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Enabling business mitigation and adaptation to climate change

Green policies and the role of Employer and Business Membership Organizations

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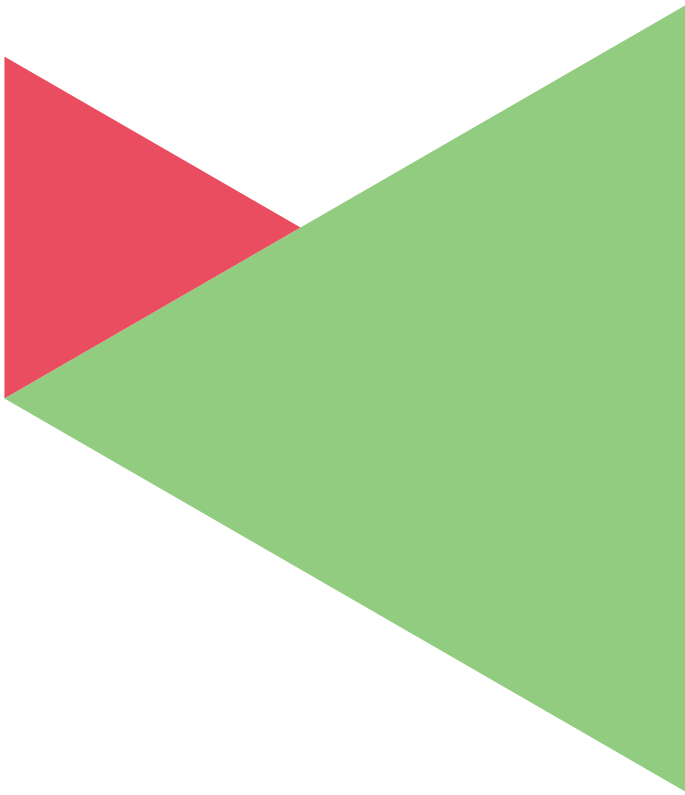

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Preface

Climate change is a global challenge that is affecting billions of people, entire communities, employers and business organisations, and enterprises across regions. It represents a threat to human well-being and socio-economic development[1]. According to the World Economic Forum's Global Risk Report 2022, climate action failure and extreme weather are considered among the most critical threats to the world in the next 2 to 5 years. Moreover, a joint report prepared by the ILO Bureau for Employers' Activities and the International Organisation of Employers revealed that nearly 70% of businesses recognised that increasing environmental and disaster risks have considerable impact on their operations[2].

The ILO has long recognised the importance of providing technical support to member States, workers' and employers' organisations to cope with the labour market impact of climate change. In 2015, the ILO *Guidelines for a just transition towards environmentally sustainable economies and societies for all* introduced a set of principles to aid constituents in devising strategies to foster the transition to environmentally sustainable economies and societies.

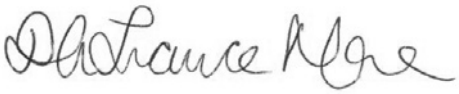
In the context of the ambitious obligations of the Paris Agreement, participating countries need to make emissions reductions in all industrial and economic sectors. However, this can only be realised by the private sector if a holistic and coherent policy framework is implemented, in consultation with Employer and Business Membership Organisations (EBMOs). Therefore, supporting business mitigation and adaptation to climate change is of the essence to accelerate change towards a net zero carbon emissions economy.

This study prepared by the ILO Bureau for Employers' Activities is aimed at:

I. Analysing if the global governance for the transition towards a green economy creates a level playing field for enterprises of all sizes, facilitates access to resources and knowhow, and encourages business adaptation and mitigation to climate change.
II. Identifying the main obstacles to business adaptation and mitigation across regions and sectors.
III. Assessing key policies for a comprehensive strategy to decarbonize the economy and accelerate the structural transformation towards a net-zero carbon emissions economy.
IV. Providing concrete recommendations for EBMOs to develop services and knowledge products, along with a policy reform agenda for advocacy purposes, to support their members in taking action for climate change mitigation and adaptation.

This report is mainly aimed at EBMOs as a thought piece for future action. However, it will also be of interest and relevance for all those interested in the role that enterprises and the wider private sector can play in driving change for sustainable development. We remain at the disposable of our constituents to deepen this analysis and provide guidance in the pursuit of sustainable enterprises and economies for the benefit of all.

Deborah France-Massin



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International Labour Office

1 IPPC (2022). Climate Change 2022: Impacts, Adaptation and Vulnerability. IPCC Sixth Assessment Report.
2 ILO-IOE (2019). Changing Business and Opportunities for Employer and Business Organizations. International Labour Office and International Organisation of Employers – Geneva: ILO and IOE, 2019.

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Introduction

Emissions of greenhouse gasses into the Earth's atmosphere by the combustion of fossil fuels have increased exponentially since the end of the nineteenth century, in line with global GDP per capita that exploded around that time. Since the industrial revolution, our modern economy and its growth are based on affordable and easily available energy; this energy has been provided in abundance by fossil fuels. The explosion of technological progress and economic activity that followed created unprecedented prosperity, improvement of living standards, and a wealth of new products and services. These developments, coupled with advances in medicine and agriculture, have led to the world's population reaching its highest level in history. In fact, in the 20th century, the world's population almost doubled twice while global Gross Domestic Product (GDP) doubled over four times. On the other hand, the emissions produced by that combustion are and have been making their effect very clear in the form of climate change[3]; in 1900 total global emissions amounted to about 2 billion tonnes of carbon dioxide (CO2), by 1950 emissions were three times that much and today they are close to 20 times that much[4].

According to the International Energy Agency (IEA) and the World Resources Institute (WRI), CO2 comprises 74.1% of greenhouse gas emissions. Most CO2 emissions (92%) are from the use of fossil fuels, for the generation of electricity and heat, transportation, manufacturing, and consumption. The largest increases in greenhouse gas (GHG) emissions in the last three decades have been driven by the energy sector. Energy consumption is responsible for 75.6% of GHG emissions worldwide. The energy sector includes transportation, electricity and heat, buildings, manufacturing and construction, fugitive emissions and other fuel combustion (WRI, 2022; Foster & Bedrosyan, 2014). Other top-emitting sectors are agriculture (11.6%); industrial processes of chemicals, cement, and others (6.1%); waste (3.3%); and land-use change and forestry (3.3%), such as deforestation. Within the energy sector, heat and electricity generation is responsible for most emissions (31.8%), followed by transportation (17%), and manufacturing and construction (12.7%) (See Figure 1).

The science of what happens in an energy- and carbon-intensive global economic system is straightforward: to avert the worst impacts of climate change and preserve an inhabitable planet, global temperature increase needs to be limited to 1.5°C above pre-industrial levels. Currently, the Earth is already about 1.1°C warmer than in the late 1800s, and emissions continue to rise. To keep global warming to no more than 1.5°C – as called for in the Paris Agreement – emissions need to be reduced by 45% by 2030 and reach net zero by 2050. Under the current trends, climate change could cut global income by $23 trillion in 2050, which amounts to 14 percent of global income (Mumenthaler, 2021).

