies for fossil fuels. Recent estimates indicate that, over the period 2017–2019, G20 governments provided an annual average support of $584 billion to the production and consumption of fossil fuels at home and abroad, in the form of direct budgetary transfers and tax expenditure, price support, public finance, and SOE investment (IISD, 2020), with coal and petroleum together account for 85 percent of global fossil-fuel subsidies (Coady et al., 2019).

Removing these obstacles in developing countries will not only foster structural transformation towards a low-carbon economy but also support industrial development. The equipment to generate renewable energy (wind turbines, solar photovoltaic cells, batteries) are products of manufacturing and, just as traditional manufactures, are likely to enjoy increasing returns to scale from learning by doing and, especially as the turn towards renewable energy accelerates, expanding markets (Mathews, 2020). As such, the switch to renewable energy can help foster industrialization, while advancing the energy transition (initially through the diversification of energy sources), reducing the vulnerability of energy security to changes in global fuel prices, and freeing scarce foreign exchange for imports of capital goods and technologies that will further support industrialization.

Morocco is one example of a developing country that has adopted a comprehensive strategy aimed at industrialization based on low-carbon, resource efficient technologies.[19] Starting from the desire to diversify the energy mix and reduce the share of imported fossil fuels in energy supply, Morocco adopted ambitious renewable energy targets in 2008 and created a favourable legal framework, training and research programmes, a project development and implementation agency, and dedicated public funds to finance required investment. While initially targeting use of renewable energy in housing and agriculture, the government also began providing tax reductions and other investment incentives for manufacturers to adopt domestic renewable energy sources and to manufacture parts and components for renewable energy and energy-efficiency technologies, with a view to creating a market for renewables and foster the development of a local industry. While the strategy has supported employment creation and domestic manufacturing, insufficient coordination of individual policy measures has hampered a scaling-up of the initiatives and their outcomes (Auktor, 2017).

China's engagement in renewable energy production has also initially aimed at building energy security. But the judicious coordination of a wide range of industrial policy measures (such as tax incentives, domestic capability formation and standard setting, and the provision by development banks of finance at discounted rates in priority activities) has propelled China to a globally leading provider of manufactured low-carbon energy devices (Mathews, 2020). This has been the case particularly for solar photovoltaic products, which can be mass manufactured and provide an easier entry point for developing countries into emerging low-carbon technologies than, for example, wind power equipment where the high transport cost of some components, or the requirement for local maintenance and servicing of specific turbine models, require rapidly growing domestic demand to support the development of manufacturing activities (Binz et al., 2020).

China's rapid development of low-carbon energy sources has also supported the country's technological shift from internal combustion engines to electric automobile technology, with an emphasis on cars and two-wheelers. Proactively engaging in this shift has been considered an opportunity for

catching-up in global automotive technology and production, in addition to addressing urban air pollution. The government has supported this shift on the demand side through generous purchase subsidies, tax exemptions, public procurement and the creation of a public electric grid company tasked to build an infrastructure of charging stations for electric vehicles, as well as on the supply side through dedicated research programme on lithium-ion batteries, electric vehicle quotas for carmakers, stricter fuel economy requirements, new technological and environmental regulations, etc. These measures have made China a leading global market for electric vehicles. While Chinese manufacturers have so far mainly covered the low-end product range, the government's stronger emphasis on research, stricter technology standards, and consolidation of the fragmented auto and battery industries are set to result in rapid upgrading (Altenburg, Feng and Shen, 2017). Particularly the recycling and reuse of batteries will provide further manufacturing opportunities, as discussed in the following section.

ii. Resource security

Achieving resource security relates to the concept of a "circular economy", which relies on the insight that resource use must be decoupled from output growth to ensure that the global economy can grow, and the growing global population be fed without an ever-increasing demand on Earth's finite resources. This decoupling can be achieved by replacing the traditional linear path of resource use with a circular economy that can be characterized by 3Rs – reduce, reuse, recycle.

The linear path of resource use relies on extracting resources from nature at one end of the process and dumping the residues back into the natural world at the other end. Doing so creates the threat of unmanageable waste and shortages of key resources, including water and rare minerals and metals.[20] A circular economy aims to slow the depletion of non-renewable natural resources, reduce environmental damage from their extraction and processing, and reduce pollution from their use and disposal. It seeks to do this by increasing the efficiency and productivity of resource use and by reducing the share of material that is not reused. It also aims to change product design to foster reuse, refurbishing and repair, rather than their disposal.

Moving to a circular economy may be defined as representing "a change of paradigm in the way that human society is interrelated with nature and aims to prevent the depletion of resources, close energy and material loops, and facilitate sustainable development" (Prieto-Sandoval, Jaca and Ormazabal, 2017: 610). In this definition, geographic proximity is a key component of the circular economy. As such, it provides a new entry point for industrialization as the circular use of resources is based on disassembling and re-manufacturing resources which, like more traditional manufacturing processes, may be subject to increasing economies of scale and result in a decline of the costs of recirculated materials to below the cost of newly extracted materials (Mathews, 2020).

The reuse of resource waste from domestic manufacturing processes can be enhanced by the promotion of a global circular economy that provides opportunities for developing countries to export re-manufactured products. However, such support can materialize only if an emerging global circular economy is not one where developed economies reduce their carbon footprints by dumping their waste and scrap on developing countries or by outsourcing carbon-intensive recycling and re-manufacturing stages of the circular economy to developing countries and tax resulting re-imports through carbon border adjustment mechanisms, or where they themselves undertake recycling and re-manufacturing activities and export to developing countries production inputs or final consumer goods at prices that make developing country producers of new goods and materials uncompetitive. Avoiding such outcomes requires appropriate trade policy measures to provide a developmental frame for a global circular economy, as addressed in chapter 5 of this Report.

iii. Low-carbon agriculture and food security

Current modes of food production, which are based on intensive industrial agriculture that rely on high inputs of fertilizers and pesticides and dominated by large-scale specialized farms – cause substantial environmental burden, in addition to being characterized by a lack of secured access to food and the widespread occurrence of forms of malnutrition (FAO et al., 2021). Agri-food systems (including crops, livestock, fisheries, aquaculture, agroforestry and forestry) account for about one-third of total anthropogenic greenhouse gas emissions (Crippa et al., 2021). Moreover, industrial agriculture, fish farming and forestry is often related to export-oriented global value chains, with product demands imperfectly suited to local soil conditions, resulting in soil degradation,

overfishing and the replacement of natural wildlife systems with food crops or animal feed.

One approach to adapting agriculture to climate constraints is through climate-smart agriculture. This approach builds on sustainable agriculture approaches, using principles of ecosystem and sustainable land and water management and landscape analysis, and assessments of the use of resources and energy in agricultural production systems and food systems. It does not rely on a set of practices that can be universally applied, but rather involves different elements that are embedded in specific contexts and tailored to meet local needs.[21]

This comprehensive approach will bring benefits in terms of adapting agriculture to climate change but may not be sufficient. In an analysis of different scenarios for reducing emissions from agriculture by 2030 to limit warming in 2100 to 2 degrees Celsius above pre-industrial levels, Wollenberg et al. (2016) find that plausible development pathways fall far short of that goal, and that more transformative technical and policy options would be needed.

More radical approaches include the production of food from microbes. The resulting microbial biomass is rich in proteins and other nutrients. One huge benefit of this method, which is still in its infancy, is that brewing microbes through precision fermentation can move production of food from fields to factories and thus reduce the need for farmland and intensive agriculture, reducing the environmental impact of food production and allowing land use for other purposes in the process. Another is higher efficiency than in traditional agriculture. In terms of caloric and protein yields per land area, microbial production can reach an over 10-fold higher protein yield and at least twice the caloric yield compared to any staple crop (Leger et al., 2021). Moreover, as with other manufacturing activities, the costs decline as producers move along the learning curve and productivity increases.

It remains uncertain which, if any, of these innovations will eventually make strides into global agricultural production in the decades to come. But if they do, the environmental sustainability of food production is very likely to increase drastically at the global scale. However, it is concerning that these innovations will further detract from the universal availability of affordable nutritious food in developing countries. These innovations tend to be owned and applied in developed countries, with likely adverse impacts on developing countries' net food import balances. And if these shifts to less carbon-intensive modes of food production cause food price increase in developing countries, they will also have an adverse impact on their low-carbon industrialization pathways.

Most importantly, these changes would largely eliminate farmers and hand food production and food security over to large digital and agro-industrial corporations that mostly reside in developed countries. This further expansion of corporate power would be made worse by using the land that has been freed-up by moving food production to labs as carbon sinks in which global financial capital can invest to reduce their net carbon footprint by offsetting their own emissions without actually reducing them (e.g., Oxfam, 2021). What is needed instead are agroecological approaches that can tackle climate change and ensure food security while at the same time ensure decent income of local farming communities.

(b) Lessons for effective industrial policymaking

Critics of industrial policy query the practical implementation of industrial policy, typically pointing to information asymmetries between government officials and entrepreneurs, as well as rent seeking by government officials and industry lobbyists (Oqubay et al., 2020). Here, the lessons of successful structural transformation in developed countries and in the East Asian developing economies provide useful insights (see also UNCTAD, 2006, 2016, 2018).

A first such lesson is the need for *strong administrative and institutional capacities* for the government to formulate industrial policy and lead structural transformation. Experience with the Covid-19 pandemic and the uncertainties associated with climate adaptation suggest that governments should also possess dynamic capabilities to be able to anticipate and learn from events. One recent suggestion (Mazzucato and Kattel, 2020) applies such dynamic capabilities to five areas: foresight and anticipatory governance; handling partial and at times contradictory evidence; mechanisms for "mesh governance" (governance which includes multiple tiers); quickly repurpose existing infrastructure; and learning from other governments.

A second lesson is about *mechanisms of accountability* of policymakers and implementation agencies, such as through reporting requirements and other obligations to disclose information, combined with more general checks through auditing, independent

courts and the press. As noted by Altenburg and Rodrik (2017: 10), "[a]ccountability serves not only to prevent corruption, favouritism and other forms of collusive behaviour but also helps to legitimize appropriate industrial policies." Combined, the second and third lessons constitute reciprocal control mechanisms.

A third lesson involves embeddedness – the *close relationships between entrepreneurs and government officials* that can ensure a mutual exchange of information and common understandings. Embeddedness will be particularly important for green industrial policies because climate adaptation involves a grand societal transition to new economic pathways. This societal transition involves a broader set of stakeholders and tends to create a larger number of disadvantaged parts of the population, especially those affected by disruptive energy policies in sectors, such as the scrapping of fossil-fuel subsidies. Given the already large income and wealth inequalities across and within many developed and developing countries, targeting, designing and phasing-in of green industrial policies must avoid further increases of inequality and, instead, reflect broad societal consensus.

A final, and related, lesson concerns disciplining devices that the State uses to *sanction abuse* of its support and to *discontinue* failing projects and activities. Disciplining abuse requires clearly defined objectives, measurable performance indicators, appropriate monitoring and evaluation routines, and government autonomy in deciding where and when to apply disciplining devices, as well as where and what experimental approaches to apply, and where and when to change course if something goes wrong.

2. Fiscal policy

The accelerated investment in green infrastructure and low-carbon technologies that climate adaptation requires will not be possible without fiscal expansion and a rebalancing of the structure of public expenditure towards an emphasis on low-carbon activities. In this context public procurement, which has always been a major part of public policy, is a powerful policy tool governments can use strategically as a major purchaser (UNCTAD, 2016, Chapter 6).

Expanded and restructured public spending will need to aim both at an increase in public investment, such as to foster the transition to renewable energy sources, and an increase in government transfers, required to address the adverse effects of the shift away from fossil fuel-based production modes and ensure that a low-carbon economy is more inclusive than the fossil fuel-based economy of the past few decades. One important distinctive factor of transitions to low-carbon paths of structural transformations is that expansionary fiscal policies that include green stimulus measures tend to have higher fiscal multipliers (UNCTAD, 2019). This is the case particularly in developing countries where the stock of public capital as a share of GDP is generally low, so that the higher direct output effect of increased public investment combines with a larger crowding-in effect on private investment to result in larger fiscal multipliers (Izquieredo et al., 2019).

Fiscal multipliers will also be higher where fiscal expansion is accompanied by an increasing role of public banking. The mandates of development and other public banks that value long-term development outcomes and sustainable economic transformations facilitate crowding-in of private investment (UNCTAD, 2019). This is the case, for example, because the broad range of activities that require investment for climate adaptation requires strategic collaboration between the government and private investors that aims at coordinating investment activities, where the interdependence of individual investment decisions makes the investments and profits of one entrepreneur partly dependent on the investment decisions of others.

Another distinctive benefit of green fiscal expansion is higher employment benefits. This is because expanding low-carbon sectors tend to be more labour intensive than shrinking high-carbon sectors. A recent study estimated that renewable energy, energy efficiency and grid enhancement will create around 19 million new jobs worldwide by 2050. As the job losses in the fossil fuel sector will be around 7.4 million, the net addition will be 11.6 million jobs (Gielen et al., 2019; see also IMF, 2020). The greater job-generation capacity of a green path towards structural transformation may be of particular importance for economies where labour migration resulted in an expanding urban informal sector, including because existing technologies were too capital intensive for these economies' structural conditions, as for instance, in parts of Africa.

3. The role of central banks

Central banks around the world have been gradually adapting their operations, and in some cases,

their mandates, to better reflect the financial risks related to climate change and reduce the threat of a "Minsky climate moment" (e.g., UNCTAD, 2019). A global Network for Greening the Financial System has brought together more than 80 central banks and financial institutions to explore various means by which central banks can play their role as both leaders of the financial system and also investors. These include integrating climate risks into prudential and monetary frameworks and insisting on regular climate stress tests and disclosure across the financial system.

However, as UNCTAD and others have noted before, this is encouraging but not sufficient. Helping to mitigate risk is the minimum that is needed to encourage positive investment in transformative activities and processes that will assist countries adapt to climate change and reduce emissions overall. Others have also argued that central banks need to align their current Covid-19 responses to avoid locking-in to high carbon recovery as they attempt to maintain financial stability (Dikau, Robins, and Volz, 2020; McDonald et al., 2020). Liquidity enhancing stimulus measures that are not aligned with the ambitions of the Paris Agreement can exacerbate already existing climate-related risks in the portfolios of financial institutions and across the financial system as a whole. Moreover, as governments around the world think about easing off the stimulus put in place since Covid-19, care will be needed to ensure this does not further increase climate related risks, nor the costs of capital for already struggling developing countries.

Some central banks have gone further, by putting in place macro prudential policies and positively guiding capital in a more carbon-sensitive way. A number of developing countries have been very active in this new direction for several years already (Campiglio et. al., 2017; Dikau et al., 2020; UNCTAD, 2019; Volz 2017). The People's Bank of China, in particular, has long used financial policies and directed credit to support green industrial policies, but banks in much smaller economies have also been experimental and innovative in terms of capital creation and direction. These are, however, more related to providing finance for climate mitigation than adaptation, reflecting the fact that even when interest rates are low the funds are still given as a loan not a grant. Banks are in the business of banking; even when offering loans at concessional terms, they are not normally seen as grant giving bodies nor philanthropists. This is not to say that they cannot be the engine of finance for other institutions that are grant giving bodies and philanthropists, especially in advanced economies.

Given the scale of adaptation needs and the fact that those who suffer the most are the least able to pay for them, it is clear that advanced and more resilient economies will be the main source of finance. As central banks around the world were able to help support governments directly during the Covid pandemic, post-Covid recovery period presents an opportunity to consider to what extent central banks could also follow this path to supporting government development ministries, aid agencies and development banks.

At the very least, central banks could do more to ensure they do not continue to support carbon-intensive and maladaptive activities – which means a change in the current programme. While governments around the world have reduced sharply their financing flows to the fossil fuel and petrochemical industries since the Copenhagen COP, central banks remain the primary conduit for that finance – accounting for some $26 billion out of a total $38 billion of public funding that began since 2009 and remains active today, in the sense that transactions and bonds have yet to mature (Barrowclough and Finkill, 2021). This sends the wrong signal to the markets and to society.

This has continued during the recent Covid-19 period when central banks purchased corporate bonds on an unprecedented scale as part of their emergency operations to increase liquidity and avoid economic paralysis. Surveys of central bank Covid-19 recovery packages find that many are biased towards fossil fuel finance and did not attempt to tilt away from the sector (Oil Change International, 2021), even though several have active research and policy interests raising awareness of the contradiction.