Several countries have put forward pledges to reach a net-zero economy. Net-zero means cutting greenhouse gas emissions to as close to zero as possible, with any remaining emissions re-absorbed from the atmosphere, by oceans and forests, for instance. However, this does not mean cutting economic growth, which is still needed to lift millions of people from poverty. Decoupling, the separation between economic growth and increased per-capita emissions is at the core of sustainable development. When the increase of an environmental pressure or impact is slower than GDP growth, then economies are decarbonizing. Figure 2 shows that the world has followed a decarbonization process. Global economic activity today produces 1/3 fewer emissions per dollar of GDP than in 1990. However, this pace is not fast enough to reach the net-zero scenario required to avert the worst consequences of climate change. Under expected global GDP growth estimates, the size of the global economy will more than double by 2050 (PwC, 2017). If emissions per GDP were halved by 2050, there would be no improvement in the total amount of emissions released into the atmosphere each year. This is the size of the challenge that policymakers, enterprises, and employers and business membership organisations (EBMOs) face: emissions need to decrease faster than incomes increase. This situation means that enterprises will

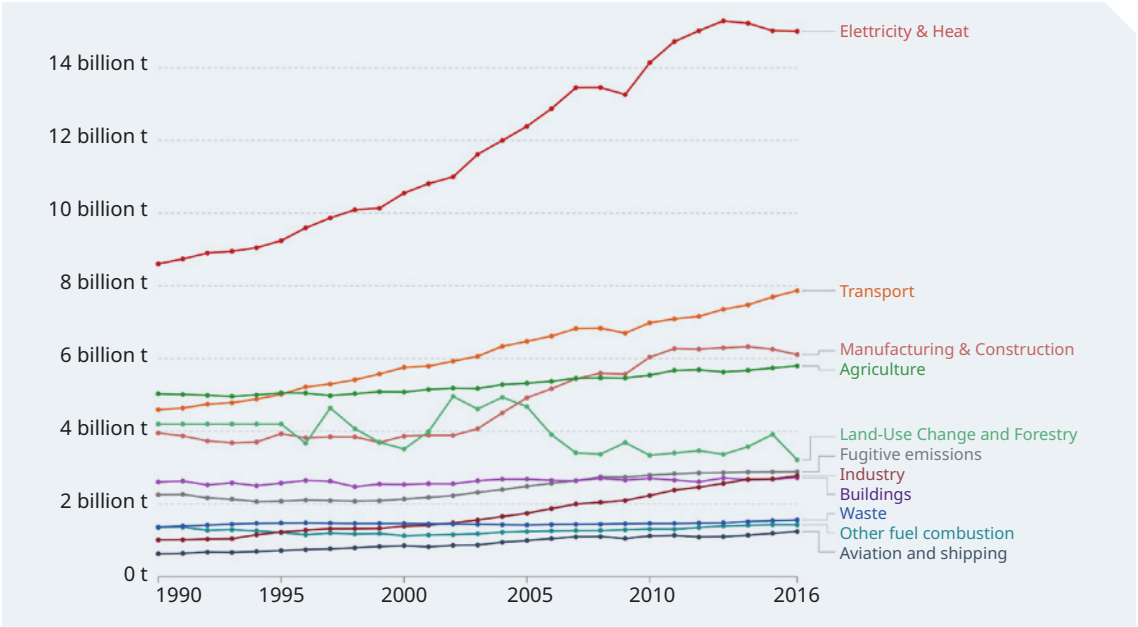
3 The Economist, 2019, "The past, present and future of climate change" and "Humanity's immense impact on Earth's climate and carbon cycle".

4 The Economist, 2019, "The past, present and future of climate change".

have to adapt to increasingly ambitious – yet in many cases, still insufficient- climate policies and lead innovative decarbonization efforts that generate green jobs. At the same time, enterprises will need to improve their management practices, products, physical assets, and prioritize workforce's upskilling and reskilling and life-long learning mindsets to ensure a resilient future in a warmer and more volatile world. Decarbonization is a radical but inevitable transformation. In this report, we will overview the policy landscape that is shaping this process, the barriers for enterprises to participate in the transition, and some lines of action for EBMOs.

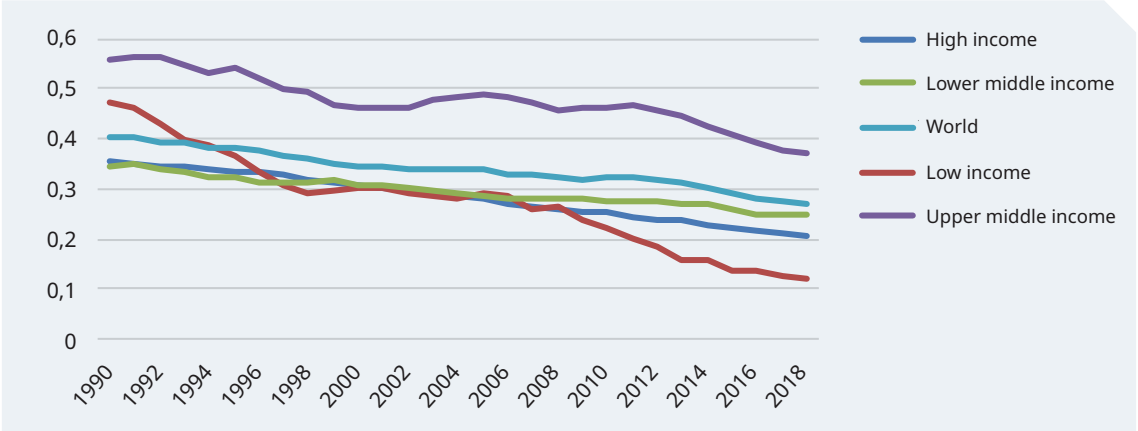
There are disparities in emissions per dollar of GDP (Figure 2). While low-income countries produced more emissions per dollar of GDP than the global average in the nineties, this comparison has completely flipped. At the same time, there are also significant regional disparities in the contributions to total emissions, which need to be accounted for (Figure 3). Current emissions levels of the poorest half of the population are close to per-capita 2030 climate targets in the US, the UK, Germany, and France. In these countries, policy efforts should arguably be largely focused on reducing emissions levels of the top half of the population and, in particular, of the top 10%. In low-income and emerging countries, while certain groups will see their emissions levels rise in the coming decades, urgent action is needed to curb the emissions of the wealthy.

Figure 1. Global emissions of greenhouse gases (CO2-e) by sector



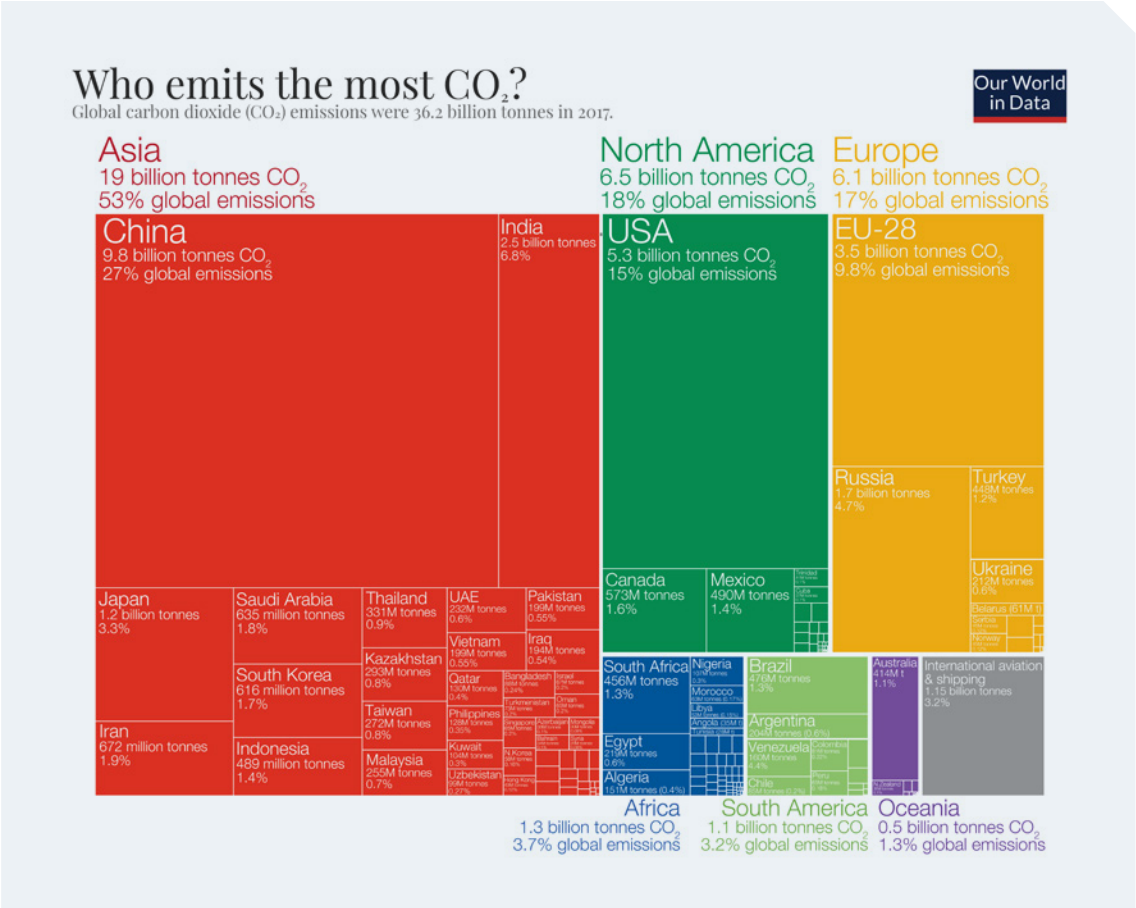
Source: Our World in Data visualization with data from CAIT, the Climate Data Explorer via Climate Watch.

Figure 2. Emissions by income group (kg of CO2 emissions per PPP $ of GDP)



Source: Authors' elaboration with World Bank Data.

Figure 3. Global emissions of greenhouse gases (CO2-e) by country (2017)



Source: Our World in Data visualization with Global Carbon Project (GCP) data. Note: total emissions were 36.2 billion tons of CO2-e. Emissions embedded in trade are excluded.

According to a recent survey carried out by the International Organisation of Employers (IOE) (IOE & ILO, 2019), sustainability and climate change are among the five leading global trends impacting business globally; almost 70 percent of surveyed employers see the considerable impact in their operations from increasing environmental and disaster risks. Mitigation and adaptation measures must be undertaken to prevent losses and develop climate-resilient and sustainable enterprises. Experts agree that it no longer makes sense for enterprises to think about climate change mitigation and climate change adaptation as separate line items (Sijbesma & Ishii, 2019). The private sector needs an integrated strategy to confront climate disruption - business leaders would make better decisions by considering both sides of the equation. The 2022 World Economic Forum Global Risks Report (WEF, 2022) found that environmental risks were the five most critical threats to the global economy, highlighting climate action failure, extreme weather, and biodiversity loss as the most acute risks. Climate change has been one of Davos' main topics of discussion in recent years (Bakker, 2020; Clift, 2020).

Enterprises reporting to the Carbon Disclosure Project (CDP)[5] have reported extensive climate change risks to their activities and operations and potential opportunities that can have a significant impact. The largest enterprises reported likely financial impacts on their assets but also opportunities for growth far beyond the size of risks; the takeaway is that managing identified risks ahead of time is significantly cheaper than tackling them when they hit. Timing is a key element, and there are already many options

5 The Carbon Disclosure Project is an international, not-for-profit organisation providing a global system for enterprises and cities to measure, disclose, manage, and share environmental information. They request information on climate risks and low carbon opportunities from the world's largest enterprises on behalf of over 515 institutional investor signatories.

for adaptation and increasing business resilience (Pinner & Sneader, 2019; WEF, 2020b). Climate change requires a rewiring of the entire global economy. The Global Commission on Adaptation estimates that investing $1.8 trillion to climate-proof enterprises and the broader economy between now and 2030 could generate up to $7.1 trillion in net benefits. This is an attractive return on investment (Sijbesma & Ishii, 2019).

In the context of the obligations of the Paris Agreement, participating countries need to make emissions reductions in all industrial and economic sectors. Furthermore, over 1,200 enterprises have put in place science-based targets in line with net-zero, and more than 1000 cities, over 1000 educational institutions, and over 400 financial institutions have joined the Race to Zero, the UN-backed global campaign rallying non-state actors to take rigorous and immediate action to halve global emissions by 2030.

However, enterprises can only realize this if measures are implemented in a realistic and economically friendly way. As seen with the Covid-19 crisis, extreme measures that interfere with regular economic activity cannot be sustained. Swift action at the national and global levels is required to accelerate the transition to a low-carbon economy. Supporting business mitigation and adaptation to climate change will be essential in this context. This report aims to identify policies and strategies to enable business adaptation to climate change. On the one hand, the rapid social change and ambitious environmental policies to keep the Earth's environment within safe boundaries for human development will require significant business resilience and adaptability to changing regulations and consumer demands. On the other hand, environmental degradation itself, and the accompanying increase in extreme weather events, biodiversity loss, and shifting of agro-climatic suitability of the land will represent significant challenges for millions of enterprises worldwide. Harm to enterprises may arise through interruptions associated with plant shutdowns or logistics issues, increased operational costs due to rising heating/cooling or water treatment costs, reduced stock prices related to compromised assets, and many other impacts (CDP, 2014). At the same time, enterprises and communities have to deal with other shocks and disruptions such as volatile energy prices, inflation, and geopolitical tensions, making the business enabling environment and the broader socio-economic context even more relevant nowadays.

The structure of this report is as follows. Chapter 1 analyses the global and regional governance of the transition towards a green economy. Chapter 2 undertakes a comprehensive literature review to identify the main obstacles to business adaptation across regions and sectors, focusing on the business environment and regulatory frameworks. Chapter 3 identifies and proposes a set of essential policies and institutions to decarbonize the economy, promote the use of renewable energy, and accelerate the structural transformation towards a net-zero carbon emissions economy without jeopardizing the competitiveness and economic viability of enterprises. Finally, Chapter 4 examines the role of Employer and Business Membership Organizations (EBMOs) in fostering resilience in a changing planet. It provides concrete recommendations to develop a policy reform agenda and services and resources (such as guides and trainings) to support members in adapting and mitigating climate change.

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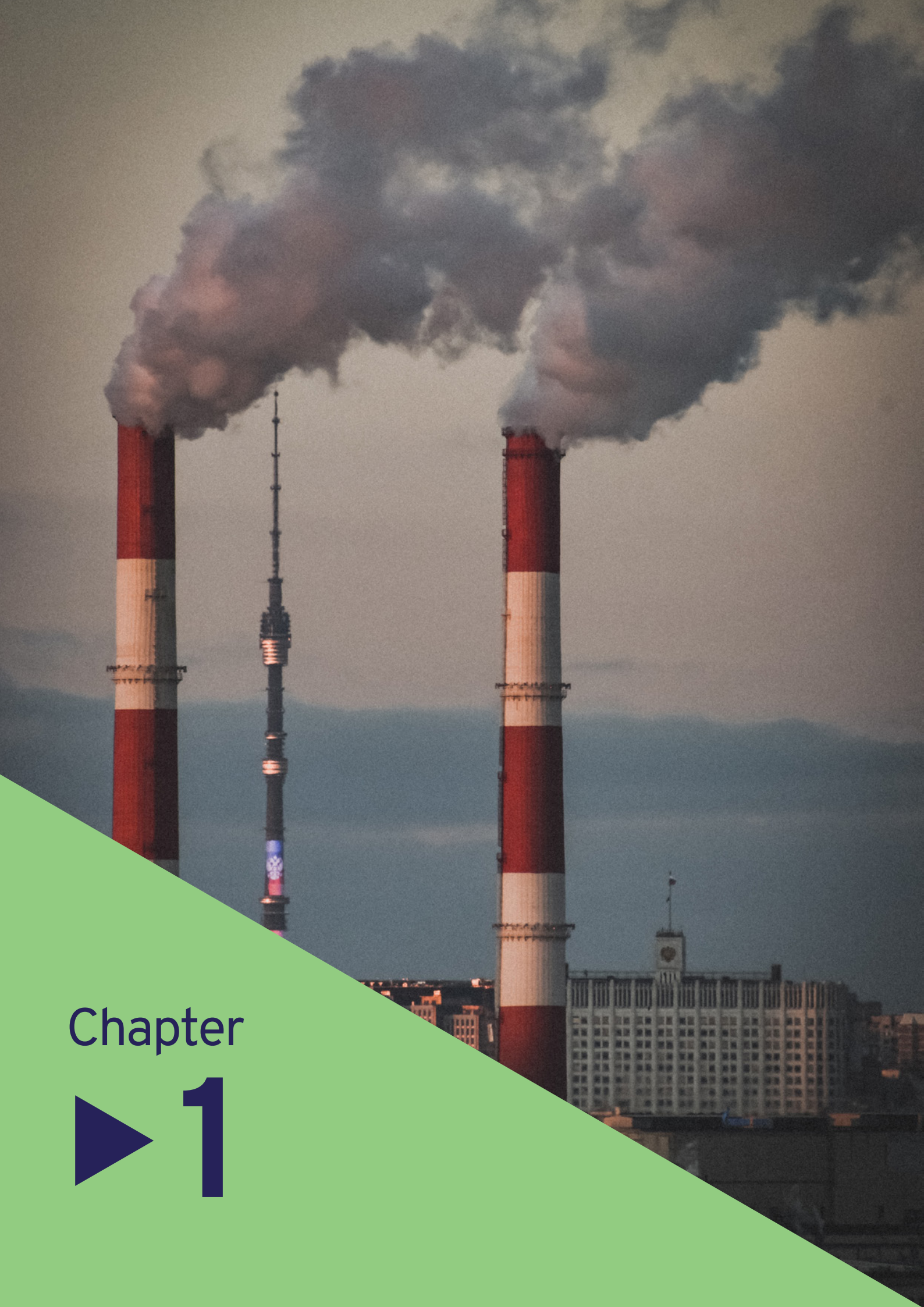