UNCTAD and Lund University research similarly finds that Covid-19 recovery purchases by major central banks are often at odds with their governments' green ambition.[22] In extending the supportive public function of the central banks to climate needs, BoE (2021) notes that incentives could be used to influence companies to achieve net zero, and these could be ratcheted up over time. At the same time, the Bank also notes that disinvesting out of high-carbon companies means it would lose an opportunity to influence its policy; and recent Covid-19 recovery support schemes suggest that this needs to be an explicit goal or it might not happen. Support to the fossil fuel industry was typically given without any conditions but the opposite occurred when funds were

given to firms in the renewables sector (Tearfund, 2021). The growing awareness of these issues is encouraging, but going the further step - to consider how central banks in advanced economies could help finance adaptation in less developed ones - has not been high on the radar screen.

In addition to properly regulating the financial sector, central banks should use a fuller range of tools to create and guide finance to green activities. More specifically, they should stop implicitly supporting high carbon emitters and penalising low-carbon activities. Collateral policy is one of the main tools towards greener central banking: central banks should also adjust their collateral regulations and accept financial institutions' green bonds as collateral.

4. Towards a green developmental state

While there is broad agreement on the need to widen economic policy objectives to include environmental adaptation, disagreements continue as to the role and scope of the State in attaining these objectives. Taking its cue from framing the adaptation challenge as one of risk management, one school of thought argues that most of the heavy lifting should be done by the private sector, with the role of the State focussed on distilling environmental objectives into bankable projects and de-risking these projects such that global private financial capital invests in them. In addition to long-standing beliefs that State involvement creates, rather than resolves, economic problems, this approach assumes that efficient resource allocation and maximizing economic welfare is supported best by the creative forces of markets. In this view, pro-active State action comes in as a last resort, when de-risking fails to produce investable projects (see also Chapter III of this Report).

An alternative view of the role of the State starts from the recognition that climate adaptation requires *transformation,* rather than the preservation of existing assets, i.e., the core of the risk-management approach. This is akin to the notion discussed earlier of a "developmental State" in East Asia's rapid industrialization and economic catch-up. To be applicable to the challenges of climate adaptation, policymakers need to recognize changes in the development agenda. This especially concerns the ways structural transformation and rapid economic growth connect with the global challenge of climate change to ensure sustainable low-carbon development. While this agenda continues to see technological and industrial upgrading and raising levels of material prosperity as key development objectives, these objectives need to be reconciled with environmental sustainability goals.

As a result, the traditional concept of the East Asian developmental State has evolved and been adapted for several reasons. In East Asia itself, the successful industrialization strategy and the economies' moving up to middle- or even high-income status reduced the importance of capital accumulation and increased the role of innovation and technological advance for economic growth. At the same time, rising household incomes made constraints on consumption more difficult to maintain, while strengthening the desire of citizens for greater participation in society not least because of the environmental degradation associated with rapid industrial growth.[23] Internationally, the reorganisation of global production around global value chains made domestic firms increasingly beholden to the guidance of MNCs, in the process becoming detached from agreements with the state. The tightening of rules and regulations in international trade and investment agreements reduced the policy space for some of the industrial policy measures East Asian economies had applied, while the increased financialization of the global economy made achieving macroeconomic and financial stability more complex (UNCTAD 2006, 2014).

Domestically and internationally, beginning in the 1990s, these changes prompted traditional East Asian developmental States into a set of liberalization measures and regulatory changes which helped to usher in the 1997-98 financial crisis in the region (UNCTAD, 1998). Despite the origins of the crisis, the response in international policy circles, including the international financial institutions, was to further demonise the developmental State and promote the idea "of doing business" properly. This perspective is not only premised on questionable assumptions about market dynamics but also equates the developmental State with specific policy measures and freezes the concept in space and time. It fails to recognize that at its core "is not the existence of intervention per se but rather the *developmental ambition and elite consensus that* frames that intervention and the existence of institutional capacities that help translate ambition into more or less effective policy outcomes", and while, with regard to the Republic of Korea, "the type of conditions placed by the government on industry support has evolved in tandem with changing objectives, there is little evidence to suggest that the Korean state has abandoned such practices in science-based industries" (Thurbon 2014: XI, XIV; emphasis in original). [24]

Indeed, the Green Growth Strategy that the Republic of Korea adopted in 2008 may be characterized as "an eco-oriented development strategy with an activist industrial policy dimension" (Dent, 2018: 1200). It has allowed, *inter alia*, for the development of world-class smart-grid systems based on local technologies and the assumption by the Republic of Korea of global leadership in key energy storage technologies, including lithium-ion batteries and hydrogen fuel cells (e.g., Dent, 2018; Kim, 2021). This means that, rather than dismissing the role of the developmental State, these changes have made the concept evolve to what may be called an "East Asian eco-development state" (Harrell and Haddad, 2021) or, more generally, a "green developmental state".

This re-orientation towards a green developmental State maintains the core elements of the traditional developmental state model (see UNCTAD, 1996; Wade, 2018), such as: (i) the developmental mindset of the political leadership centred on structural differences between economic sectors and targeted at long-term economic catch-up as a powerful shaper of the state's development strategy; (ii) a policy approach that emphasizes an active and coordinating role of the State in structural transformation applied through regulation and an incentive structure where state support is conditioned on performance requirements and an industrial policy aimed at technological upgrading and the creation of well-paying jobs – i.e., where the quality and modalities of interventions matter, not their quantity; and (iii) an institutional architecture that relies on a competent and mission-oriented bureaucracy that is independent from special-interest pressures while being in close contact with the private sector.

There are also important departures from the traditional model of state dirigisme. Perhaps the most important distinction is that policymakers must succeed in the *creation* of green industrial activities while simultaneously achieving the *destruction* of incumbent fossil fuel-intensive activities. Navigating these distinct but interrelated objectives will require a broader range of policy measures, based on the recognition that the industrial structure of developing countries in today's technology-induced global economy cannot flourish without a knowledge- and innovation-based development strategy.

Policymakers will also require societal support that goes far beyond the industrial elite. The combination of the constructive and the destructive elements of structural transformation towards a low-carbon economy requires an alliance between the state and society that extends to workers, who the traditional developmental State co-opted by creating high-wage jobs, and that pays greater attention to the spatial dimension of development and consequently a larger focus on rural areas and the role of agricultural development. Only such more balanced socio-economic alliances can defeat the influence of certain elite and interest groups that are heavily linked to carbon-intensive growth whose perpetuation would make it impossible for governments to apply a long-term green development-oriented approach (Oatley and Blyth, 2021).

Better balanced socio-economic alliances are also necessary because civil society has become a more proactive and empowered form of agency in the development process. As noted by Dent (2014: 1204), "[l]ow-carbon development is as much a societal process as an economic one, encompassing individual lifestyle and choice issues at the micro level as well as macro-level industrial and infrastructural strategies." This means that a green developmental State must explicitly aim to build state-society networks that are based on social participation, deliberation, and consensus and at the same time cover wide parts of the society. Building this new and broader legitimacy base complicates the move towards a green developmental State, even though these wider groups may share the common interests more than the corporate elite where vested interests and financial losses related to stranded assets may prevail.

Another important difference between the traditional and green developmental State lies in its international dimension. The developmental State has been a strategic political choice of countries aiming to compete in the global economy, but this has mainly been in the form of export targets and attracting FDI. By contrast, given today's hyper-globalization, policymakers also need to put in place capital-account management measures to insulate the domestic financial system from global financial instability. Moreover, the goals of today's developmentalism derive ultimately from the global agenda of decarbonising economic activity and international efforts to tackle climate change. Therefore, linking nationally devised and implemented strategies is part of a much larger international climate action project, and national strategies will need to reference their contribution to wider international endeavours on low-carbon development, such as the Paris Agreement (UNCTAD, 2019).

It is also important to note that a State focusing on de-risking will narrow the policy space of a green developmental State, as de-risking often implies a constraint on the very policy instruments that a green developmental State would apply. For example, regulatory de-risking would make it more difficult to maintain vertically integrated, state-owned energy utilities, to redirect subsidies from fossil-fuel to renewable energy providers, such as via feed-in tariffs, or to ensure guaranteed grid access for renewable energy sources. Moreover, financial de-risking would target green-oriented grants, tax relief, or debt-based instruments, while it would promote financial globalization with an emphasis on portfolio flows (rather than FDI as in traditional developmental States), which will tend to hamper macroeconomic and financial stability. It would also divert scarce fiscal resources from public investment towards backstopping public-private partnerships, such as to compensate a private operator for demand shortfalls in the payable use of infrastructure, or if a government introduces regulations, such as higher minimum wages, that might reduce private sector profitability.[25]

These international aspects of climate adaptation policies call for a new multilateralism that is enabled to provide the global public good needed to deliver shared prosperity and a healthy planet and to ensure that no nation's pursuit of its economic and environmental goals infringes on the ability of other nations to pursue them. This is discussed further in the following chapter.

E. Conclusion

Structural transformation, characterized by a shift in the production structure from the primary sector to manufacturing, has traditionally been the most successful way of achieving rapid economic growth. This avenue was followed by the now advanced economies, as well as a few successful late industrializers in East Asia. This traditional fossil fuel-intensive model, however, cannot satisfy the aspirations of the many other developing countries that are trying to upgrade their national incomes through industrialization because it would take emissions and resource consumption beyond the limits of the planet's ecological capacity.

The answer to this problem is not to forsake manufacturing development, and diversification strategies more generally, in developing countries. Rather, it is to build a low-carbon industrial system, powered by renewable energy sources and green technologies, and where economic activities within and across sectors are interconnected through resource-efficient linkages. Such a solution maintains manufacturing as a central objective because important elements of structural transformation towards a low-carbon economy are closely inter-related with industrialization. The energy transition and an emergent circular economy provide opportunities for a reduction of the carbon footprint of traditional manufacturing, as well as for the manufacturing of devices for a low-carbon economy themselves.

The transition to renewable energy and engagement with the circular economy can increase the scope for industrialization for a broad range of developing economies because they decouple economic activities from natural resource use. Sources of renewable energy – such as sunshine, wind and water – are more equally distributed than economically exploitable deposits of fossil fuels, and the circular economy allows extracting resources from used products and waste, thereby reducing the required quantity of new resources. Many activities related to renewable energy production and the circular economy can economically operate at low scale, opening business opportunities for small firms and rural areas. This will not only help to diversify economic production structures and reduce many countries' dependence on the production of a narrow range of primary commodities, but it can enlarge developing countries' tax bases and foster domestic resource mobilization as a source of development finance. These activities can also help to relax countries' balance-of-payments constraints. Relying on domestic production of energy and food requirements, thereby reducing the import of virgin raw materials, may allow for a sizable reduction of imports, which will liberate scarce foreign exchange for imports of capital goods for industrialization and economic catch-up.

None of these transformations are likely to occur without a developmental State. Successful structural transformations have generally relied on proactive government policies. Climate change adaptation implies system-wide changes that cannot occur without an integrated policy approach that addresses the multiple challenges

of industrialization in a climate-constrained world, synchronously and cohesively. In addition to undertaking large-scale public investment and financing the investment push required for green structural transformation through green financial instruments, it will involve green industrial policy and state-society relations that not only break existing fossil-fuel interests but also establish clear rules, the enforcement of which can govern the new green investment trajectories and ensure a legitimacy base that can rely on a wide range of societal groups.

Notes

1 Or, in other words, the economy attains the so-called "Lewis turning point".

2 Much of the criticism relates to Lewis' questioning of the neoclassical approach to labour and its focus on homogeneous one-sector economies, and his explicit reference to classical economics and historical experience (Sumner 2018).

3 Lewis (1979) extended his original approach by adding an "in-between" sector to the dual economy model. This sector includes a heterogenous range of small-scale enterprises in urban areas that operate in manufacturing, transportation, construction, and a wide range of services. They often are unregistered and constitute part of the informal sector. While these enterprises provide valuable employment, their capital base and levels of technology and productivity are generally lower than in the modern sector.

4 Lewis (1954) had, in fact, stressed that the traditional, non-capitalist sector should not only be identified with agriculture or rural areas, but includes all those economic activities that do not use reproducible capital. This criticism also gave rise to the so-called "urban bias" hypothesis (Lipton, 1977; Bates, 1988) that sees poverty in developing countries as concentrated in rural areas and as a direct result of how government policy manages the relationship between traditional and modern sectors, further discussed below.

5 The concept is closely associated with the contribution to development economics of Albert Hirschman.

6 This relationship is known as the "Verdoorn law" which is based on the observation that a key characteristic of manufacturing is its greater potential for the division of labour, which gives rise to scale economies.

7 Primary exports can also be an initial source of foreign-exchange earnings. However, in addition to issues related to the availability of affordable food, mentioned above, this mechanism may be constrained by the non-tradability of major food staples.

8 The failure of African economies to achieve structural transformation to a similar extent as East Asian economies has often been related to differences in managing the relation between the two sectors. Post-independence African governments were said to have an "urban bias" by concentrating infrastructure in urban areas, over-taxing rural areas, and tilting relative prices in favour of urban pursuits (Lipton, 1977; Bates, 1988). But see Karshenas (2001) who concludes that the major policy failure in Africa during the 1970s and 1980s was not the rate of agricultural taxation per se, but rather the failure to put money back into agriculture to increase productivity and thus nurture an increase in the net agricultural surplus.

9 In poor economies where the process of industrialization is in its infancy or where the income incentives for migration are low for other reasons, climate change may tighten the liquidity constraints of rural dwellers to the extent that they cannot afford migration (e.g., Selod and Shilpi, 2021). Where this is the case, climate change is likely to abort structural transformation and cause large swaths of rural populations to be trapped in poverty.

10 Land degradation and soil nutrient depletion have also resulted from so-called "land grabbing", where land, with its available water potential, is acquired by private and public actors, including sovereign governments, often with a view to securing their own national food security and biofuel needs. These acquisitions often occur in areas with weak land tenure regulations and with local governments in need of fiscal revenues, accompanied by little compensation for dispossessed local communities and little consideration for sustainable land use (e.g., Batterbury and Ndi, 2018).

11 The continued divergence of structural transformation in Africa from experiences in East Asia is clearly related to a broad of reasons that also include macroeconomic and institutional factors. The account here is limited to main elements of the Lewis model.

12 In a sense, this is the other side of the same coin regarding attempts to transit to low-carbon value chains from end to end, discussed below. See Rani (2020) for a general discussion of informal

employment for cost-cutting reasons, motivated by labour regulations or costly environmental or social protection policies.

13 For recent evidence on the cost of climate-related port disruptions, see, e.g., Verschuur, Koks and Hall 2020. See also UNCTAD, 2020b.

14 For the mechanism envisaged by the United States, see the President's 2021 Trade Policy Agenda and 2020 Annual Report of the President of the United States on the Trade Agreements Program, March 2021, https://ustr.gov/sites/default/files/files/reports/2021/2021%20Trade%20Agenda/Online%20PDF%202021%20Trade%20Policy%20Agenda%20and%202020%20Annual%20Report.pdf; for the European Union, see the proposal for a new Carbon Border Adjustment Mechanism, adopted by the Commission on 14 July 2021, https://ec.europa.eu/taxation_customs/green-taxation-0/carbon-border-adjustment-mechanism_en; for further discussion of this proposal, see UNCTAD, 2021.

15 According to media reports, the European Union plans to use the expected annual revenue of Euro 10bn from its planned carbon border tax mechanisms to repay debt incurred for its recovery measures; see Mehreen Khan "EU carbon border tax will raise nearly Euro10bn annually", Financial Times, 6 July 2021, https://www.ft.com/content/7a812f4d-a093-4f1a-9a2f-877c41811486.

16 The more recent literature argues that the advantage of backwardness can benefit only those countries that are not too far behind because many poorer countries require a level of domestic technological capabilities that is sufficiently high to gainfully use advanced technologies (e.g., Oqubay and Ohno, 2019). This helps to understand why many least developed countries have not benefitted from their "advantage of backwardness".

17 For a review of this debate see UNCTAD 2006, 2016; Cherif and Hasanov 2019; Oqubay et al., 2020.

18 For detailed discussion of definitions and concepts related to green industrial policy, see Altenburg and Rodrik, 2017; Harrison, Martin and Nataraj, 2017; and Tagliapietra and Veugelers, 2019.

19 For a more general assessment of the potential to link renewable energy and manufacturing in Egypt, Morocco, and Tunisia, see EIB, 2015.

20 See OECD, 2019, for a recent account of the use of material resources since 1970 and projections until 2060.

21 See FAO, 2017, with country-specific examples in FAO, 2021b.

22 'Pathways to Breaking the Fossil Fuel Lock-In'. Sources: Bank of England, Asset Purchase Facility (APF): Additional Corporate Bond Purchases – Market Notice 2 April 2020, https://www.bankofengland.co.uk/markets/market-notices/2020/asset-purchase-facility-additional-corporate-bond-purchases [Accessed 19 July 2021]; European Central Bank. (2021). Pandemic Emergency Purchase Programme, https://www.ecb.europa.eu/mopo/implement/pepp/html/index.en.html [Accessed 15 August 2021]; US FED (2021). Board of Governors of the Federal Reserve System. The Fed - Secondary Market Corporate Credit Facility, https://www.federalreserve.gov/monetarypolicy/smccf.htm [Accessed 23 June 2021].

23 This environmental degradation has a domestic component in the form of polluted cities, soils and rivers, as well as high greenhouse gas emissions, but also an international component in the form of deforestation in those countries that provide wood for the construction and furniture industries, or soybeans for animal feed.

24 For detailed discussion of the alleged death of the developmental State see, for example, Thurbon 2014; Wade 2018.

25 For more detailed discussion of these issues, see Gabor 2021.

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ADAPTATION GOVERNANCE: CHALLENGES IN INTERNATIONAL TRADE AND FINANCE

V

A. Introduction

In recent *Trade and Development Reports*, UNCTAD has outlined the case for a Global Green New Deal to tackle the multiple challenges facing the international community. At its heart is the call for a massive and coordinated investment and jobs push for a cleaner and more efficient global energy system. But as with its erstwhile namesake, this recovery strategy for the planet is linked to regulatory and redistributional measures which should also assume a global dimension. These include measures (and related institutional reforms) aimed at curbing the undue power and predatory practices of large financial and non-financial corporations, reducing the wealth and income inequalities that have created fragmented societies and distorted economies, and ensuring that resilience to unforeseen shocks is guaranteed for the many, not just the privileged few.

The previous chapters of this *Report* explained that at the national level, pursuing a Green New Deal requires recovering policy options (and the space to implement them) lost to the undue reliance on market forces. During the last forty years, two key assumptions have guided economic policy in many countries: first, that the private sector is uniquely placed, and should be left alone, to boost national incomes through its focus on cost competitiveness, guided by market efficiency, and second, that fiscal austerity is the best tool available to policymakers to correct macroeconomic imbalances that might alter market outcomes.

As a result, the global economy has been fundamentally transformed, shrinking the public space while unleashing the forces of financialization and rentierism. It has not, however, delivered the promise of a more vibrant, inclusive and stable economic system. This failure has been particularly evident with respect to investment, both public and private, where the trend, in many countries, has been stagnation or decline over this period, while a prolonged disconnect between wage and productivity growth in most countries, along with the degradation of public services, has produced widening socio-economic gaps (*TDR* 2017, 2020).

The unprecedented government response to the pandemic is an implicit recognition that both the need and the room for a policy shift is greater than previously acknowledged. Chapter II offered a series of lessons that should guide policy forces, beyond the context of the current crisis and recovery. Among these, the recognition that "no one is safe until everyone is safe" speaks directly to the extension of the resilience challenge to climate adaptation.

But there are significant differences across countries in their capacity to respond to that challenge. In particular, the pandemic has exposed the gulf between developed and developing countries when it comes to the space they have to mobilize the resources needed to respond to unforeseen shocks. This has unavoidable implications not only for a big investment push into new sources of energy, but also for their capacity to respond to the growing threat from rising global temperatures.

The intensification of climate threats facing developing countries is not of their own making. Given this history, as well as the tight external constraints

on their efforts to mobilize resources, they cannot be expected to put their own house in order without significant financial and technological support from the international community. As noted in Chapter III, the principle of common but differentiated responsibilities is intended to ensure that advanced countries provide that support, commensurate with the economic benefits they have reaped from pumping two centuries' worth of greenhouse gases into the atmosphere. The best vehicle for mobilizing and coordinating that support remains the multilateral system.

Previous *Reports* have stressed that the current multilateral architecture will need to undergo reforms to be able to address the multiple crises facing developing countries, in the time frame, and with the ambition, that has been set by the international community. In part, this means getting the institutions established in the years between 1944 and 1947 back to what their original designers intended (Gallagher and Kozul-Wright, 2021). Yet even assuming we are in "a Bretton Woods moment" (Georgieva, 2020), this cannot be an exercise in simply winding the clock back, given the weaknesses and asymmetries in the original design (particularly on matters of economic development). In 2021-22, creating a new multilateralism for shared prosperity is just as, and arguably even more, demanding a task than it was at the end of the Second World War. The global economy is now larger, more complex and fragile; the competing demands for resources are greater; and the voices that have to be listened to, in particular from the developing world, are more diverse.

Building back better will require a rethinking of public policy at the national level, along with a renewal of public institutions and a revitalization of the social contract, combined with new principles of cooperation and leadership at the global level. Strengthening the ambition and capacities of the developmental state is, as discussed in the preceding chapter, a necessary condition for developing economies when undertaking the structural changes needed to build resilience, without exacerbating the climate crisis and causing further environmental damage. But developing countries need collective support at the international levels to complement and bolster their domestic efforts at resource mobilization. Progress on both fronts, can, if effectively coordinated, advance an agenda that works for all people and the planet.

This chapter analyses two major multilateral areas of the climate adaptation challenge: international trade rules and the financial system. As explained earlier in this *Report*, climate adaptation has been overshadowed by commitments to climate mitigation and reduction targets for greenhouse gas emissions. This asymmetry has been replicated in the wider trade and financial architecture, which have not delivered the opportunities and funding needed for a resilient, and climate conscious growth in developing economies. Existing rules and principles do not accommodate the technological, economic and financing needs of developing economies facing the adaptation challenge. Below we review these challenges and mechanisms in detail, and outline proposals for policy changes.

B. Climate adaptation and the international trading system

With a shrinking timeline to stabilize the climate and advance the SDGs, all countries should find ways to both promote and discipline trade and investment in line with their Paris Agreement commitments and with the principle of common but differentiated responsibilities. But many of the initiatives that are gaining momentum in the reform of the international trading system continue to adhere to a lopsided liberalization agenda. This agenda has thus far neither delivered on the promise of development nor been associated with reduced emissions. Pursuing it further is likely to undermine any notion of a just transition by disadvantaging developing countries that have least responsibility for climate-related damages.

1. Trade and environment in the WTO and other trade agreements

Issues around trade and environment have again gained momentum in the World Trade Organization (WTO) since November 2020, when a group of 23 members (EU as one of them) initiated 'trade and environmental sustainability structured discussions' (TESSD) with an intention to report concrete deliverables, initiatives and next steps to the ministers at the 12th Ministerial Conference.[1] Since then, in various meetings, proposals have been tabled on liberalizing trade in environmental goods and services; reforming environmentally harmful subsidies; carbon border adjustment mechanism

and climate actions; and circular economy and biodiversity.[2]

The Preamble to the Marrakesh Agreement emphasizes the need for "…expanding the production of and trade in goods and services, while allowing for the optimal use of the world's resources in accordance with the objective of sustainable development, seeking both to protect and preserve the environment and to enhance the means for doing so in a manner consistent with their respective needs and concerns at different levels of economic development."[3]

In line with this objective, paragraph 31 (iii) of the Doha Ministerial Declaration called for negotiations on "the reduction or, as appropriate, elimination of tariffs and non-tariff barriers to environmental goods and services"[4] and paragraph 32 called for particular attention to be given to the effect of environmental measures on market access of developing and least-developed countries, aiming at a triple win situation beneficial to trade, environment, and development.

Formal negotiations on a plurilateral Environmental Goods Agreement were launched at WTO in July 2014 but only two developing countries joined these negotiations, which stalled in 2016. Some of the reasons for developing countries not joining the negotiations included a missing development dimension, the inclusion in the lists of goods with multiple non-environmental uses that primarily supported the export interests of developed countries, and the fear that trade liberalization discriminates against their products based on non-environmental and social concerns (Khor et al., 2017; de Melo and Solleder, 2020).

Outside of the WTO, climate concerns have been reflected in the trading system primarily as non-binding sustainability chapters in bilateral or plurilateral trade agreements. These chapters have arguably had limited impact on encouraging climate action (Lowe, 2019) but mainly helped to secure the regulatory advantage of wealthy regions as global standard-setters (Goldberg 2019). The 2021 G7 Trade Ministers' communiqué also included the commitment to "make trade part of the solution" to climate change, in particular highlighting environmentally destructive agricultural practices and the issue of carbon leakage whereby high-emitting industries move operations from regions with stricter regulation to those with lower standards, undermining the goal of reducing global greenhouse gas emissions (G7 Trade Ministers' Communiqué, 2021). Preventing carbon leakage has been high on the agenda of advanced economies, due to concerns that their higher environmental standards provide an unfair trade advantage for countries with less strict environmental regulation, and they have been demanding to 'level-the-playing-field' (United States Congress, 1992). One such measure is the proposed carbon tariff or Carbon Border Adjustment Mechanism (CBAM), which has been under consideration in the United Kingdom, the United States, and Canada, and is already part of the European Union's flagship policy in aligning trade and climate, i.e., the Green Deal (European Commission, 2021).

The G7-communiqué also highlighted the trade ministers' united position against 'unfair trade' and 'non-market policies and practices' including industrial subsidies and forced technology transfer, even though these same countries have used these policies in their own successful development process. The G7 has also called for an overhaul of the principle of special and differential treatment (SDT), essentially calling for a contraction in privileges with more targeted and specific measures. SDT was adopted to allow developing countries to benefit from non-reciprocal tariff reductions and granted some special rights and privileges to them to mitigate the disadvantages they face in the international trading system and to help them with implementing multilateral trade agreements (Kozul-Wright et al., 2019). With developing countries standing on the edge of another lost decade in the aftermath of the pandemic, it is a clear contradiction for the world's most advanced economies to restrict what policy space is available to them through SDT or industrial policy tools while expecting them to meet increasingly demanding climate goals.

These more recent unilateral proposals were preceded by the beginning of negotiations of a plurilateral Agreement on Climate Change, Trade and Sustainability (ACCTS) which has brought together six 'first-mover' countries (Costa Rica, Fiji, Iceland, New Zealand, Norway, and Switzerland) to build momentum around aligning trade and climate issues. While these negotiations are ongoing and have not yet resulted in a formal trade agreement with enforceable rules and regulations, they signal the approach that these countries plan to take on trade and climate, namely reducing tariffs on environmental goods and services, eliminating fossil fuel subsidies, and

developing guidelines on voluntary eco-labelling schemes.[5]

2. Carbon border adjustment mechanism in the era of global value chains

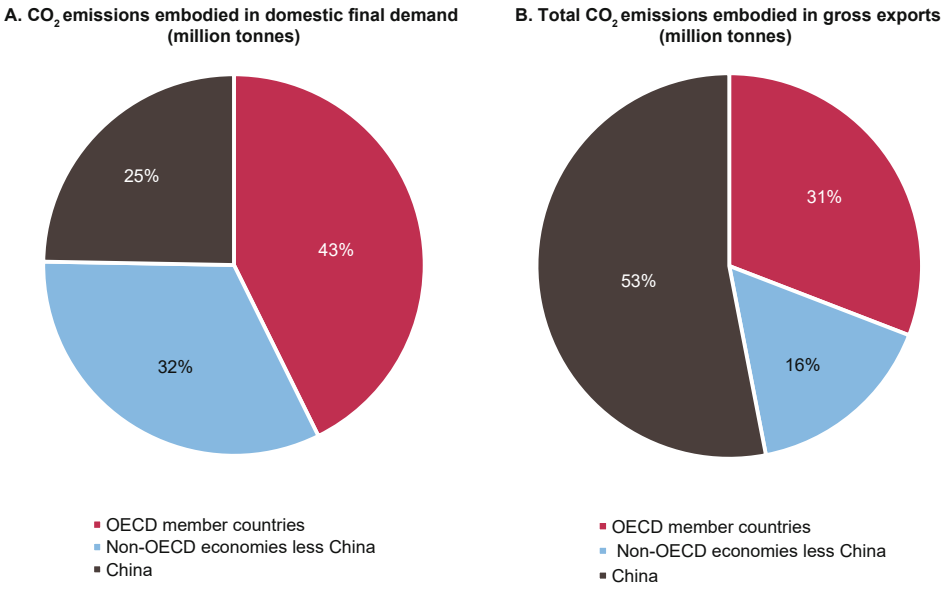
The interconnectedness of the global economy and the fragmentation of production process make it difficult to gauge any specific country's carbon footprint accurately because a sizable share of CO_2 emissions in developing countries are generated in the production of consumer goods for developed countries. The organization of global production through global value chains (GVCs) has led to many carbon emitting production activities to be shifted to developing countries, while associated low-carbon pre-production and post-production activities have been retained in developed countries (*TDR 2018*). The comparative energy efficiency in the North is therefore closely linked to the energy inefficiency in the South.

According to data on the amount of carbon emissions embodied in final demand and international gross trade published in Yamano and Guilhoto (2020) for 65 countries and the period 2005–2015, of the total global CO_2 emitted in 2015, around 27 per cent is linked to international trade and concentrated in seven industries (mining and extraction of energy producing products; textiles, wearing apparel, leather and related products; chemicals and non-metallic mineral products; basic metals and fabricated metal products; computers, electronic and electrical equipment; machinery and equipment; and motor vehicles, trailers and semi-trailers). These are also the industries with a higher proportion of trade through GVCs. An analysis of these data reveals three additional features.

First, the share of non-OECD countries in global CO_2 emissions embodied in global domestic final demand and in global gross exports is 57 per cent and 69 per cent, respectively. However, removing China's share (25 per cent) from non-OECD aggregates makes the share of non-OECD decline to 32 per cent in CO_2 emissions embodied in global final demand, i.e., below that in the OECD countries (43 per cent). Similarly, the share of non-OECD countries less China in CO_2 emissions embodied in global gross exports is almost half of that in the OECD countries, i.e., only 16 per cent as compared to 31 per cent (Figure 5.1).