Chapter 1

Assessment of the global governance for the transition towards a net-zero carbon emissions economy

Global and regional governance toward sustainable transitions should create a level playing field for enterprises of all sizes, facilitate access to resources and know-how, and encourage business adaptation to climate change, as well as participation in mitigation policies and adaptability to tackle the required transformation of the global economic landscape. In this chapter, global governance is overviewed and evaluated to assess whether it produces the enabling conditions for private sector engagement and business resilience.

The rest of the chapter proceeds as follows. Section 1.1 presents an analysis of the lessons learned from the first climate agreements happening a quarter of a century ago in Kyoto, Section 1.2 reviews the Cancun Adaptation Framework, Section 1.3 synthesizes the implications for enterprises from the Paris Agreement, Section 1.4 analyses the European Green Deal, section 1.5 presents some selected prospective debates and the future of global environmental governance. Section 1.6 concludes with a synthesis of the policy challenges outlined in this chapter.

▶ 1.1 It all started with Kyoto: lessons learned from 26 years of global environmental governance

In 2023, over a quarter of a century will have passed since the adoption of the Kyoto Protocol (KP) in 1997. In 26 years, the international environmental governance will have gone from the Kyoto Protocol to the Paris Agreement to the Glasgow Climate Pact. Glasgow and Kyoto are the only times in 26 years of UN climate negotiations that fossil fuels have been named in the final agreement. Owing to a complex ratification process, the KP did not enter into force until 16 February 2005. Currently, there are 192 Parties to the KP.

The Kyoto Protocol operationalized the United Nations Framework Convention on Climate Change (UNFCCC) by committing industrialized countries and economies in transition to limit and reduce greenhouse gas (GHG) emissions under agreed individual targets. The Convention asked participating countries to adopt policies and measures on mitigation and report periodically. The KP was binding, but only for a subset of developed countries. In Annex I and its updated version, Annex B, the Kyoto Protocol set binding emission reduction targets for 37 industrialized countries and economies in transition and the European Union. Overall, these targets add up to an average 5 percent emission reduction compared to 1990 levels over 2008–2012 (the first commitment period).

The KP enabled three market-based mechanisms: Emissions Trading System (ETS), the Clean Development Mechanism (CDM), and Joint Implementation. This section summarizes the implications for the private sector from these three market mechanisms, which are also outlined in Table 1.

Table 1. Market mechanisms in the Kyoto Protocol and implications for the private sector

Mechanism	Objective	Implications for the private sector
Emissions Trading System (ETS)	International Emissions Trading allowed countries that have emission units to spare - emissions permitted them but not "used" - to sell this excess capacity to countries over their targets.	*Cap and trade provide the private sector with the flexibility required to reduce emissions while stimulating technological innovation and economic growth. (Evans, 2003).*
Clean Development Mechanism (CDM)	The CDM allows a country with an emission-reduction or limitation commitment to implement an emission-reduction project in developing countries. Such projects can earn saleable Certified Emission Reduction (CER) credits, which can be counted towards meeting Kyoto targets.	*CDM and JI bring together private economic interests and public climate policy by helping to channel private sector investment toward climate-friendly projects that otherwise might not have taken place (Voigt, 2008).* *CDM projects attract substantial transfers in financial and technological services to developing countries while promoting climate protection.* *JI projects generate technology transfers between developed countries: a developed country with a relatively high cost of domestic GHG reduction can set up a project in another developed country with relatively low abatement cost.*
Joint Implementation (JI)	JI allows a country with an emission reduction or limitation commitment under KP (Annex B Party) to earn emission reduction units (ERUs) from an emission-reduction or removal project in another Annex B Party.	

Source: (UNFCCC, 2021).

Emissions Trading System can significantly lower carbon mitigation costs and promote environmentally friendly investment in transition economies. The design of domestic systems to complement international emissions trading plays a significant role in emissions trading's effectiveness. The value of traded global markets for CO_2 permits grew by 164% to a record 760 billion euros ($851 billion) in 2021. However, most of the transactions occurred within the framework of the European ETS (Chestney, 2022). Evans (2003) examined the benefits and challenges of proposed domestic ETSs and the related flows of emissions trading revenue in seller nations. The overwhelming majority of emissions available for sale come from transition economies. Some governments in this income group feel the money would best be used as public revenue. Others argue that emissions trading should involve the private sector and other emitters to provide maximum incentives to reduce emissions and generate additional emissions trading revenue (the rules for international emissions trading explicitly allow this). The counterargument is that special carbon mitigation funds would enable the government to maintain control yet stimulate additional emission reductions. Each policy contains its own set of challenges: stimulating further emission reductions, credibly monitoring emissions and emission reductions, or applying adequate fiscal accounting to the money flows. Enterprises have engaged in this policy issue at different levels. The International Emissions Trading Organization (IETA) was the first international, multi-sectoral, purely business group devoted to pricing and trading greenhouse gas reductions. It emerged in response to the KP and helped members using, hosting and investing in Clean Development Mechanism (CDM) and Joint Implementation (JI) projects, by disseminating policy and market information and promoting development and reform. The work of IETA exemplifies what EBMOs can do to operationalize ETSs: the organization has convened numerous forums for market participants to hone skills, develop business relationships and analyse policy impacts. The organisation sponsored the development of the first model contracts for the EU, CDM and other markets that emerged, tapping the expertise of its wide membership (IETA, 2022).

The debate about ETS designs also encompasses whether they should be domestic or international. Nong and Siriwardana (2017) analysed the environmental and economic impact of domestic ETSs in New Zealand, EU27, Switzerland, Norway, Kazakhstan, and South Korea, and potential implications of linking these systems into an international ETS to ascertain whether the linkage might provide significant

benefits to these economies. Using GTAP-E simulations[6] results showed that the permit prices vary significantly over economies in the case of domestic ETSs. Intuitively, in the case of international ETS, the market converges to an intermediate price, driven mainly by the bigger economies. Over the two scenarios examined, economies experience only slight reductions in their real GDP and acceptable inflation levels. They find that there is not much difference in reported projections when comparing the domestic ETSs scenario with the international ETS scenario. This is because most economies in their study are very small relative to EU27 and South Korea. Hence, the authors conclude that a more efficient linkage involving those large economies or polluters such as the USA, Japan, China, India, or Australia, is promising. Such a linked market would also reduce market power and carbon leakage. In addition, the results also indicate that the six economies in this study can achieve their targets at relatively low costs under an international ETS.

Most of the Clean Development Mechanism (CDM) studies agree that it positively impacted the various facets of sustainable development in the host countries (Spalding-Fecher et al., 2012). Notably, employment generation[7] was one of the most widely reported impacts. Spalding-Fecher et al. (2012) highlight that the CDM is the only mechanism that offers an innovative solution to the challenge of incorporating sustainable development considerations into emission mitigation activities. It has also contributed to the development of a global carbon market. Capacity-building for low-carbon development within developing countries may be one of the most critical sustainable development impacts of the CDM. This capacity-building has engaged the local private sector and laid the domestic climate change policy foundation.

The authors find that large-scale renewable power is the largest CDM project category and, within this, wind, hydropower, and biomass are the largest contributors to new electricity capacity. Registered CDM projects have accounted for more than 110,000 MW of renewable electricity capacity over the last ten years, roughly Africa's total power generation capacity. More than 90% of this renewable electricity capacity is in five countries: China, India, Brazil, Vietnam, and Mexico. These infrastructure projects also have had an impact on technology transfer. According to previous empirical studies, 27–39% of CDM projects report technology transfer as a component of the project design.

1.1.1 Lessons learned

Olmstead and Stavins (2006) describe the basic features of a climate agreement that incorporated the lessons from the KP. First, it is necessary to include all critical developed and developing countries. The authors propose that countries should make "growth commitments," that is, commitments that become more stringent as the countries become wealthier. Second, the authors urge to consider two classes of commitments: moderate ones in the short run, to avoid premature obsolescence of capital; and more stringent (and flexible) pledges, in the long run, to give incentives for technological change. Third, the authors argue that it is necessary to employ market-based policy instruments. Domestic policy instruments encompass tradable permits, carbon taxes, and a hybrid system of ordinary tradable permits with a government promise to sell additional permits at a stated price. International policy instruments include a system of international tradable permits, similar to those employed in the Kyoto Protocol but including developing countries (Diniz, 2007). Finally, researchers from the Bookings Institute suggested that the system required a fixed supply of long-term emission permits[8] to make it viable and efficient (Wilcoxen & McKibbin, 2002).

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6 The standard GTAP Model is a multiregional, multisector, computable general equilibrium model, with perfect competition and constant returns to scale. GTAP-E, which includes the standard GTAP model as a special case. In addition, GTAP-E incorporates carbon emissions from the combustion of fossil fuels and this revised version of GTAP-E provides for a mechanism to trade these emissions internationally.
https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=923

7 Through a study of 202 registered project design documents (PDDs), (Spalding-Fecher et al., 2012) show that 99% of PDDs reported sustainable development benefits: 96% mentioned economic benefits, 86% mentioned social benefits and 74% mentioned environmental benefits. Among sustainable development indicators, most mentioned benefits in terms of: improved local quality of life (82%), employment generation (80%) and contribution to national energy security (76%).

8 In this proposed system, all long-term permits would be distributed by a country's government to energy suppliers, enterprises, even individuals if deemed appropriate. Each long-term permit would allow the holder to emit one ton of carbon each year. The long-term permits would be given away or auctioned or distributed by the government in any way it sees fit. Each country's supply of long-term permits would be negotiated internationally, but one possibility would be an amount equal to 95 percent of the country's 1990 emissions -the basis of Kyoto's targets– (Wilcoxen & McKibbin, 2002).

▶ 1.2 The Cancun Adaptation Framework

1.2.1 Context

The 2010 United Nations Climate Change Conference (UNCCC) was held in Cancun, Mexico, from 29 November to 10 December 2010, with more than 160 participating delegates. The conference was the 16th session of the Conference of the Parties (COP 16) and produced a series of agreements commonly referred to as the "Cancun Agreements." It aimed to establish a legally binding greenhouse gas emission reduction program, limiting the average increase in the Earth's surface temperature to below 2 °C compared to pre-industrial levels.

In this event, industrialized economies recognized their role in a low emissions development, declaring their willingness to create strategies and plans that would include market instruments. Industrialized countries also recognized the necessary actions to reduce emissions, considering common, but differentiated responsibilities. It was agreed on registering all activities in the Global South with technological and financial support from the Global North to mitigate the effects of climate change and to publish every two years their progress. In the same line, it was reiterated that the Kyoto Protocol's Clean Development Mechanism (CDM) should be strengthened to attract green investments and exchange sustainable technology to reduce emissions in the Global South.

The accord set two tiers or paths: developed countries, whose emissions limits were explicitly listed, and developing nations encouraged to formulate nationally appropriate mitigation actions (NAMAs) (C2ES, 2010). A critical missing area of analysis in the COP 16 was to find the optimal strategy to efficiently cut emissions to stay well below 2°C warming: the sum of all reduction pledges was approximately 60% of what was needed for this limit.

Nevertheless, one crucial product that came about during this summit meeting was the establishment of the "Cancun Adaptation Framework" that aimed to engage in better planning and implementation of adaptation projects in the Global South. The main objectives of the Cancun Adaptation framework would strengthen action on adaptation in developing countries through international cooperation. It would support better planning and implementation of adaptation measures through increased financial and technical support and maintaining and establishing regional centres and networks. The framework could also boost research, assessments, and technology cooperation on adaptation and enhance education and public awareness. For the first time, adaptation measures were given equal importance as mitigation measures (Molina, 2010). Importantly, the Cancun Adaptation Framework also produced an institutional architecture to guide adaptation: an Adaptation Committee tasked with advice and recommendations relating to technical assistance, best practices, and other related matters. Box 1 summarizes the objectives of the Cancun Agreements, and Table 2 summarizes institutional mechanisms that were set in place to achieve such objectives.

Box 1. Main objectives of the Cancun Agreements

1. Establish clear objectives for reducing human-generated greenhouse gas emissions over time to keep the global average temperature rise below 2°C.
2. Encourage the participation of all countries in reducing these emissions, in accordance with each country's different responsibilities and capabilities to do so
3. Ensure the international transparency of the actions which are taken by countries and ensure that global progress towards the long-term goal is reviewed in a timely way.
4. Mobilize the development and transfer of clean technology to boost efforts to address climate change, getting it to the right place at the right time and for the best effect.
5. Mobilize and provide scaled-up funds in the short and long term to enable developing countries to take greater and effective action.
6. Assist the particularly vulnerable people in the world to adapt to the inevitable impacts of climate change.
7. Protect the world's forests, which are a major repository of carbon.
8. Build up global capacity, especially in developing countries, to meet the overall challenge.
9. Establish effective institutions and systems which will ensure these objectives are implemented successfully.

Source: (UNFCCC, 2011b).

Table 2. New institutions developed through the Cancun Agreements.

Institution	Objective
Green Climate Fund	To house the international management, deployment, and accountability of long-term funds for developing country support.
Technology Mechanism	To get clean technologies to the right place, at the right time, and to the best effect.
Adaptation Framework	To boost international cooperation to help developing countries protect themselves from the impacts of climate change.
Registry	To enable an outlet where developing countries will detail their voluntary plans to limit greenhouse gas emissions and the support they need to achieve them.

Source: (UNFCCC, 2011a).