Second, average per capita CO_2 emissions based on production declined over the period 2005–2015 in OECD countries, but remained much higher than those in the non-OECD countries in 2015. Most of the developed economies like Australia, Canada, European Union, Germany, Japan, and the United States, have higher CO_2 emissions per capita

FIGURE 5.1 CO_2 emissions in domestic final demand and gross exports, OECD and non-OECD countries, 2015

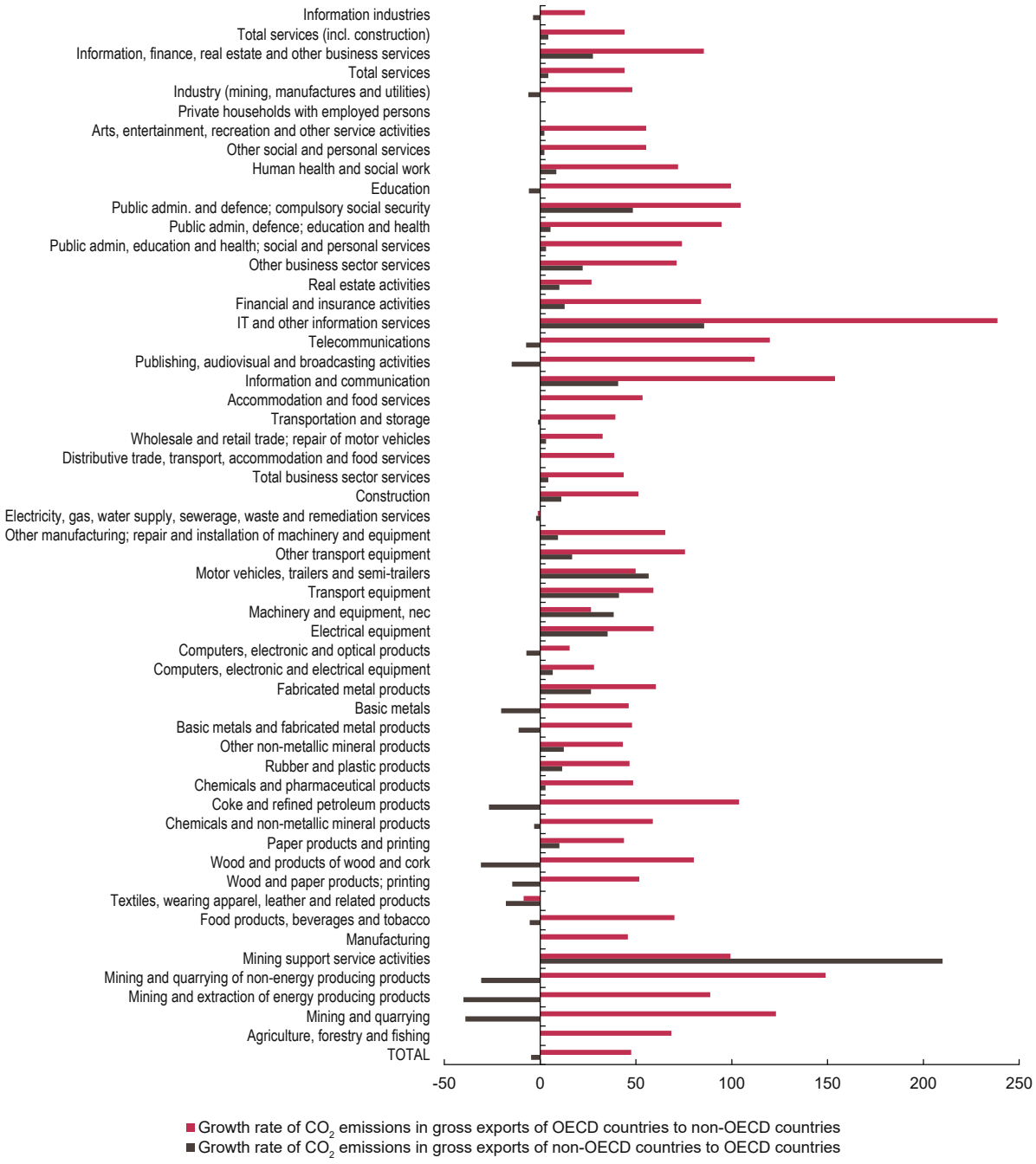


Source: UNCTAD secretariat calculations, based on OECD, https://www.oecd.org/sti/ind/carbondioxideemissionsembodiedininternationaltrade.htm.

compared to developing countries like China, India, Indonesia, and Malaysia.

Third, CO_2 emissions in gross exports of OECD countries to non-OECD countries have grown much faster than the CO_2 emissions in their imports from non-OECD countries in the period 2005–2015. This trend is consistent across almost all industries and services (Figure 5.2). The fact that despite their lower emission levels, CO_2 emissions in the gross exports of OECD countries have grown faster than CO_2 emissions in their gross imports, is indicative of the growing inter-connectedness in the global economy which makes it impossible to disentangle high-carbon and low-carbon emitters in global value chains.

FIGURE 5.2 Growth in CO_2 emissions in gross exports and gross imports of OECD-countries from non-OECD countries, 2005–2015
(tonnes, millions)



Source: See Figure 5.1.

At the same time, should carbon border adjustment mechanisms actually be implemented, much of their impact on structural transformation in developing countries will depend on their detailed technical specifications, with one of the major legal challenges being to make these mechanisms compatible with WTO rules. Yet, independent of these details, the principle on which these mechanisms are based is to impose on developing countries the environmental standards that developed countries are choosing. This goes against the principle of common but differentiated responsibility enshrined in the Paris Agreement. Moreover, should the revenues from these mechanisms be used in developed countries, rather than invested in climate adaption in developing countries, they would turn basic principles of climate finance on their head.[6]

In this context, it is notable that "[s]ince 1995, carbon emissions embodied in trade have been increasing both in absolute value and as a share of global emissions. However, the volume of global trade has grown more rapidly than carbon emissions embodied in it" (OECDb, 2019: 10).

In 2015, CO_2 emissions embodied in international trade (8.8 Gt) as a share of total global emissions was only 27.2 per cent (Yamano and Guilhoto 2020). This indicates that carbon emissions generated to produce goods and services consumed domestically comprise a much higher share in global carbon emissions than those that are internationally traded. National policies for climate adaptation can therefore play a much greater role than international trade policies. Nevertheless, proposals have been advanced by some of the developed countries to liberalize trade in environmental goods and services (e.g. WTO, 2021).

3. Push to liberalize environmental goods and services

The Combined List of Environmental Goods (CLEG) that was elaborated by OECD (2019b) provides the Harmonized System 6-digit level codes of 248 environmentally related goods. In 2019, the top ten exporters of these goods were the European Union followed by China, the United States, Japan, the Republic of Korea, the United Kingdom, China Hong Kong SAR, Singapore, Canada and Switzerland with a combined share of 88 per cent of global exports (Table 5.1), most developing countries were net importers of these products.

Tariffs on these environmentally related goods are on average 5 to 6 per cent in developing countries with maximum tariffs exceeding 100 per cent on some products, while they are below 1 per cent in most developed countries (OECD, 2019). For example, passenger motor vehicles (HS code 8703.90) are also listed in CLEG as an environmental good, which is levied a tariff of 125 per cent in India, 100 per cent in Pakistan, 80 per cent in Nepal and 51 per cent in Egypt.

TABLE 5.1 Top exporters of environmentally related goods

	Exports (mn $)	*Share in total exports (percentage)*
European Union (EU27)	510 210	38.8
China	279 877	21.3
United States	106 252	8.1
Japan	85 738	6.5
Republic of Korea	46 524	3.5
United Kingdom	36 760	2.8
China Hong Kong SAR	27 282	2.1
Singapore	26 360	2.0
Canada	20 440	1.6
Switzerland	17 847	1.4
Memo item: Total of the above	1 157 290	87.9

Source: UNCTAD secretariat calculations, based on World Bank *World Integrated Trade Solution (WITS)* database, and United Nations *Comtrade* database.

In 2019, tariff revenue collected on these goods by developing countries amounted to $15 billion (using applied duties). Trade liberalization in these products will therefore entail a substantial loss of tariff revenue for developing countries. This may have substantial adverse effects especially now when domestic sources of finance are urgently needed both to fight the Covid-19 pandemic and address climate change. Table 5.2 presents estimated annual tariff revenues in these products for 99 developing countries.

While there is no consensus on what goods should be included in the list of environmental goods, environmental services were already classified for the negotiations on the General Agreement on Trade in Services (GATS). Negotiations on environmental services have traditionally taken place under the Council for Trade in Services focusing on sewage services, refuse disposal services and sanitation services, which are listed in the environmental services sector of the Services Sectoral Classification List (GATT, 1991). However, there are attempts to widen the scope of environmental services to include services like engineering, architecture, design, general management, construction (OECD, 2017). Any

TABLE 5.2 Tariff revenue from environmental goods, developing economies, 2019

	Weighted average tariff rate	Maximum tariff rate	Imports of environmental goods ('000 $)	Tariff revenue ('000 $)		Weighted average tariff rate	Maximum tariff rate	Imports of environmental goods ('000 $)	Tariff revenue ('000 $)
Algeria	10.2	60	5 936 180	606 678	Lao PDR	0.3	20	651 445	2 150
Angola	3.3	50	1 680 473	55 120	Lebanon	3.4	20	693 714	23 517
Anguila	14.7	20	8 979	1 323	Lesotho	0.2	30	283 544	482
Antigua and Barbuda	10.9	35	55 488	6 065	Macao	0.0	0	187 547	0
Argentina	9.8	35	6 292 625	619 194	Madagascar	5.7	20	191 376	10 889
Armenia	2.9	15	301 507	8 804	Malawi	4.6	25	82 154	3 763
Aruba	11.6	50	70 954	8 195	Maldives	20.9	400	312 341	65 217
Azerbaijan	5.3	15	1 569 400	83 649	Mali	8.2	20	168 101	13 734
Bahrain	3.2	5	1 407 649	44 341	Mauritania	8.8	20	184 151	16 224
Bangladesh	8.0	25	2 349 383	187 246	Mauritius	0.5	30	348 394	1 881
Belize	7.3	45	59 056	4 287	Mongolia	5.0	20	493 144	24 559
Benin	7.6	20	100 845	7 614	Montserrat	10.5	35	3 859	403
Bhutan	1.1	100	63 192	695	Morocco	2.1	25	3 199 868	68 157
Bolivia	2.9	20	1 624 712	46 629	Myanmar	1.3	30	995 940	12 648
Botswana	1.4	30	266 854	3 816	Namibia	0.7	30	373 416	2 689
Brazil	10.5	35	15 557 060	1 630 380	Nauru	10.5	30	5 024	529
Brunei	0.0	5	900 181	270	Nepal	9.6	80	465 351	44 813
Burkina Faso	8.1	20	179 222	14 535	Nicaragua	1.5	15	311 005	4 789
Burundi	8.9	35	16 597	1 472	Niger	9.2	20	86 909	7 987
Cameroon	13.9	30	316 419	44 014	Oman	2.1	5	3 522 949	73 982
Cape Verde	6.1	40	58 834	3 589	Pakistan	11.5	100	4 220 456	483 664
Chile	0.4	6	4 604 802	20 261	Palau	3.0	3	10 470	314
China	3.7	15	151 613 712	5 655 191	Papua New Guinea	1.9	25	409 901	7 870
Colombia	1.6	35	3 404 373	55 491	Paraguay	4.2	20	541 667	22 642
Comoros	12.2	20	2 706	329	Peru	0.1	11	3 055 895	2 139
Congo, Dem. Rep.	9.3	20	393 356	36 543	Philippines	1.2	30	8 667 970	104 016
Cook Islands	0.0	0	8 580	0	Qatar	3.4	5	3 184 188	107 307
Costa Rica	0.8	14	993 988	8 151	Rwanda	6.4	35	306 986	19 524
Cote d'Ivoire	8.6	20	787 451	67 721	Sao Tome and Principe	8.8	20	4 248	372
Cuba	10.0	30	475 653	47 660	Senegal	8.5	20	680 144	57 948
Ecuador	6.8	35	1 419 910	96 128	Seychelles	0.0	25	105 682	0
Egypt, Arab Rep.	2.4	135	3 659 071	88 915	Singapore	0.0	0	25 144 184	0
El Salvador	1.4	30	509 218	7 180	Solomon Islands	8.1	15	26 787	2 156
Eswatini	0.4	30	9 9071	406	South Africa	2.1	30	5 633 598	118 869
Fiji	7.9	32	149 789	11 848	Sri Lanka	5.7	30	1 072 420	60 806
French Polynesia	5.0	13	99 797	4 990	St. Kitts and Nevis	11.9	45	19 830	2 354
Gabon	12.5	30	249 306	31 039	St. Lucia	5.5	50	50 521	2 784
Ghana	8.3	20	938 607	78 280	St. Vincent & Grenadines	8.7	35	21 893	1 900
Grenada	7.1	35	16 788	1 195	Suriname	6.3	30	155 882	9 852
Guinea	8.1	20	216 794	17 539	Taiwan, Prov. of China	2.0	18	17 070 441	334 581
Guinea-Bissau	8.8	20	12 872	1 134	United Republic of Tanzania	6.2	35	724 055	44 819
Guyana	6.1	45	220 345	13 529	Togo	12.6	20	136 060	17 184
Hong Kong, China SAR	0.0	0	30 341 851	0	Turkey	0.6	16	13 607 372	84 366
India	6.4	125	25 710 053	1 645 443	Uganda	6.1	35	426 025	26 158
Indonesia	1.6	50	15 567 797	244 414	United Arab Emirates	4.0	5	15 153 056	612 183
Iran, Islamic Rep.	12.4	55	5 207 631	643 142	Uruguay	6.3	23	496 472	31 178
Kazakhstan	1.4	15	7 748 942	106 935	Venezuela	11.4	26	282 817	32 241
Kenya	8.0	35	539 190	42 973	Vietnam	1.0	70	21 151 174	217 857
Kuwait	3.9	5	4 971 529	191 901	Wallis and Futura Isl.	0.4	10	2355	10
Kyrgyz Republic	2.6	20	237 716	6 157					

Source: UNCTAD secretariat calculations, based on World Bank World Integrated Trade Solution (WITS) database, and UN-TRAINS. Tariff revenue calculated on basis of applied duties.

resulting commitments in these services will take away the flexibility that the positive list approach in the GATS offered to the developing countries in terms of liberalizing their services trade. Furthermore, there is a risk that forcing liberalization of vital public utilities and bringing it under private sector can lead to negative development outcomes, because this creates an environment of conflicted interests, because public goods are delivered for profit. This will further restrict developing countries' ability to use public procurement as a policy tool to achieve social objectives.

4. Can international trading rules promote the circular economy?

Recently in the WTO, developed countries have been pursuing the narrative on 'circular economy' to gain market access into the developing countries. It has sometimes been argued that trade liberalization is indispensable to move towards a circular economy, particularly because trade restrictions in the form of export bans may hinder circular economy activities related to reuse, repair, refurbishment, remanufacturing and recycling (OECD, 2018).

Calls for the liberalization of trade in remanufactured or recycled goods and waste date back to 2004 when the issues of non-tariff barriers affecting trade in remanufactured goods such as medical and heavy equipment and motor vehicles and parts were first raised (WTO, 2004). Some of the non-tariff barriers identified at the time with respect to remanufactured goods were: requirements to provide a "refurbished certificate" signed by the consulate in the country of origin guaranteeing that the imported product is "like new"; prohibitions on imports of remanufactured goods if the equivalent goods are manufactured domestically or if they can be substituted for goods manufactured domestically; requirements that imported remanufactured goods meet a "special needs" test; and certification requirements from a chartered engineer that spare parts have at least 80 per cent of their original life remaining. To remove these restrictions and liberalize trade in remanufactured goods, some WTO Members proposed a Ministerial Decision on Trade in Remanufactured Goods in 2010 (WTO, 2010).

The proposed Ministerial Decision was rejected mainly because some developing countries raised concern about the possible adverse impacts of these imports on producers of new goods in their countries and on the transfer of new technologies. The danger was that second-hand, refurbished, or remanufactured goods may lock developing economies into outdated and less efficient technological solutions and therefore would delay the achievement of environmental goals (Steinfatt, 2020). Concerns were also raised on liberalizing trade in waste and scrap as that would put additional pressure on the waste management systems of developing countries, especially those which lack a sound regulatory framework for waste management and the associated infrastructure capacities. Developing countries argued that restrictions like export bans on metal waste and scrap were used to promote domestic processing and value added. Furthermore, imports of second-hand clothes and footwear were found to have significant negative impacts on the revamping of the textiles and leather industries, especially in Africa. They were also found to have adverse impacts on consumer health, human dignity, and culture (Wetengere, 2018).

While moving towards a circular economy is, therefore, vital to contain resource use and environmental degradation, there is little reason to combine the moves required to do this with trade liberalization. Instead, a circular economy may be best achieved through appropriate domestic regulatory policies, as discussed in the previous chapter.

5. The way forward on the trade and environment agenda

While climate adaptation remains a priority for developing countries, greenhouse emissions in traded goods and services account for only 27 per cent of global carbon emissions. This points to a rather limited scope for trade policy to contribute to a global green growth agenda, with trade policy only serving as a complementary tool for attaining environmentally sustainable growth. Rather than building a trade and environment agenda on trade liberalization, making the most of the coherence between special different treatment (SDT) and the UNFCCC principle of 'common but differentiated responsibilities' (CBDR) may offer a better point of departure for a development-oriented approach to the trade-climate nexus.

While SDT is designed to expand policy space for developing countries to tackle the specific challenges they face in integrating into the global trading system, CBDR recognizes that advanced economies bear most of the responsibility for historic emissions that have caused climate change, and therefore should shoulder most of the burden to respond to the

impacts of climate change and tackle its root causes. The convergence of SDT and CBDR, both of which acknowledge systemic asymmetries, leads to a vastly different agenda for aligning trade and climate. Such an agenda emphasizes the expansion of policy space for green industrial policy; the enhancement of flexibilities regarding the protection of intellectual property rights and of incentives fostering technology transfer for climate and environment-related goods; a strengthening of transition support for developing countries to accelerate the adoption of renewable energy sources; and an expansion of financial support that exceeds the $100 billion climate finance target agreed in the UNFCCC process for developing countries to meet climate goals.