1.2.2 Implications for low-and middle-income countries vs. rich economies

The Green Climate Fund (GCF), the Technology Mechanism (TM), the Cancun Adaptation Framework (AF), and the Registry were created as mechanisms that could aid in addressing the disparities between countries in terms of access to capital, their contributions to climate change, abatement capabilities, and vulnerability to environmental degradation. The institutional framework created in Cancun contemplated four steps: a) funding mechanisms through the GCF, b) development of mitigation tools through the TM, c) development of adaptation tools through the AF, and d) accountability through the Registry. The conference also established a process for LDCs and other interested developing countries to formulate and implement national adaptation plans (NAPs) to identify and address their medium and long-term adaptation needs. Developing countries stood to benefit from these institutions in both adaptation and mitigation areas. Adaption implications included financing for infrastructure in flood defences and potable water storage and installing renewable energy sources. Mitigation would result from the continued installation of renewable sources and their accumulating effects of lowering emissions.

1.2.3 Implications for enterprises

The Cancun Agreements encompassed actions to mobilize financial resources towards green development. The pledges included a new green fund of $ 30 billion in fast-start financing from developed countries to support action on climate change in developing countries through the 2010-2012 period, intending to raise $ 100 billion in annual funding by 2020. Regarding climate finance, a process was established to design the Green Climate Fund under the Conference of the Parties that has a 24-member board with equal representation from developing and developed countries. In some cases, implementing actions that reduce emissions could result in adverse economic or social consequences for enterprises in local and international supply chains. As a result, governments decided to convene a forum in 2011 to discuss this further and establish a work program to address such consequences (UNFCCC, 2011c).

Robust international government funding in fast-start financing and as investors of first resort seeks to spur technological advances in adaptation and mitigation. This is especially relevant in areas where private equity investors might not otherwise have been comfortable with the level of risk and lack of quantifiable returns and the long timeframes involved. The widespread adoption of new energy systems takes a long time, typically many decades, as has historically been with coal, oil, and natural gas. Private energy enterprises spend on average only 0.3% of revenues on research and development (Gates, 2021). Public funding and incentives can help mature markets and foster technology transfer.

Once a technological advancement is proven viable, other measures, such as the TM comes into play to disseminate it relatively quickly, potentially leading to increased employment and other health and social benefits. In many cases, SMEs in some of the most vulnerable regions to climate change would end up participating in the benefits of increased access to capital and technology transfer. Larger corporations in the developing world could also benefit from added investment in complex infrastructure projects, such as installing wind turbines and solar or building seawalls or flood defences over time. New green technology has already led to increased employment, much of this in the developing world. According to IRENA and the ILO, there are already some 12 million jobs in the renewable energy sector. China now leads the world in clean energy employment, followed by Brazil and India. Other countries in the developed and the developing world are following suit (ILO, 2021b).

▶ 1.3 The Paris Agreement

1.3.1 Context

The Paris Agreement is a legally binding international treaty on climate change. Its goal is to limit global warming to well below 2°C, preferably to 1.5 °C, compared to pre-industrial levels. The Paris Agreement is a landmark in the multilateral climate change process because, for the first time, a binding agreement brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects.

While the agreement calls for an urgent increase in funds for adaptation, it does not establish a concrete target, even though developing countries are set to face adaptation costs of at least $520bn a year by 2050 (UNFCCC, 2015). Oxfam projected that the pledges of increased climate finance made by several governments ahead of and during the Paris meeting would mean dedicated adaptation finance of just $6–9bn per year delivered by developed countries to developing countries by 2020 – this leaves a perilous adaptation gap (Carty & Le Comte, 2016).

1.3.2 Implications for enterprises

The Paris Agreement marked a breakthrough in climate action from many parts of the business community. Hundreds of CEOs pledged to reduce their carbon footprint – 115 enterprises committed to aligning their targets to keep the global temperature increase below 2 °C, and 52 enterprises promised to strive for 100 percent renewable energy (OXFAM, 2015). On mitigation, the collective efforts announced by enterprises combined with the plans submitted by governments –Intended Nationally Determined Contributions (INDCs), 80 percent of which address agricultural mitigation (Richards et al., 2015)– were unprecedented in scope and scale, covering 189 countries and 98.8 percent of global emissions. However, these pledges are still nowhere near enough to avoid disastrous climate change. Even with full implementation, the planet is still headed for warming of 2.7°C to 3°C (Pearl-Martinez & Gore, 2016).

The Paris Agreement positively impacted SMEs in general, though progress was slower than many might have wished. This is mainly because MSMEs are generally slower to adopt new technologies than larger enterprises. This is important since SMEs represent the bulk of all enterprises in every region and virtually every country in the world. In fact, in the E.U., SMEs represent 99% of the business landscape, while in the ASEAN, they comprise 97% of all enterprises, 69% of employment, and some 41% of aggregate GDP. SMEs are therefore critical in any global effort to effect meaningful change in GHG emissions (Quintás, Martínez-Senra, & Sartal, 2018).

However, most SMEs suffer a knowledge gap, which is particularly true of the developing world. A lack of knowledge impedes seizing the opportunities in technology transfer and financing that may have been available to them under the PA. They tend to suffer from fewer resources in general, in areas such as human capital and access to financial resources in the first place. There is also an inherent reluctance to change, with many SMEs lacking confidence in investing in green technologies that they do not always fully understand. There are notoriously few studies on SMEs and their approach to decarbonization, but one undertaken in Spain by (Quintás et al., 2018) is particularly illuminating. The authors observed 1,161 MSMEs in their adoption of 9 distinct environmental practices. The most important findings are summarized in Table 3 below, where it is evident that as the size of an organization grows, there is a higher uptake of meaningful environmental practices. It is also clear that there remains significant room for improvement.

One of the most significant (while arguably the least tangible) results of the PA was bringing climate change into the mainstream. People worldwide have become increasingly and acutely aware of the potential for a climate disaster, and they are voting with their pocketbooks. More and more multinationals were getting the message, with many enterprises at the time pledging to halve emissions by 2030 and to reach net-zero by 2050. This is having a knock-on effect in terms of their SME suppliers. They are driving change from the top-down and requiring that more of their providers adopt environmentally friendly practices in their business models as a condition of doing business. Purchasing criteria of multinationals increasingly ask that providers share these same targets. A growing number of large corporations have also agreed to provide concrete tools to meet these objectives and share knowledge and best practices. Today more than 1,000 of the world's leading enterprises have made commitments towards achieving the 1.5 °C target, and they are pressuring their suppliers to do the same (Jouven, 2021).

Table 3. Percentage of adoption of environmental practice differences by SME size

Environmental Practices	All SMEs	Micro	Small	Medium
Environmental audits	28,90%	13,73%	26,39%	43,57%
Eco-design	3%	1,96%	2,38%	5,71%
Eco-labeling	3,90%	1,96%	3,57%	5,71%
Life cycle analysis	6,90%	1,96%	5,75%	12,86%
Best available techniques	6,90%	1,96%	11,51%	19,29%
Recycling and reuse of sub-products and waste	47,60%	29,41%	47,82%	53,57%
Reclycing and/or waste to generate energy	14,10%	15,69%	14,09%	13,57%
Cogeneration and trigeneration	1,40%	1,96%	1,39%	1,43%
Inclusion of renewable energy	7,20%	5,88%	7,74%	5,71%

Source: (Quintás et al., 2018).

▶ 1.4 The European Green Deal

The European Green Deal reflects the most recent regional approach to environmental policy. As climate change intensifies and produces massive costs for enterprises and governments, the synergies between green investments and economic growth have been increasingly highlighted in policy rhetoric and business communication. This widespread political and consumer sentiment set the stage for the European Green Deal.

1.4.1 Context

From the beginning of its mandate in December 2019, the new European Commission declared climate policy a top priority. The Commission presented the European Green Deal (EGD) (EC, 2019a) to provide an initial roadmap of the necessary key policies and measures in climate policy. At the core of the EGD is the net-zero emissions target by 2050. The document also stated that the Commission would propose 'the first European "Climate Law" by March 2020' to incorporate the 2050 climate neutrality objective in legislation. Moreover, it proposed increasing the EU's 2030 GHG reduction target to at least 50% and towards 55% compared with 1990 levels by revising climate-related policy instruments (EC, 2019a). The 2030 goal is fundamental because incumbent governments must take action in the short term (Siddi, 2020).