(a) Expanding policy space for climate and development

A first step in aligning SDT and CBDR would be to widen non-reciprocal SDT measures to expand policy space for climate and development initiatives. A limited climate waiver of WTO trade and environment rules combined with a 'peace clause' for disputes on trade-related environmental measures of developing countries could be one route forward. A narrowly defined waiver and peace clause would give countries the assurance that they will not face disputes for climate and development-friendly initiatives such as prioritizing a transition to renewable energy, green procurement, and green jobs programmes – all initiatives that advanced economies are also prioritizing but that could be challenged under the WTO-dispute mechanism.[7]

While legal tools such as waivers and peace clauses will help diminishing the number of restrictive rules and the extent of regulatory chill, as well as expanding the policy space for developing countries, unilateral action in advanced economies can provide further room for maneuver. Incentive-based approaches, such as optional preference schemes that provide ringfenced climate financing additional to ODA or preferential market access in exchange for progress towards nationally determined contributions (NDCs), could accelerate climate action without recurring to punitive measures with anti-developmental effects.

(b) Climate and intellectual property rights

Recent evidence suggests that intellectual property rights protection does not promote the transfer of low-carbon technology (Pigato et. al. 2020), suggesting that an alleviation of intellectual property rights protection may be the best way to ensure global dissemination of low-carbon technologies. This calls for a multilateral arrangement that reflects the commitment to "shared responsibility" and makes low-carbon technologies widely accessible.

As a step towards such an arrangement, the international community could support initiatives to transform rules governing intellectual property rights, such as through a WTO Ministerial Declaration on TRIPS and Climate Change, with a view to expanding TRIPS flexibilities for developing countries in relation to climate-related goods and services. The Doha Declaration on the TRIPS Agreement and Public Health adopted by the WTO Ministerial Conference of 2001 reaffirmed flexibility of TRIPS member states in circumventing patent rights for better access to essential medicines. This could provide a basis for innovative mechanisms for promoting access to patent-protected critical green technologies. Other initiatives that could support this agenda include the open-sourcing of key green technologies as global public goods, South-South cooperation on low-emission research and design, and green investment strategies that include technology transfer.

(c) Climate finance and trade

Concerning the relationship between climate finance and trade, existing proposals for Carbon Border Adjustment Mechanisms (CBAMs) and tariff eliminations on environmental goods and services are likely to disproportionately impact resource mobilization in developing countries whose total economic output is currently more carbon-intensive than that in developed countries and for whom tariffs make up a greater proportion of government revenue. New financing support could be provided through a Trade and Environment Fund, as proposed by some WTO members (WTO, 2011). Such a Fund could finance the incremental costs of sourcing critical technologies, provide grants for specific green technologies, finance joint research, development and demonstrations, as well as the establishment of technology transfer centres, exchanges and mechanisms.

Should negotiations on carbon tariffs proceed at the WTO, it will be important to ensure that this issue remains in the multilateral rules-based system. No decision should be taken between smaller groups of developed economies, as this would risk further undermining the trust of other WTO members, particularly those impacted most, in the ability of the multilateral trading system and global climate

initiatives to support the achievement of developmental objectives.

While it is not clear whether currently considered forms of a CBAM would be compliant with WTO rules, any such mechanism will best serve the interests of global climate commitments and development goals if it includes a redistributive mechanism that redirects new tariff revenue to dedicated financing for green transitions in developing countries. Moreover, any imposition of tax or elimination of tariffs should be commensurate with the level of economic development, national objectives and needs of developing countries, and adequate transition periods should be built in that allow for phased implementation of obligations for developing and least-developed countries. But most importantly, any requirement for governments in the Global South should be contingent on the more effective policies outlined above regarding expanded policy space, enhanced intellectual property rights flexibilities and new sources of climate finance to avoid a catastrophic impact on development initiatives.

C. Financing Climate Adaptation: Issues, Instruments, Institutions

Facing up to the climate challenge, both mitigation and adaptation, requires an unprecedented degree of investment, on a global scale.[8] As noted in Chapter III of this *Report*, estimates converge around a global clean energy investment push in the range of 2–3 per cent of world output per year, and lasting well into the next decade, if the increase in global temperatures is to be kept to between 1.5 and 2 degrees. Assuming the transition will be a just one, which would include sufficient financing for adaptation purposes, then the higher end of that range would seem the appropriate target. This amounts to something in the order of $2.5 trillion per year. To put that into perspective, the OECD countries issued $18 trillion in debt in 2020 in response to the Covid-19 crisis.[9]

A study commissioned by the UN Environmental Programme (UNEP, 2020) estimates that the annual requirement for climate adaptation and resilience investments could vary between $140 and $300 billion by 2030 and $280–$500 billion in 2050. According to the World Bank, building climate-resilient infrastructure in the power, water and sanitation, and transport sectors in low- and middle-income countries will require between $11 to $65 billion a year by 2030 (Timisel, 2021: 3). At present, scaling up development finance is seen as a largely static reallocation exercise to direct existing financial resources (or savings) to meet the SDGs including for climate mitigation and adaptation. At the heart of this agenda is the idea that available public finance should be used to "leverage" international private finance, through blended financing instruments that allow investors to hedge against risk and, more generally, by "embarking on system-wide insurance and diversification of risk to create a large-scale asset class and mobilize significantly greater private sector participation" (EPG-GFG, 2018: 30).

Rather than encouraging developing countries to build domestic banking and financial systems that can manage domestic credit creation for development, and advocating measures to reduce their exposure to volatile international financial markets, this agenda focuses on how best to increase developing countries' attractiveness for global private wealth holders and to safeguard international investor (and creditor) risk through "financial innovation" to diversify and insure such risk "throughout the system". As recent research shows, this effectively means shifting most of this risk onto the public realm (Attridge and Engen, 2019).

The political economy of climate financing entails two specific consequences for developing countries' financing needs. First, where financing for climate investments is aid dependent, they have had to compete with other donor priorities, particularly those more closely linked to poverty reduction, as well as being subject to the variable constraints on donor budgets. As a result, actual funds committed for climate-related finance have not been close to what is required to address the scale of the climate challenge.

Second, as climate investments have come to rely on market-based financial instruments for raising capital, the dominant paradigm of risk management, as laid out in Chapter III of this *Report*, has prioritized profit-making activities in climate mitigation, leaving climate adaptation needs largely overlooked and under-funded. Even with respect to mitigation efforts, existing climate governance system assumes investor rationality as a given; prioritizes "market discipline" and understand climate change as financial stability

risk which demands risk disclosure (Christophers , 2017: 1108). In this type of governance, financialization has shifted power away from the public sector to the market – that is, to funds and fund managers managing public, private and blended finance, with a consequent reduction in the quality of accountability and transparency (Bracking and Leffel, 2021; Christophers, 2019).

Previous *Reports* have highlighted a number of concerns stemming from this climate governance and specifically from letting the financial markets determine climate-oriented investment priorities.[10] The pandemic has only confirmed that the management of public goods (and bads) requires the lead be taken by governments through dedicated public policy, investments and services.

As detailed further below, the experience of many developing countries shows that public, multilateral development initiatives have yielded greater success in building resilience at national and local levels. However, such funding often suffers from insufficient and unreliable source of capital and a lack of coordination across multiple actors. As a result, finance for adaptation purposes is caught between under-financed public mechanisms on the one side, and hyper-charged but unreliable private mechanisms, on the other.

It is clear that a more structural solution is needed to address the challenge of climate governance broadly, and climate adaptation needs in particular. Such a change needs to be guided strategically at national levels, by developmental states, in line with local needs, but there is a necessary, and larger role than is currently the case for international financial institutions in mobilizing and coordinating resources in support of that change.

This section analyses the landscape and record of green finance initiatives to date, before developing specific policy recommendations. Our analysis shows that financing the climate adaptation gap in developing countries requires both a massive scaling up of grant-based and concessional finance, as well as increased certainty that the funds raised will benefit the intended users and purposes. The concluding section outlines some steps in the direction of necessary policy reform.

1. The Role of ODA and Climate Funds

Providing ample – and ideally grant-based or highly concessional – international climate finance is the cornerstone of global cooperation on climate change (Oxfam, 2020; UNCTAD, 2019, 2020). It is important not only because of the urgency and costs of the problem, and not only because its nature as a "public bad" demands collective action, but because many of the countries worst hit by changing climatic conditions, and most in need of adaptation investment, are the least responsible for causing those changes.

TABLE 5.3 Stock and flows of climate finance (by donor reports)

Annual flows of climate finance	
Pledged at Cancun (2009) and Copenhagen (2010)	$100 billion
Paid flows of funds reported to UNFCCC and OECD (2017)	$56 billion
Paid flows of funds reported to UNFCCC and OECD (2018)	$63 billion
OXFAM estimate of effective climate-specific net assistance	$19-22 billion
Estimated Stock of finance from Climate Funds under the UNFCCC	
Green Climate Fund (since 2009)*	$5.6 billion
LDC Fund (since 2001)	$1.6 billion
Adaptation Fund (since 2001)	$0.8 billion
Special Climate Change Fund (since 2001)	$0.3 billion

Source: Oxfam (2020), Vincent (2021).
Note: *The phrase "since 2009" refers to the year of this fund's inception; same with the other dates. The figures above these come from the Oxfam report.

The key dilemma facing these countries is that financing climate adaptation is not as likely to generate income-earning opportunities as compared to mitigation. Moreover, even if funds were divided equally between the two broad categories, the total size of the envelope from ODA and contributions to dedicated global climate funds is too small for what is needed (Table 5.3).

Donor reports of public climate finance to the UNFCCC and OECD show that even though sums are rising, they still fall well short of the $100 billion per year by 2020 pledged in Copenhagen in 2009 and Cancun 2010. Of the $79.6 bn assistance provided by developed countries in 2019, one quarter was for adaptation purposes (OECD, 2021). Moreover, on some measures the effective funds are even less than half the amount reported (Oxfam, 2020). Counting only the grant equivalent and not loans, guarantees or non-grant instruments that bring with them future debt service payments, interest and administrative costs, the net financial value to recipient countries in 2017-18 fell to $19 – $22.5 billion from the

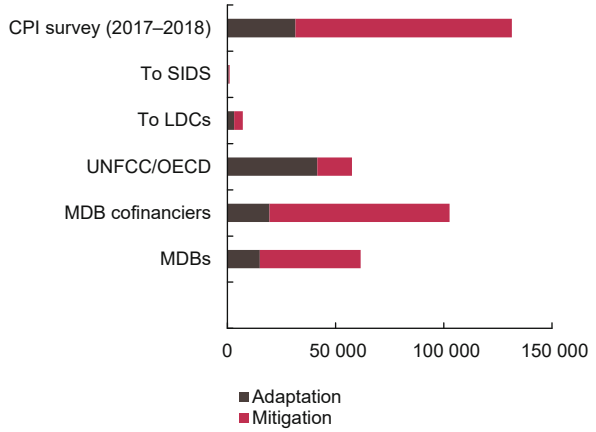
reported figure of $60bn (ibid). Some individual donor countries gave 100 per cent of aid in the form of grants;[11] yet grants from other donors ranged from less than one third and up to only one half of their total package – meaning that the net contribution to poor countries' ability to finance climate change adaptation is much less than it appears. Of the total funding received, only around 20 per cent came as grants (ibid); the rest came in loans and other non-grant instruments that could significantly increase the debt burden of recipient countries – many of whom are LDCs and SIDS.

The need for global public funds to scale up adaptation finance is reinforced by a survey carried out by the Climate Policy Initiative in 2019 (Buchner et al., 2019, updated 2020). The survey found that in 2017–2018, total grants came to only $29 billion, all of which was provided by public sources; the small amount of low-cost loans came to 93 per cent from public sources (in particular, DFIs), and a very large amount of market-rate loans reached as much as $316 billion.[12] The vast majority of loan finance raised was directed to mitigation (93 per cent) and only 5 per cent to adaptation. More positively, the absolute value of adaptation funds was rising as was the value of joint adaptation-mitigation funds (2 per cent of the total) reflecting, perhaps, a better understanding of the integrated nature of the problem. Nonetheless, CPI concludes that a "tectonic plate shift" is still needed in both public and private financing, especially of adaptation (ibid:26). Figure 5.3. illustrates this; the CPI survey includes only Certified bonds which is a small proportion of the total bonds described by their issuers as "green".

The United States has recently pledged to double by 2024 its annual public climate finance to developing countries (relative to the average commitment made during 2013–2016), including increasing three-fold its annual adaptation financing.[13] This would take the US pledge to where it was almost seven years ago when it made a similar commitment. At the recent 2021 Climate Adaptation Summit,[14] France reaffirmed that €2 billion, or one-third of France's climate contributions, will be directed at climate adaptation. Germany also committed €270 million extra for climate-vulnerable countries.

Notwithstanding these pledges, the persistent failure of advanced countries to meet the 0.7 per cent ODA target is a major obstacle to achieving climate-related goals. The lack of dependable, core financial support particularly affects countries that lack the domestic

FIGURE 5.3 Adaptation vs Mitigation finance estimates



Source: Derived from Buchner et al. (2019), Oxfam (2020), AfDB (2019).
Note: CPI survey includes only certified bonds.

resources for even the most fundamental activities, such as waste disposal and water treatment services, which are unlikely to be attractive as private investments. Even before the Covid era, lack of investment in these activities had a climate change urgency, e.g., the lack of publicly provided fresh water provokes demand for water sold in bottles – usually single-use plastic – which ends up polluting the oceans. The recent G7 communiqué committed to "strengthening adaptation and resilience to protect people from the impacts of climate change," but provided little indication of how that might happen beyond encouraging "further development of disaster risk finance markets... in line with the InsuResilience Global Partnership and Risk-Informed Early Action Partnership (REAP)." Instead, a commitment by just these seven countries to meet the 0.7 per cent ODA target would generate an additional $150bn annually, albeit still at the bottom of the range needed.

2. Debt relief for adaptive development

Previous *Reports* have shown that the Agenda 2030 is undeliverable in many developing countries under their existing burden of debt (*TDR* 2015, 2019). Moreover, warming global temperatures will only worsen their prospects, fueling an even more vicious circle in developing countries, as the adverse impact on growth prospects heightens their perceived credit risks, leading to a downgrade in their credit ratings and higher borrowing costs, adding hundreds of billions of dollars in debt servicing over the coming years (Klusak et al., 2021). For many vulnerable developing countries this will add insult to the injuries already caused by unfair credit conditions.

When financial and debt distress reaches levels that require intervention, effective and fair sovereign debt restructuring mechanisms are essential to preserving a constructive role for developmental credit creation and debt in the future. The current *ad hoc* frameworks for sovereign debt restructurings are costly, fragmented and fraught with inefficiencies and perverse incentives, largely tilting the balance of power in favour of creditors (*TDR* 2015: chap. VI; Guzman et al., 2016).

As UNCTAD has long argued, many poorer developing countries and SIDSs, now regularly exposed to natural disasters related to climate change, need temporary debt moratoriums and automatic mechanisms to extend such moratoriums on debt servicing to safeguard government expenditure on essential social spending, such as health, education and sanitation, when such events occur. The pandemic has seen moves in this direction, through the DSSI, albeit on far too small a scale.

An obvious place to begin linking debt relief to climate adaptation would be with economies that are already experiencing serious damage from rising global temperatures (see Box 5.1). Prime Minister Sheik Hasina of Bangladesh has called for a reassessment of the debt burdens of climate vulnerable countries in response to the imminent climate collapse predicted in the report.[15] As a founding member of the Group of Twenty Finance Ministers of Vulnerable Countries (the V20), Bangladesh and the group of 48 countries who self-identify as climate vulnerable, have much to be concerned about.[16] Left unchecked, rising global temperatures will lead to two-thirds of Bangladesh's land mass being inundated with sea water within 30 years. Viet Nam, another V20 country, faces a prospect that within the same time span, 80-90 per cent of the country will be covered by sea water each year; only once will be enough to dislodge Viet Nam as the producer of a third of the world's rice. Sea level rises of this sort will displace more than 100 million people in South Asia alone.[17]

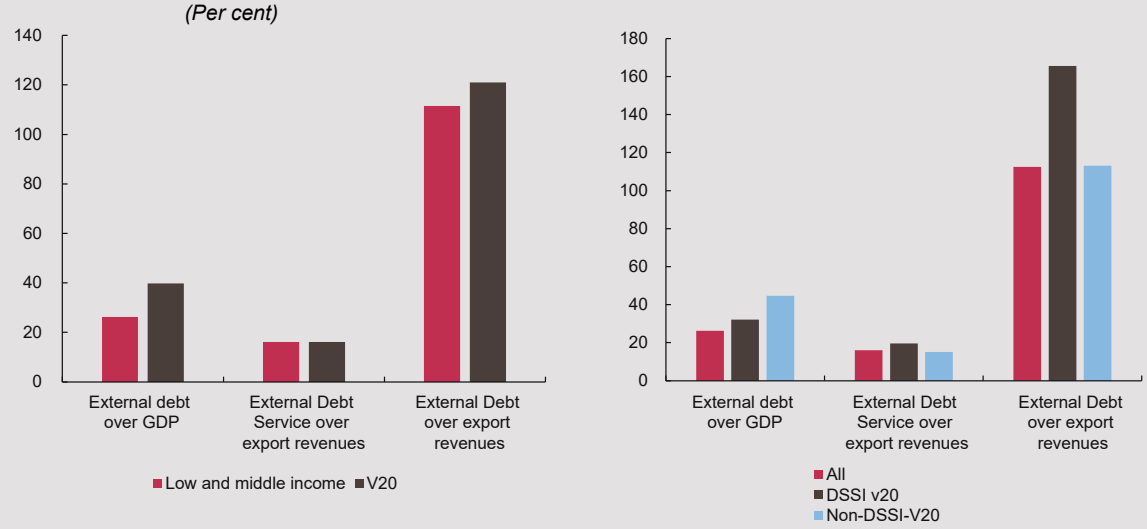
The external debt of V20 countries stands at under $1 trillion, and forgiveness or relief of a substantial part of this would provide the fiscal space to begin to address adaptation investment and the climate related SDGs. The London Agreement of 1953 which relieved post-war Germany of half its outstanding debt and limited its debt servicing requirement to 3 per cent of the value of annual exports could provide the blueprint for a negotiated settlement between these vulnerable countries and their creditors (*TDR* 2015: 134).

Box 5.1 Shades of Vulnerability – Climate, Finance and SDG Dimensions facing the V20 countries

While their classification as low- and middle-income developing countries already suggests vulnerability,[18] a closer examination suggests that the V20 countries are relatively more vulnerable than their reference groups in three fundamental ways: financial, climatic, and developmental vulnerabilities self-reinforce to undermine the prospects of V20 countries to emerge from climate collapse with their economies and populations intact. In each of these aspects, the V20 have little self-determination – they are not responsible for the climate degradation, or the high interest rates they face in international capital markets, and they are unlikely to be able to mobilize sufficient domestic resources to meet the developmental needs encapsulated in the SDGs.

Around 70 per cent (33 countries) of the V20 countries are considered Poverty Reduction and Growth Trust (PRGT)-eligible countries, which can access concessional finance due to tier low-income status. Of these, 32 are eligible for the G20 Debt Servicing Suspension Initiative (DSSI) – set in place in the wake of the Covid-19 pandemic[19]. While this has provided some small measure of relief, it was clearly not enough, with 25 of the 33 V20 DSSI countries in debt distress, or in high-risk of debt distress by June 2021.[20] Figure 5.B1.1 (left panel) shows that V20 countries have higher levels of external debt to GDP (40 per cent) than other LICs and MICs (26 per cent) on average, and similar levels of external debt servicing (as a share of export earnings – at 16 per cent). However, the right panel of Figure 5.B1.1 shows that the non-DSSI V20 countries – excluded like many other MICs from concessional finance – have the highest levels of indebtedness (as measured by the external debt to GDP ratio), at almost 45 per cent. In the case of public debt, it appears that V20 countries pay a premium to access capital markets, with a recent paper from Buhr et al. (2021) suggesting that V20 countries pay an additional 117 basis points or nearly 10 per cent more on overall interest costs, as a consequence of climate change effects being transmitted to sovereigns' credit profiles through weaker economic activity, damage to infrastructure, rising social costs associated with climate shocks (access to health and food) and population displacement.

FIGURE 5.B1.1 **LICs, MICs and V20 country groupings – Indicators of external debt sustainability, 2019**
(Per cent)



Source: UNCTAD secretariat calculations based on World Bank data.
Note: No debt data for Barbados, Kiribati, Marshall Islands, Palau, South Sudan, and Tuvalu. WB do not carry data for Palestine.

While the much-anticipated 2021 SDR allocation to all developing countries – including the V20 countries – offers some potential relief, for the non-DSSI V20 countries, the new SDR allocation will not make a big dent in indebtedness, making up just over 2 percent of their 2019 external debt, compared to 2.4 per cent for all MICs (see Table 5.B1.1).

TABLE 5.B1.1 **Projected SDR allocations – all LICs and MICs and the V20**

	All LICS and MICS				*V20*			
SDR allocation as a share of 2019 External Debt	*Number of countries*	*2021 Allocation (billion USD)*	*2019 total External Debt (billion USD)*	*SDR over total debt (per cent)*	*Number of countries*	*2021 Allocation (billion USD)*	*2019 total External Debt (billion USD)*	*SDR over total debt (per cent)*
LICs	26	8	151	5.40	12	5	86	5.46
MICs	105	198	8.220	2.41	33	19	899	2.07

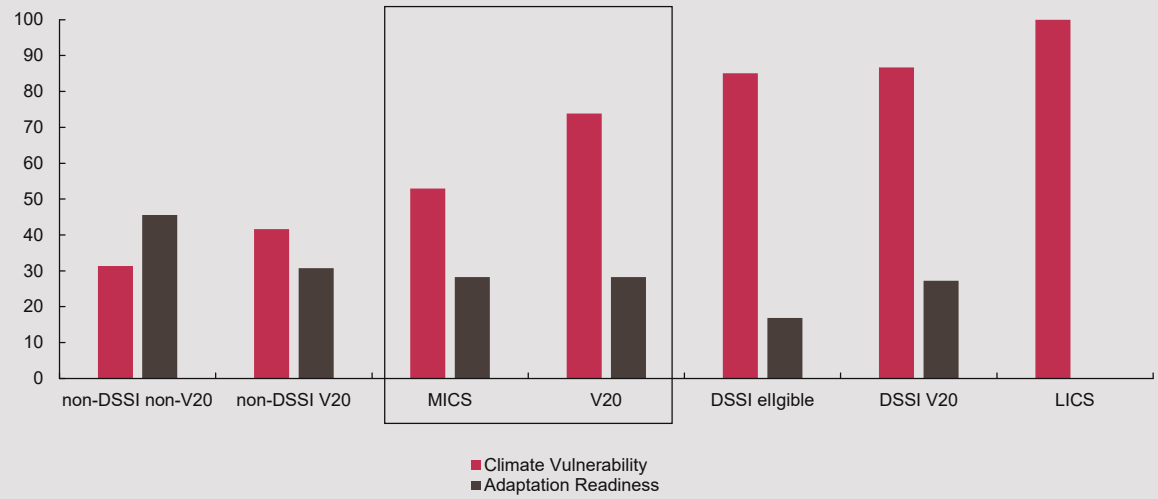
Source: Oxfam (2020), Vincent (2021).

The Notre Dame Global Adaptation Index and Climate vulnerability Index[21] is gaining prominence in terms of measuring climate vulnerability (eg. Tiedemann et. al., 2021) and includes an assessment of the propensity or predisposition of human societies to be negatively impacted by climate hazards in one index, and climate change readiness, defined as the ability to make effective use of investments for adaptation actions, in another. According to these measures, the vulnerability of 74 per cent of V20 countries falls below that of the global average, as compared to 53 per cent of MICs. Moreover, MICs that are neither DSSI nor V20 countries perform best on the Readiness index (more of them exceed the global average value of readiness) and only 31 per cent are relatively vulnerable (see Figure 5.B3.2.) LICs are more vulnerable and have least readiness (Zero per cent are more ready than the global average). The adaptation readiness of V20 countries matches that of all MICS at 28 per cent, and slightly more DSSI V20 countries (27 per cent) exceed the global average than for DSSI eligible countries (17 per cent). It is possible the identification of V20 countries as climate vulnerable has already directed their investments to adapt.

Archimedes famously indicated that in order to change the world, one needs a lever and a place to stand.[22] The V20 – by virtue of their identification as the climate vulnerable South – have a place to stand. One potential way to extend their lever would be to redress exclusion of vulnerable countries from concessional finance – on the grounds that they have exceeded some national income threshold. By adding climate vulnerability as a criterion to the PRGT selection, for example, could potentially mean access to concessional finance, and a

lower cost of credit. Another would be to enact a regular (possibly annual) SDR allocation to climate vulnerable countries as suggested in Chapter I, Box 1.3 and a third would be to begin a process of debt relief, targeting countries whose climate vulnerability undermines their capacity to adapt.

FIGURE 5.B1.2 Climate-vulnerable and ready for adaptation* countries, percentage by country group, 2019



Source: UNCTAD secretariat calculations based on University of Notre Dame Global Adaptation Index (ND-Gain).
Note: Obs: MICs and LICs classification based on WB. * Above the global average.

3. The topography of green finance: instruments and institutions

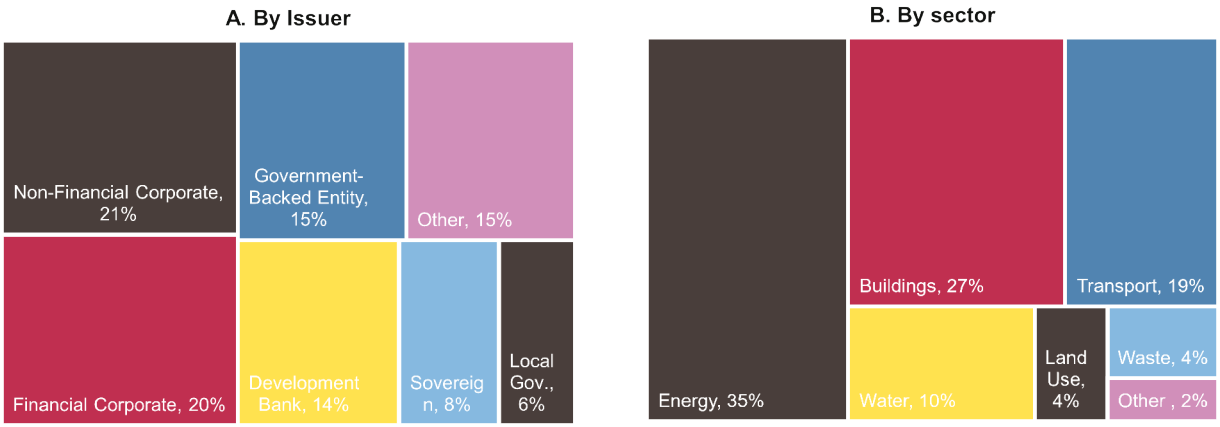
Notwithstanding the political prioritization of market-based mechanisms in global climate governance, private capital has neither been sufficient nor willing to address the climate challenge. Existing research lists a long of obstacles that prevent private actors from engaging with climate projects at a fuller scale. These include the lack of quantifiable incentives, low returns to corporate social responsivity practices, perceived high risks of low-carbon technologies by private financial institutions, a mismatch between long-term payback period and the short-term horizons of most private investors, inability to evaluate projects and their climate-related consequences, as well as a shortage of 'bankable' low carbon, adaptation, and resilience projects (see Bhandary et al., 2021). Political, institutional and legal barriers to private investments also play a major role, especially when coordination is lacking at the international level (Ibid: 530). This section reviews key instruments used by the private sector and evaluates their role in funding climate adaptation needs.

(a) Green bonds

Of all the activities in the fast-growing green finance space, the so-called green bonds have attracted the highest profile, in financial quarters at least. This is unsurprising, given that since 2007 – when the first green bond was launched by the European Investment Bank (EIB) – estimates for the sector now range from $754 billion to $1.1 trillion in loosely defined climate or climate-aligned bonds (CBI, 2021). While much of this may be window-dressing or worse (Guardian, 2021), the considerably smaller $100 billion category of "Certified Climate Bonds (CBI, 2021) is still large compared to the other sources of finance discussed above.[23] In 2020 alone, the total issuance reached a record level of $300 billion (in comparison to less than $50 billion in 2014 and 2015, an increase of almost 700 per cent) a value already achieved in the first-half of 2021. Green bonds also dominate the certified green finance market.[24] Yet even with this rapid growth, the green bond market represents only 5 per cent of the total issuance and 4.3 per cent of the amount outstanding in the international capital market. In other words, although the world is awash with capital, the challenge is how to direct it to productive purposes – in this particular case, towards adaptation that meets the additionality criteria.

Green bonds are, by their nature, often considered to be more suitable for green investments with higher short-term profitability. This may be in part because

FIGURE 5.4 **Green bonds: accumulated issuances, 2014–2020**
(Billions of current dollars)



Source: UNCTAD secretariat calculations, based on OECD, https://www.oecd.org/sti/ind/carbondioxideemissionsembodiedininternationaltrade.htm.

they are mostly issued by the private sector, even though governments and development banks are still very significant sources (Figure 5.4). More research is needed to examine in detail the distinctions between different bonds from different issuers, but given that green bonds do not need to be asset-backed (asset defined *apriori*) and can also be asset-linked (asset defined after the fact), there is a lingering concern about the possibility of "greenwashing", that is, the practice of channelling proceeds from green bonds towards projects or activities having negligible or even negative environmental benefits that can be maladaptive. While some bond label certificates do help to ensure that financed activities are green, existing frameworks are non-binding and lack enforcement mechanisms (Deschryver and Mariz, 2020; Noor, 2019). Moreover, even if bonds have the benefit of a significant 'greenium' – a question on which there is still no consensus[25] – as long as adaptation-oriented activities do not generate profit, especially in the short-term, such sources of finance are unlikely to be a solution for developing countries. Although the distinction between adaptation and mitigation has not been formally made in these kinds of instruments, looking at the categories of activities and issuers shown in Figure 5.4, it is evident that adaptation account for a tiny proportion of the whole.

(b) Nature-based swaps and funds.

Can developing countries use their natural resources as a way to get the finance needed for climate adaptation? Keeping the majority of fossil fuels in the ground has been cited as one way to meet the Paris Agreement – prompting a revisiting of the concept of debt-for-nature swaps that were used in previous decades. This could be something of a win-win in the sense that the countries get the funds needed and emission-creating activities are halted or reduced; recipient countries could even be protected from the volatile swings in commodity prices that will happen anyway as investors pull their funds out of "sunk assets". However, once again these proposals need to deal with the fact that adaptation is not likely to be a revenue-earning activity, as compared to mitigation.

The current call for a renewal of debt for nature deals rests in part on the historical experience of their use by at least 30 countries across the globe, mostly in the 1980s and 1990s. Compared to other sources of finance the amounts cited are small – in the order of $2.6 billion to $6 billion over the three decades since their inception in 1987, according to some estimates, Recent examples include the Seychelles Sovereign Debt swap of $21.6 million in 2016, which was innovative as it included philanthropic donors and impact investors, and contained a government policy commitment for marine conservation (World Ocean Initiative, 2020). Other recent examples include debt-for nature swaps between the United States and Indonesia (in 2011 and 2014) under a Tropical Forests Conservation Act programme, one of which was included under the REDD+ (See Box 5.2). However, while actual activity has declined since the earlier decades, some country proposals have been more ambitious, including Commonwealth Secretarian proposals for debt swaps to finance climate change adaptation and mitigation for small states. Other

recent examples have been used in countries ranging from Bhutan to Fiji and South Korea.

Compared to previous decades, however, debt-for-nature swaps seemed loosing favour during the 2000s – a trend attributed by some to the stronger world economy and to the impacts of debt restructuring and debt forgiveness programmes of the 1980s and 1990s, and by others to the concerns of creditor countries that suffered from the global financial crisis including the United States, European Union and Japan (Ito et al., 2018; Sheikh, 2018).

Box 5.2 What makes a bank green?