To meet the higher costs of the energy transition for regions and member states that are more reliant on coal or fossil fuels, the Green Deal Communication also proposes a Just Transition Mechanism and a Just Transition Fund (EC, 2020b). The proposed financial mechanism should also be an incentive for Poland, one of the prospective largest recipients and the only member state that has refused to commit to the 2050 net-zero emission target (Siddi, 2020).

The Green Deal Communication announced the upcoming introduction of various strategies via a wide range of regulatory and legislative frameworks, for instance, the Carbon Border Adjustment Mechanism (CBAM), the Sustainable Europe Investment Plan, an EU industrial strategy, a Circular Economy Action Plan (CEAP), a new EU Biodiversity Strategy to 2030 and a 'Farm to Fork' (FtF) sustainable agriculture strategy.

> "(The European Green Deal is) ...a new growth strategy that aims to transform the European Union (EU) into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use". (EC, 2019a).

The measures and objectives of the EGD are summarized in Box 2. Implementing the EGD requires the total mobilization of industry, with all industrial value chains having an essential role to play. The strategy must lead the dual green and digital transition to help the industry reduce its carbon footprint and simultaneously enhance its competitiveness. The expectation is that this goal will be achieved by providing affordable and clean technological solutions and developing new business models. In particular, the goal of investing in a green future can transform industrial value chains and financial markets. 30% of the EU's multiannual budget (2021-2028) and the EU's unique Next Generation EU (NGEU) instrument to recover from the COVID-19 pandemic has been allocated for green investments. EU countries must devote at least 37% of the financing they receive under the €672.5 billion Recovery and Resilience Facility to investments and reforms that support climate objectives. On behalf of the EU, the Commission intends to raise 30% of the funds under NGEU through green bonds. To thrive and get on board of the EGD train, enterprises must be prepared to attract this targeted capital, link their performance indicators to sustainability, and, more broadly, to social responsibility. The EU estimates the cost of implementation of the EGD at €1 trillion over the next ten years, with contributions derived from the EU budget, member states, and private industry (Harvey & Rankin, 2020).

Box 2. Actions included in the European Green Deal

1. **Path to climate neutrality.** The EGD aims to make Europe climate neutral by 2050. To make this objective legally binding, the Commission proposed the European Climate Law.
2. **A clean energy transition.** The EGD focuses on 3 key principles:
   i. Ensuring a secure and affordable EU energy supply.
   ii. Developing a fully integrated, interconnected, and digitalized EU energy market.
   iii. Prioritizing energy efficiency, improving the energy performance of our buildings and developing a power sector based largely on renewable sources.
3. **A healthy food system for people and planet.** The EU's goals are:
   i. Ensure food security in the face of climate change and biodiversity loss.
   ii. Reduce the environmental and climate footprint of the EU food system.
   iii. Strengthen the EU food system's resilience.
   iv. Lead a global transition towards competitive sustainability from farm to fork.
4. **An industrial strategy for a competitive, green, and digital Europe.** The main objective is to tap the significant potential of global markets for low-emission technologies and sustainable products and services to achieve climate neutrality by 2050.
5. **Preserving environment and oceans**. EGD priorities include:
   i. Protecting biodiversity and ecosystems.
   ii. Reducing air, water, and soil pollution.
   iii. Moving towards a circular economy.
   iv. Ensuring the sustainability of our blue economy and fisheries sectors.
6. **Providing efficient, safe, and environmentally friendly transport.** Today, transport emissions represent around 25% of the EU's total greenhouse gas emissions, and these emissions have increased over recent years.
7. **Investing in a green future.** To achieve the goals set by the EGD, the Commission has pledged to mobilize at least €1 trillion in sustainable investments over the next decade.
8. **Research and innovation driving transformative change.** Research and innovation will play a central role in:
   i. Accelerating and navigating the necessary transitions.
   ii. Deploying, demonstrating and de-risking solutions.
   iii. Engaging citizens in social innovation.

Source: (EC, 2019b).

1.4.2 Implications for enterprises

The EGD emphasizes the synergy between the digital transition and the green transition. Enterprises should follow suit and tackle the double opportunity and reinforcement mechanisms between digitalization and decarbonization. Digital technologies—such as sensors, networked devices, and data analytics—are already changing how energy is used and consumed across the economy. As digitalization expands, it creates new opportunities to optimize energy use and decrease greenhouse gas emissions. Options in critical sectors, synthesized in a publication for the Center for Climate and Energy Solution (C2ES), include the following (Ye, 2021):

Power

Digitalization can improve the grid's ability to integrate more variable renewable energy, create an interconnected grid with multi-directional power flow to allow for flexibility, and expand the use of demand response strategies.

Transportation

In addition to enabling electric vehicles to provide flexible load and storage resources for the power grid, digitalization of transport can improve fuel efficiency (e.g., through route optimization) and enable autonomous driving systems.

Buildings

Digitalization of facilities—such as through energy management systems, smart heating and cooling systems, and connected appliances and equipment—can improve the comfort of occupants while reducing energy use.

Industry

Smart manufacturing innovations can optimize energy and resource use, improve supply chain management, and enhance measurement, reporting, and verification (MRV) systems to assess compliance with energy efficiency, emission reduction, and clean procurement goals and requirements.

Agriculture

Smart farming approaches can reduce emissions-producing inputs (e.g., fertilizers) and water use, better manage livestock production and animal health, enable urban and vertical farming, and improve carbon sequestration accounting.

It is commonly recognized that SMEs face a host of challenges when committing to adapt towards greener business models, running the gamut from financing to knowledge to human resources. Some of the main hurdles for SMEs are summarized in Box 3 below.

The EU has long understood the importance of SMEs to its economy. The Green Action Plan (GAP) for SMEs was launched in 2014 to provide guidance and assist SMEs in resource efficiency, cost reduction, and information regarding various financial assistance programmes. Other programmes followed (e.g.,

the Circular Economy Package, LIFE) without focusing on SMEs. The adoption of the EGD in December of 2019 was followed shortly thereafter by the publication of the *SME Focus* in March 2020 (Smit, 2020), which focused on areas such as improving access to capital, reducing regulations, and capacity building (EC, 2020a). However, within the EGD itself, there is relatively little mention of SMEs specifically.

Box 3. Why are SMEs challenged more than large enterprises in responding to policy?

- **Financing difficulties:** SMEs (especially start-ups and micro and small enterprises) can face problems in access to external finance, higher financing costs and therefore higher economic risk.
- **Lack of time:** for the senior manager/owner to devote to familiarisation with legislation and implementing policy or identifying and applying for public support.
- **Shortage of and difficulties in the recruitment of specialist staff:** SMEs usually have less or no specialist labour force and face proportional higher costs in acquiring new specialists.
- **Less experience and limited internal know on how to manage change processes:** these barriers especially affect traditional handicraft enterprises or enterprises in low-tech sectors.
- **Lack of market knowledge:** SMEs have less knowledge about customer needs and foreign markets, which hinders marketing and internationalization of their activities.
- **Bureaucratic hurdles:** slow/costly administrative procedures and restrictive laws or regulations may constrain SME adaption, especially in highly regulated sectors (e.g. construction or chemicals).
- **Intellectual property management:** SMEs have less resources and capabilities for the economic exploitation of intellectual property rights.
- SMEs usually have a **smaller network of partners** or lack access to relevant actors with specialist knowledge (e.g. regulations, R&D, standards).
- **Knowledge and technological transfer:** SMEs may face greater challenges adjusting to new technological trends (e.g. digitalization) or find it harder to exploit new developments (e.g. building information modelling).