To be effective, a "green" bank should stand out clearly compared to other banks in terms of its mandate, its loan portfolio, and the terms and conditions of its lending. The *mandate* in particular should be dedicated to green developmental outcomes and in line with international commitments including the SDGs and Paris Agreement, even if this is somewhat flexibly defined and can evolve over time as banks develop capacity and country needs change. Some banks highlight the goal of investing in the most promising new technologies. Some are rather supposed to focus on the needs of poor households in this area (e.g., Hawaii GEMS). This is important because the mandate and role drive public banks' activities and focus their investment decisions, including the types of clients and sectors to target. They also allow stakeholders to hold banks and management to account for the impact of their investments and commitment to community.

The *operational strategy* or business model must be consistent with its mandate. This refers to how the bank raises its finance, including the mix between public and private funding, which, in turn, will affect the extent to which it offers concessional loans and can deliver environmental and development outcomes. Surveys suggest that the vast majority of green banks offer loans, most of which are priced lower than the market rate. But even when rates are favourable compared to the market, this obligation may be a challenge for developing countries to meet. A smaller proportion offer finance in other ways such as equity or guarantees, and an even smaller number offer grant finance.[26] It appears that all green banks offer technical assistance. This contribution is important as expert banks can help governments design the framework of climate change adaptation, including strategies relating to regulation and pricing policies etc. (Griffiths-Jones, 2021). *Financial sustainability* is also important for all banks. This does not mean maximizing profitability and requires a different lexicon for performance measurement. The long-term financial sustainability of a green bank should not undermine its ability to invest in higher risk areas or projects where development returns are high but profitability is low – as is likely to be the norm when it comes to adaptation.

Most green banks are stand-alone entities set up by government legislation and capitalized by government appropriations. Some (e.g. the United States) are funded through a transfer, for example the transfer of electricity bills (Connecticut Green Bank and New York Green Bank). Striking a balance between the appropriate level of returns for a bank to remain viable, and the broader social and environmental demands of non-profit adaptation remains a challenge however.[27]

Some hints as to how green banks could create this path are evident from the recent experience of Covid-19. Public banks around the world responded immediately and often dramatically to support their governments' efforts to secure economic relief and resilience during the stand-still caused by lockdown. A rapid review carried out by UNCTAD during the early months of lockdown found that local, national and regional public banks around the world stretched out to produce a fast and strong counter-cyclical effect.[28] Some changed their mandates and procedures to meet the urgent needs; many scaled up their lending capacities by issuing bonds or accessing international markets, sometimes for the first time; virtually all offered finance on concessional or favourable conditions as well as technical advice. Those with a long institutional history, mandates that were supported by adequate finance and appropriate performance metrics were in the best position to respond effectively . Financing the adaptation to climate change has many parallels with this experience.

Schemes of the size of the Polish EcoFund have not been seen again yet – perhaps reflecting the charged timing of this debt-for-environment initiative, which came just as Poland was in transition away from central planning (Caliari, 2020). The debt-for-environment initiative was carefully prepared in parallel to negotiations on the shape of the wider economy and institutions (OECD, 2007: 23). Paris Club creditors agreed to additional bilateral debt swaps that were arranged not as a one-off swap of the entire debt stock. Rather, the Polish government transferred every year a percentage of the debt repayment due to a local financing facility the EcoFund, which then managed the spending to be given as grant support for projects in Poland, addressing transboundary air pollution of sulphur and nitrogen oxides; pollution

and eutrophication of the Baltic Sea; global climate change gases; biological diversity; and waste management and the reclamation of contaminated soil. Over the years additional swaps were arranged with other creditors, each on different terms, and altogether the scheme generated an unprecedented amount of over half a billion dollars – an amount that dwarfs all other debt-for-environment or nature swaps in the world (OECD, 1998).

Debt swaps represented an alternative to deeper sovereign debt restructurings in countries with high but sustainable debt burdens (i.e. those that do not face a solvency problem). Debt swap programs can be effective in addressing different debt compositions in developing economies and, in particular, exposure to large commercial debts and large public debt stocks. A disadvantage of debt swaps can be high transaction and monitoring costs for project-based swap programmes. They are complex to implement, and swaps in the past have taken from 2 to 4 years to negotiate between all parties – many of which involve a recipient government, a donor government, and local and donor country conservation groups. However, these can potentially be mitigated under coordinating regional initiatives, such as ECLAC's Debt for Climate Adaptation Initiative for the Caribbean and ESCAP's Debt Swap Mechanism for the Western Asia region, both recently launched.

Nature Performance Bonds (F4BI 2020) are another nature-based way being used to recapitalize sovereign debt. Any new debt would receive Brady type credit enhancement in exchange for commitments to spend the money on SDG type investments – secured by bond issues by MFIs or SDRs from the IMF. The original Brady Plan was organized extremely quickly, yet this partly is because the debtor countries essentially refused to pay and their bargaining power was high. It is not clear if this proposal could work when it is not banks that are owed money but rather institutional investors who offer it. Supporters of this approach insist that such a policy should be linked with country programmes that are designed by the recipient countries, and with conditionalities that are designed by them as well (See Caliari, 2020; Griffiths-Jones, 1992; OECD, 2007, among others). Once again however, it is not clear how to translate these into adaptation, which does not provide recipient countries with an income stream. In addition, one needs to be careful given the nature of the arrangements being proposed that limit the policy space of developing countries. They may place even greater power in the hands of bondholders and international financiers, and the latter may apply conditionalities and constrict democratic decision-making on the part of the debtor country.

D. Banks and Climate Finance

1. Dedicated Green Banks

Nearly all the public banks established since 2010 have "green" in the title or high up in their mandate (see Box 5.3). By some estimates they have lent about $24.5 billion since their inception (Whitney et al., 2020). The figure does not include established banks with a green desk or with green lending within their normal activities – such as the new public banks that emerged after the 2007-2008 crisis, including the Asian Infrastructure Investment Bank. Many governments have expressed an interest in establishing a green bank, as in the case of current discussions in the United States for a new national development bank with a green mandate. Others are looking to establish a green facility within an existing bank. Survey evidence suggests that typically it is the Ministry of Finance, or a country's central bank, that champions the idea, as opposed to the Ministry of Environment or the private sector. The main motive of investing in climate related activities is the second, not the first, priority. It is therefore not clear whether this will be a significant source of finance for adaptation activities, as compared to mitigation. In the State of Green Banks report, adaptation activities appear in a minority of related investments (Exhibit 9, Whitney et al., 2020: 30). Other long-standing public and development banks have boosted their green credentials; for example, the EIB recent declaration that 50 per cent of all new lending from 2025 must be low-carbon and no investments will be allowed that are not consistent with the Paris Agreement.

The Banco Popular in Costa Rica, established in 1969 by the Costa Rican government to promote economic development, for example, has been involved as a "finance catalyzer" in a project designed to help marginalized people and communities adapt to the frequent droughts that are attributed to changing climate. Based on grant financing, watershed protection and better management of water use are among the adaptation strategies that it supports. Banco Popular,

working with the Government of Costa Rica and agro-processing companies, came up with a $9.8 million grant as co-financing alongside the $8.8 million grant provided by the Green Climate Fund.

The German public development bank KFW has long argued it was not enough to address the causes of climate change by reducing emissions, because the impacts of climate change are already being felt in many countries. In the years 2013–2018 it invested 23.6 billion euro in climate related projects in developing countries, of which around 25 per cent was devoted to adaptation and resilience building projects. Among these projected included monitoring of glaciers in Pakistan, flood protection in Mozambique and hydrological monitoring in Jordan. As with the Costa Rican example above, these national banks operate in cooperation with other institutions: a recent project for flood protection in Bangladesh saw the KFW deliver $15 million (from the German Federal Ministry of Economic Cooperation and Development), alongside $40 million from the GCF with the Government of Bangladesh contributed $25 million.

2. Multilateral Development Banks with a climate change agenda

Development banks are well positioned to respond to the adaptation challenge compared to other sources of finance, as their remit usually specifically authorizes them to provide finance for the long-term, at lower rates and on more advantageous terms. When it comes to these investments the private sector will hardly support as necessary, illustrating the systemic problem related to adaptation and non-profit-centred ambitions. To date, development banks have provided most of the concessional loans and grant-based finance. Not all MDBs and RDBs have been consistent in this regard, but their role is critical given current predictions and worsening scenario in light of the IPCC 2021 report.

This type of public financing needs to increase in areas that so far have been under-resourced, especially in regional projects where many climate projects are considered less feasible for private or revenue-seeking purposes. Partly compensating for the limitations of under-capitalized national banks, MDBs have been steadily increasing their climate finance activities in the years since the Paris Agreement. Many pledged to re-direct their financing decisions and investment portfolios to be consistent with climate change adaptation and mitigation goals. The 12 largest MDBs committed to five Voluntary Principles for Mainstreaming Climate Change and by October 2020 as many as 48 institutions had followed suit.

The key principle of providing financing for MDBs in vision, if not yet in practice, has moved beyond the issue of simply increasing lending for climate-oriented or green projects. Now, MDBs and other members of the International Development Finance Club (IDFC) vow to "shift from financing climate activities in incremental ways to making climate change – both in terms of opportunities and risk – a core consideration and a "lens" through which institutions deploy capital" (Climate Action in Financial Institutions, 2018; Murphy and Parry, 2020). This is a major change in focus that aims to mainstream climate considerations and align banks' entire financing and investment portfolios with the Paris Agreement. These intended changes constitute a bigger and more complex ambition than mobilizing and tracking climate finance contributions to the $100 billion pledge made in 2009.

But the goal of scaling up is yet to be achieved. In 2019, nine MDBs announced their target to increase collective global climate investment to at least $65 billion per year by 2025, and within this timeframe to double the portion designated for adaptation purposes to $18 billion per year (ADB et al., 2019: 1). They plan also to increase co-financing to $110 billion, of which less than half is anticipated being mobilized by private direct sources. By 2020, the total committed was $66 billion (ADB et al., 2020: 3), however, at the same time, even as all banks announced ambitious plans for increased spending over the coming years, some 6 out of 8 lent less in 2020 than the year before. Only the World Bank and the European Investment Bank increased total climate finance spending in the last year. This is a particular concern for low-income countries, which received just $38 billion total finance in 2020, which is a fall from the year beforehand ($41.5 billion) (ibid: 7). This could potentially reflect the unanticipated spending due to the economic impact of Covid-19, although this rationale was mentioned specifically in only one or two bank cases. So, while there has been a sizeable increase since 2015, there is still a long way to go.[29] Securing adequate finance is not just about the *amount* of money lent, but also its *purpose* within the broad spectrum of climate related activities. MDBs themselves note the need to scale up the share going to adaptation, which currently counts for just 26 per cent of total lending. This proportion is up 2 percentage points from 2019 and while the absolute

values show a marginal increase in 2020 from $15 billion to $16 billion, they are still below the stated target (Table 5.4). This is especially important for least developed countries and lower middle-income countries that are already struggling to cope with some effects of climate change, which find it more difficult to attract finances from other sources, and which are more in need to make the transformative leap into industrialization (ideally, green) and to fund activities that can earn sustainable revenues in the future.

Preliminary evidence suggests that banks whose beneficiary members include more low-income countries such as the African Development Bank and the Islamic Development Banks, devoted the highest proportion of finances to adaptation at 56 per cent and 47 per cent respectively, in 2019 and 63 per cent and 65 per cent by 2020 (AfDB ibid). In contrast, the European Investment Bank, with a more North Atlantic focus, spent only 4 per cent on adaptation in 2019 rising to 10 per cent in 2020, and the rest on potentially game-changing mitigation. Similarly, the European Bank of Reconstruction and Development directed most of its finance to mitigation. Until low-income countries will also benefit from getting into the new technologies and new markets that mitigation entails, long-standing inequalities will be further cemented.

It is also evident that co-financing remains more prevalent in mitigation activities than for adaptation ones in 2020 compared to 2019, reflecting the fact the former are revenue-earning in nature; although at the same time, perhaps unsurprisingly, this year both co-financing and private borrowings have fallen significantly while public borrowing rose – reflecting concerns that the short-term needs of this year's health and economic crisis should not derail longer term development financing needs (see Chapters I and II of this *Report*). It is also notable that, when it comes to co-financing, alongside the public MDBs, it is other public sources of finance that provide the lion's share – especially with regards to low-income countries (Table 5.5).

Assuming the private sector remains reluctant to make the investments needed, even alongside significant public sector co-finance from MDBs, donors, domestic public sources and others – where is this necessary acceleration in capital availability to come from? A greater pool of available climate adaptation financing (with more grants and highly concessional loans) requires that MDBs scale up their total lending capacities considerably. One way of financing this could be through the revenues earned from their mitigation loans, but this will take too long to be of use to countries in urgent need of adaptation investments today. Also, some under-capitalized MDBs are already struggling to maintain viability as it is.

Other routes for scaling up have been suggested in the past, including by previous *Reports*. One is for the owner members to increase their paid-in capitalization – this route perhaps has the greatest potential if political will is there. Another is to take on new members, especially members from higher income countries that can make a larger capital contribution; or to revise MDB mandates and operational rules to allow banks to increase the leverage of the funds they already have. UNCTAD has long argued for this (*TDR* 2019) and the precedent has been made

TABLE 5.4 MDBs Climate finance components, 2020

	MDB Climate Finance ($ million)	*Per cent of total*	*Climate Co-Finance ($ million)*	*Per cent of total*
Adaptation	16 100	26	19 954	23
Mitigation	49 945	81	65 130	77
Public borrower	46 687	71	53 413	63
Private borrower	19 358	31	31 672	37
Total	**66 045**	**100**	**85 084**	**100**

Source: Derived from AfDB et al. (2020, 2019).

TABLE 5.5 Climate co-financing partners to MDBs, 2020
($ million)

Finance mobilization	*Low- and middle-income countries*	*High-income countries*	*Total*
Private direct	3 556	2 354	5 910
Private indirect	6 345	19 417	25 762
Total private co-finance	9 901	21 771	31 672
Public direct	8 366	1 658	10 024
Public co-finance			
Other MDBs	8 150	813	8 962
IDFC members	1 774	251	2 026
Other international public	1 946	4 477	6 423
Other domestic public	6 182	19 796	25 978
Total public direct and co-finance	26 418	26 995	53 413

Source: Derived from AfDB et al. (2020, 2019).

TABLE 5.4 Summary of the financing landscape

Mechanisms/Institutions	*Examples*	*Issues*
ODA $19-$63 billion depending on source.	OECD DAC, payments to UNFCCC	ODA is still way below the sums pledged. Much is given not as grants, and is more directed to mitigation than adaptation.
Global funds $8.3bn	Green Climate fund, Adaptation fund, LDCs and others	Insufficient funds for the needs.
MDBs $46 billion		Mostly for mitigation, not all banks are as reliable or effective as others. Banks especially undercapitalized and weak in areas where the needs are greatest.
Grants or Debt for Nature - $2.6 bn since inception	Most in LAC since 1980s; Indonesia, Seychelles; REDD+ schemes.	Complex to implement, high transactions costs – takes 2-4 years to negotiate between all the parties. Need long-term financial commitment, vulnerable to currency devaluation. Role of local and international conservation groups.
Sovereign and corporate green bonds $100 billion Certified out of loosely defined green market $754 bn.	Developing country green bond issuances are increasing (Bhutan, Fiji, China); Liberty Bond issuances in advanced economies.	ESG highly debatable; Asset linked not asset backed; even if domestic bonds still raise currency vulnerability; Many are not concessional; Countries say they lack capacity to manage them; all the other problems with other bonds and currency risks etc
Green banks $24.5 bn since inception; more if include green lending (AIIB, NDB MDBs etc) World Bank).	Discussion for a new United States green bank just one of many.	Risk of privatization if make too much or too little returns…. Are these actually the best bet?
Central banks	Many examples from developing countries. NGFS.	COVID programmes are not pro-climate, may instead bring about maladaptation.
Conservation Trust Funds	More than 80 in place globally, e.g. Caribbean Biodiversity Fund est. 2018 with endowment of $43 million and now managing $70 million (endowment fund and sinking fund).	
Other market – auctioning of allowances	Payment for entry to marine EEZs, payment for fishing licenses (Indonesia $31 million in 2018, Kiribati $117m in access fees). Cruise ship levies – Antigua and Barbados $1.2 m in 2018 by a $1.50 per person tax.	These are nature-related fund raising activities but may be needed to pay for other fiscal uses not adaptation.

already during the Covid period. When southern-led MDBs scaled up lending during the early phases of the Covid-19 pandemic, they did it by reallocating existing portfolios and borrowing from members' sovereign wealth funds, adapting mandates, re-defining key priorities and changing functions (MacDonald et al., 2020: 361-375). One South-South institution increased its lending capacity by as much as 60 per cent to meet the urgent needs (Ibid).

Another possible source of multilateral funding would be to repurpose SDRs for long-term environmental and country-specific adjustment plans, including preservation targets and emission reductions, as well as the required investments and budgets to meet these targets. This could provide a flexible and, in principle, unlimited financing mechanism for long-standing calls, by UNCTAD and others, for a global environmental protection fund that can provide predictable and stable emergency funding without strict policy conditionalities or limiting eligibility criteria.

International capital markets can still be used to scale up quickly, and most MDBs do rely on them.[30] Since 2008, when the World Bank issued the first green bond following demand from a group of Swedish pension funds for high quality (AAA) liquid products that could also have a positive impact (World Bank, 2008).[31] The Bank has issued 185 green bonds

in 23 currencies worth an equivalent of $15 billion, and many other MDBs have followed suit, including Southern-led ones.[32] A high profile and similar boom in demand for green bonds is taking place in the national and corporate space, although there are many reasons to think it is as much more about the search for yields in a low return environment than a concern to have concrete impact. MDBs could rather utilize at least some of these funds in a better way given that they are actively engaged in green-backed projects. It is quite likely that many investors with a genuine interest in supporting climate-related finance would prefer to buy issuances from the World Bank and other MDBs. However, it is notable that these arrangements are usually beyond the realm of individuals or smaller funds.

E. Policy Recommendations

The triple imperative of scaling up climate finance, directing it to where it is needed, and ensuring favorable conditions for developing countries in both trade (delinking international trade rules from climate adaptation policies) and funding (long maturities, grants or concessional terms) needs to be approached through a number of specific policy reforms, some of which are listed below.

At present, assistance from the international community for climate adaptation continues to rely on a combination of short-term aid, longer-term conditionalities of fiscal consolidation and preventative self-insurance schemes against catastrophic risk. This, however, is woefully insufficient to address the systemic impact of recurrent and increasingly frequent climate change-related shocks.

By its nature, the challenge of climate adaptation puts the onus on grant-based finance or highly concessional lending mechanisms as key to meeting the adaptation challenge. At the same time, any finance provided will work best if integrated under an overarching financial and industrial policy designed and implemented by a climate conscious developmental state (see Chapter IV).

This is, therefore, the *first priority* of a strategic approach to climate adaptation. A climate conscious developmental State should be catalyzing and not just addressing "market failures", nor relegating itself to "de-risking" the opportunity for others to make profit and take more than their share of the benefit. The systemic risk involved here requires a regulator and coordinator of private green finance, as with the financial sector generally. These must be seen as a means to avoid the destructive tendencies of today's ultra-liquid financial sector, where the embedded search for yield is inconsistent with the needs of climate mitigation, let alone the more challenging needs of adaptation.

Most adaptation efforts are also required at the local level (DCF AIliance, 2019). The vast majority of adaptation finance appear to be channeled to large financial institutions geared towards large-scale projects that do not necessarily support local efforts or meet local-level adaptation priorities. Locally-led climate finance efforts need to be driven by principles that ensure the most effective way of responding to governance and climate challenges and risks, including: i) community-led planning that is anchored within and supportive of existing devolved institutions, and that promotes ii) social inclusion of climate marginalized people; iii) a process that is flexible and adaptive management towards the creation of resilience investments, with iv) an emphasis on public goods provisioning (DCF AIliance, 2019: 4).

Until the right balance is found, all the best intentions will be high-jacked or side-tracked. As shown above, to date, the emergence of green bonds, a carbon trading market or even the uses of Covid-19 recovery funds, has not done enough to help developing countries adapt to climate change (Gallagher and Carlin, 2020). Two levels of reforms for financing the adaption challenge can be identified: first, steps in support of a climate conscious developmental state to mobilise financial resources for mitigation and adaptation investments, and second, reforming the approach to climate governance internationally.

The first set of reforms should focus on the following:

- **Assistance**. ODA commitments and pledges need to be met and go further, to increase the proportion of additive finance designated for climate change adaptation and resilience building. *Grants and extremely concessional*

loans are essential for adaptation. These could be financed by a green bond and a tax à la Tobin, or through the repurposing of fossil fuel subsidies. This must take account of specific country requirements in least developed countries and lower-middle income countries and fossil-fuel exporting economies that need a gradual restructuring of these carbon-intensive industries and an appropriate safety net system to meet climate debt.

- **Debt relief and debt cancellation** for developing countries should be put on the climate agenda. The delivery of the Agenda 2030 was already in doubt before the Covid-19 crisis given the burden of debt being carried by many developing countries but in the post-Covid era these countries face even greater challenges in addressing their climate resilience needs. An obvious starting point would be the debt of the V20 countries, but linking the climate and debt crises highlights the need for systemic reforms to the international debt architecture.

- **Banking.** Well-financed *green public and development banks*, staffed by experts in climate change issues, at municipal, national and regional levels, are needed. Mandates and performance indicators should be aligned with that purpose. The multilateral development banks need additional capital to support more green investments and less fossil fuel or polluting activities and their activities aligned with the Paris Agreement and their "build forward better" commitments, withdrawing from oil, coal and gas and building in transition processes that support people and those industries to make the leap. Policy conditionalities will need to be pruned back and their AAA straitjacket should be relaxed to support experimental or new green technologies and enterprises. G7 countries should use their shareholder power to guide MDB in this direction. *Regional Development banks* and multilateral development banks could also buy developing countries' green bonds, guaranteeing a more stable demand for such bonds and easier access to long-term capital for developing countries. This could also have a favourable impact on their yields and, consequently, help to mitigate the external service burden, to an extent.

- **Bond Markets**. Affordable access to long-term funding is essential for developing countries in meeting developmental and climate needs, and green bond market is a key ways to help raise such long-term financing. Yet regulatory standards lag behind the growth of the green bond market: many disclosure commitments are voluntary, mechanisms to protect issuer and bondholder rights are under-developed; mechanisms to avoid greenwashing should be in place. These deficiencies need to be addressed by the private sector, as well as national and international regulators. *Appropriate standards* and enforcement of rules need to be agreed upon and introduced to make sure that green bonds stay green; that green savings bonds issued by national governments *respond to the needs* of local population; that the use of green bonds is properly *monitored and enforced* by the issuing governments; that both *investors and bond issuers are protected* over the lifetime of the bond; that *greenwashing is identified and penalised*; certification standards need to be transparent, harmonised and properly implemented. Given the scale of the challenge, the regulatory framework for the green bond market needs to be supported by *correspondent levels of financing and staffing*, at national and international levels.

The ***second*** priority would be declaring climate change adaptation a public good (cf. Timisel, 2021), at the international level, and establishing appropriate mechanisms to govern it. Such a recognition would reflect the reality already experienced by the developing economies struggling to green their exports and fund climate adaptation needs, and enable them to access and adapt green technologies to their national growth trajectories. Internationally, Climate Adaptation Fund, as proposed by some countries in the WTO,[33] can help countries in greening their exports. A Trade and Environment Fund could fund the incremental costs of sourcing critical technologies, provide grants for specific green technologies, finance joint research, development and demonstrations and fund establishment of technology transfer centers, exchanges and mechanisms. This measure would also deliver the necessary institutional coordination at the international level, for the much needed financial, technological and economic needs of climate conscious development.

F. Conclusion

With the growing intensity of major extreme events, adaptation must be prioritized. Institutional reforms that are required must build towards a move away from the principles of a regulatory, market-enabling state, and towards a developmental green state which would be in control of its own long-term priorities in climate adaptation and economic trajectories.

Trade has an important role to play in shaping sustainable development paths. However, attempts to liberalize trade in areas of export interests of the developed world, and relying on actions like CBAM can only undermine the ability of developing countries to use trade as means of development.

Facilitating climate adaptation in developing countries through trade agreements will require green technology transfers without restrictive patents, appropriate SDT in environmental goods and services so that providers of these goods and services in developing world can have level playing field and preserving policy space to encourage export diversification.

Since CO_2 emissions embodied in international trade as a share of total emissions is not more than 27 per cent, trade rules need to be de-linked from climate adaptation objectives, especially in the WTO, and countries should be provided with sufficient policy space to implement their national policies for climate adaptation. There is a need to pursue incentive-based approaches like declaring green technology transfers and limiting patents on these technologies.

The year of the pandemic may yet prove to be transformative on the way to formulating a more ambitious approach to financing the adaptation challenges, but hurdles are high and time has run out. It is encouraging to see the United States announcing its commitment of $5.7 billion in annual climate finance for developing countries by 2024. Yet, "in the context of both the need and the money being spent at home, this is an error term…the lack of a truly global response to the pandemic augurs badly for common action of climate" (Wolf, 2021).

A much more visible and leading hand for public financial institutions at all levels is essential. Some seventy-five years ago, the Marshall Plan helped deliver shared prosperity among the war-torn economies. Today, climate change is a challenge to humanity that requires a similar integrated, anticipatory and strategic approach. A menu options has been discussed in this chapter. However, a global, green-oriented structural fund would support realignment of developing countries and deliver funding for both adaptation and mitigation initiatives as an urgent priority. This would generate dividends not only for the developing countries, but for advanced economies too. It will help building counter-cyclical buffers, enhance resilience and inclusion in communities at local and national levels, and enable growth towards a pattern that can keep global temperature rises below the critical 1.5°C.

Notes

1 WT/CTE/W/249.

2 https://sdg.iisd.org/commentary/policy-briefs/wto-members-assess-mc12-options-for-trade-environmental-sustainability-work/.

3 See https://www.wto.org/english/docs_e/legal_e/04-wto_e.htm.

4 See https://www.wto.org/english/thewto_e/minist_e/min01_e/mindecl_e.htm.

5 https://www.mfat.govt.nz/en/media-and-resources/climate-change-ministers-express-support-for-the-agreement-on-climate-change-trade-and-sustainability-at-cop25/.

6 According to media reports, the European Union plans to use the expected annual revenue of €10bn from its planned carbon border tax mechanisms to repay debt incurred for its recovery measures; *Financial Times* (2021). EU carbon border tax will raise nearly €10bn annually. 6 July.

7 Depending on its design, such a climate waiver and/or peace clause could also help to tackle the regulatory chill resulting from legal mechanisms such as Investor-State Dispute Settlement (ISDS) which disproportionately expand the purview of investors over the public policy-making process, often at the expense of climate

and development-friendly initiatives (Tienhara, 2017).

8 *Mitigation* finance is directed to general activities that reduce greenhouse emissions and are compatible with low emission development, such as renewable electricity generation or energy-efficient construction. *Adaptation* finance is, rather, linked to particular projects and location specific loans that directly impact vulnerability to climate change, such as improving the resilience of small island states to natural disasters.

9 As noted in Chapter III, with respect to investing in mitigation there are multiple potential sources of financing to ensure that countries can meet the required investment target. See further *TDR 2019*.

10 Further on the limits and dangers of relying on private finance to take the lead on sustainable investment, see Fancy, 2021.

11 This includes Australia, some European Union institutions and the Netherlands. Denmark, Sweden and Switzerland gave over 95 per cent of their contribution in the form of grants. At the same time, for countries that gave significantly much larger sums in total, such as Germany and Japan, their smaller relative proportion in grant form did yield a significant amount in absolute terms (Oxfam, 2020:10). The main point is that grant provision from all sources needs to increase.

12 https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2019/.

13 In 2015, the United States pledged to double its adaptation funding through multilateral and bilateral channels to $800 million per year to developing countries by 2020. See: https://2009-2017.state.gov/r/pa/prs/ps/2015/12/250495.htm. From 2010 to 2015, total adaptation financing was US$2.57 billion, averaging US$428 million (US State Department, n.d.). See President Biden's latest announcement here: https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/23/fact-sheet-president-bidens-leaders-summit-on-climate/.

14 See: https://adaptationexchange.org/adaptationActionAgenda.

15 Statement in Response to the Sixth Assessment Report of the IPCC, 2021. 10 August 2021.

16 Started in 2009, but formally established in Lima, Peru in 2015, the 48 countries represent 1.3 billion people and include Afghanistan, Bangladesh, Barbados, Bhutan, Burkina Faso, Cambodia, Comoros, Colombia, Costa Rica, Democratic Republic of the Congo, Dominican Republic, Ethiopia, Fiji, Gambia, Ghana, Grenada, Guatemala, Haiti, Honduras, Kenya, Kiribati, Lebanon, Madagascar, Malawi, Maldives, Marshall Islands, Mongolia, Morocco, Nepal, Niger, Papua New Guinea, Palau, Palestine, Philippines, Rwanda, Saint Lucia, Samoa, Senegal, Sri Lanka, South Sudan, Sudan, United Republic of Tanzania, Timor-Leste, Tuvalu, Vanuatu, Vietnam, Yemen. See https://www.v-20.org/members.

17 Sir David King, Head of the Centre for Climate Repair, Oxford, recorded in FT podcast "Can Climate damage be repaired?" 12 August 2021. Available at https://www.ft.com/content/5804b93f-8b80-40c4-9b30-3d8b9bf8da3d.

18 We employ the World bank categorization of countries in this discussion.

19 Sudan being the exception.

20 See: https://www.imf.org/external/Pubs/ft/dsa/DSAlist.pdf.

21 Methodology can be found here: https://gain.nd.edu/assets/254377/nd_gain_technical_document_2015.pdf.

22 "Give me a place to stand, and a lever long enough, and I will move the world".

23 According to the Climate Bond Initiative (CBI), "rigorous scientific criteria ensure that bonds and loans with Certification, are consistent with the 2 degrees Celsius warming limit in the Paris Agreement".

24 There are also ESG debt instruments that are not certified and labelled as green, social and sustainability bonds. The uncertified green debt instruments are called climate or climate-aligned bonds.

25 See, for example: Ehlers and Packer, 2017; Zerbib, 2016; Larcker and Watts, 2019; Hachenberg and Schiereck, 2018; Kapraun et al., 2019.

26 Based on a sample of 27 green banks by Whitney et al., (2020).

27 One part of the path may be to target committed, small scale investors, not just the big institutional. The Connecticut Green Bank CGB, established in 2011 and with a focus on renewable energy, recently launched an innovative bond programme purchasable in $1 000 tranches on 15-year terms to households and 'ordinary citizens' with the assurance the funds would be used to finance rooftop solar systems. The bond issuance was sold out within two weeks, with demand exceeding the bank's supply.

28 Carried out by UNCTAD in mid-2020 in collaboration with Eurodad, the Municipal Services Project and a team of 24 researchers and four regional public bank and finance associations, this was the first review of public banks and their response to Covid-19. It can be found at https://unctad.org/webflyer/public-banks-and-covid-19-combatting-pandemic-public-finance.

29 The pledged $65 billion for 2019 appears like a big increase over previous years but this is in part because it includes EIB lending to European

countries, not previously included. When only emerging and developing countries are included, the 2019 lending commitment shows a smaller increase, from $43.1 billion to $46.5 billion.

30 The IsDB issued a special Covid Sukuk and borrowed from other MDBs; the NDB also issued a special Coronavirus bond.

31 https://www.worldbank.org/en/events/2018/11/16/from-evolution-to-revolution-10-years-of-green-bonds.

32 Demand remains high and new bonds are typically heavily over-subscribed even when very large, as seen with a recent offer in May 2021 of a $2.5 billion five-year AAA rated Sustainable Development Bond. Paying an annual yield of 0.963 per cent, it had one of the lowest spreads in the sector and was taken up mostly by central banks and official institutions (buying 63 per cent of the issue). Pension funds and asset managers also took a portion (18 per cent). https://www.worldbank.org/en/news/press-release/2021/05/18/world-bank-usd-2_5-billion-5-year-bond-mobilizes-finance-for-sustainable-development.

33 The trade and environment Fund was proposed by China and India in 2011. For details see: https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S009-DP.aspx?language=E&CatalogueIdList=104702,98548,101134,90606,71962,99113,92836,94001,92436,58038&CurrentCatalogueIdIndex=0&FullTextHash=&HasEnglishRecord=True&HasFrenchRecord=True&HasSpanishRecord=True.

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