Source: (Smit, 2020).

Some areas that will affect SMEs in the EGD include the removal of construction waste (the highest waste sector amount by volume), motor vehicle repair, repair and maintenance of domestic appliances, textiles, plastics, and packaging (Smit, 2020). These industries tend to have a high concentration of SMEs, many of whom don't have the financial resources to invest in green initiatives. Their retail customers are often not incentivized to reward them for making the change. Many are also likely to view the EGD as simply adding another layer of bureaucracy to a business model with thin margins, to begin with. The same is true of many small farmers. The feed the future (FtF) initiative will likely strain already marginal enterprises in regulation and compliance.

Finally, there remains the question of the impact of the EGD on other nations, typically involving SMEs that export into the E.U.'s common market. This is not likely a very material sector concerning overall emissions. Still, they will have challenges navigating a changing risk landscape, particularly concerning the Carbon Border Adjustment Mechanism (CBAM) once it is finally implemented. Whether from industrialized nations or the developing world, these foreign SMEs will likely have to look to their own governments for help navigating the changing regulatory landscape in the EU. For example, in the case of South Africa, the organizations of TIPS, Tarlac, and Trade Advisory have identified three risk categories of the EGD on South African enterprises. These are market risks, supply chain risks, and technology risks. With respect to SMEs, market risks are the most significant. The authors suggest that policymakers should offer particular emphasis and focused support to the auto parts, agricultural, leather, and wine sectors. Local SMEs already market to EU customers. For example, efforts to increase bulk shipments in the leather and wine sectors might have the effect of squeezing out smaller producers (Quintás et al., 2018).

The EGD will affect geopolitics through its impact on the EU energy balance and global markets; on oil and gas-producing countries in the EU vicinity; on European energy security; and on international trade patterns, notably via the CBAM a proposed carbon tariff on carbon-intensive products, such as cement and some electricity, imported by the European Union. Currently being legislated as part of the European Green Deal, it is likely to take effect in 2026, with reporting starting in 2023. Some of these changes are likely to impact partner countries adversely (Leonard, Pisani-Ferry, Shapiro, Tagliapietra, & Wolff, 2021).

The Green Deal is an effort to transform European economic structure and consumption patterns. It entails a fundamental overhaul of the European energy system. Since it ranks so high on the EU policy agenda, it will also change the relationships between the EU and its trade partners and redefine Europe's global policy priorities. As such, it is a foreign policy development with profound geopolitical consequences (Leonard et al., 2021): first, such a sweeping structural change will alter European trade and investment patterns. The EU imported more than €320 billion worth of energy products in 2019, and more than 60 percent of EU imports from Russia were energy products. A massive reduction in this flow will restructure EU relationships with key energy suppliers. Countries including Russia, Algeria, and Norway will ultimately be deprived of their primary energy export market. Inevitably, Europe's exit from fossil-fuel dependency will, in the short-to-medium run, adversely affect several regional partners, who will have to adapt and think in a dynamic comparative advantage[9] framework to avoid economic and political destabilization.

Second, Europe accounts for around 20 percent of global crude oil imports. The fall in oil demand resulting from Europe's transition to renewables will impact the global oil market by depressing prices and reducing the income of the leading exporters, even if they do not trade much with the EU. Third, a greener Europe will be more dependent on imports of products and raw materials that serve as inputs for clean energy and clean technologies. For example, cobalt and lithium, of which China is amongst the largest exporters, are essential for battery production. Fourth, the Green Deal will impact Europe's international competitiveness. If European enterprises take on regulation-related costs that their foreign competitors do not bear, they will become less competitive domestically and abroad in the short run. Industrial policies and public design of educational systems should consider the skills and technologies that economies will need to adapt to these shifts in costs and priorities.

A leading European think tank (Leonard et al., 2021) suggested that Europe be prepared for geopolitical costs by taking a series of actions. Essential measures include greater supply diversification, increased recycling volumes, and substitution of critical materials. The authors highlight Europe's potential to become a global standard-setter for the energy transition, particularly in hydrogen and green bonds.

▶ 1.5 Is the global architecture conducive to business adaptation, including MSMEs, in developing and advanced economies?

The global architecture of environmental policy has encountered several obstacles in its development since the establishment of the KP a quarter of a century ago. A key impediment to the early days of climate policy was the inability of the treaty negotiators to cope with the uncertainty that surrounds every facet of climate change—how much global warming will take place and when, how much damage it will cause, how costly addressing the damage will be (Wilcoxen & McKibbin, 2002) . The KP for instance, was delayed after the United States openly declared its refusal to adhere to it in 2001, and was followed by Canada, arguing that the costs did not justify the risks.

The early uncertainty about the impacts of climate change has yielded to an urgency to stay within what the scientific consensus now declares as the least dangerous possible goal: 1.5°C warming. Uncertainty about the relevance of climate action is no longer a first-order obstacle for the global architecture for green transitions, although uneven climate impacts do hinder negotiations, with countries with more at stake having the lower hand due to a combination of smaller size (both in terms of population and

9 A dynamic comparative advantage framework (Redding, 1999) emphasizes the potential trade-off an economy may face between specializing according to an existing pattern of comparative advantage – for instance, exporting fossil-fuel based energy products-, and entering sectors where it currently lacks a comparative advantage, but may acquire such an advantage as a result of the potential for productivity growth. This will be discussed further in Chapter 3.

GDP), and more vulnerability[10]. **A key barrier currently is the presence of significant disparities in the potential for developing clean technologies and raising capital for green investments across countries. A related barrier is the proper regulatory and international framework to mobilize resources to achieve the abatement goals to stay within 1.5°C**. For instance, the Glasgow accord calls on wealthy nations to "at least double" the funding allocated to assist vulnerable countries in adapting to the changing climate. Still, it is unclear how this massive increase in funding will be achieved. The achievement of a just transition is nothing but a promise until funding mechanisms and national regulations start to develop as a result of these international agreements.

International environmental agreements should include strong policy tools for encouraging and nudging enterprises and governments to follow sustainability-based priorities. However, this is not an easy task. **The EGD, the most ambitious and thorough international agreement currently existing, falls short on generating a clear set of incentives for enterprises to invest in sustainable production**, and Member States have no official political constraints that may push governments to implement a Green Deal agenda (Pianta & Lucchese, 2020).

The European Commission itself recognizes that the EGD would require a broad European industrial strategy. But present measures for industrial policy remain too narrow in scope and based on the reliance on the benefits of the Europe's Single Market. Pianta and Lucchese (2020) stress that is not clear whether EU rules preventing state aid by governments to enterprises engaged in environmental transition will be revised.

Signed on the same year as the Paris Agreement, another key piece of the global architecture to consider is the 2030 Agenda. Embedded in the development agenda of most countries, the SDGs have to be integrated into national plans for implementing the Paris Agreement (NDCs). The 2030 agenda was approved unanimously by the all the UN member states. Its centrepiece comprises 17 sustainable development goals (SDGs), to be implemented by 2030. The SDGs specifically demand enterprises to discover solutions and improve the situation concerning sustainable development challenges. "As the world realigns itself with this new framework, it will be imperative for enterprises to understand, prioritize and embed the SDGs into the core of their enterprises". The Figure 4 displays the SDGs that are more relevant to enterprises according to the International Organization of Employers (IOE) (ILO, 2019b).

Even if SDGs are not legally binding, they still act as an important road map regarding future policy direction at an international and national level. Governments have the primary responsibility for follow-up and review: they are called to decide how the SDGs should be embedded into national policies and report on their implementation at the global level in the framework of the High-Level Political Forum (HLPF). However, there is a key role for the private sector and their EBMOs to engage in the follow-up and review phase of SDG implementation. Furthermore, there exist relevant tools created by international business organizations to align private sector activities to the SDGs. SDG Compass, envisioned and developed by the UN Global Compact in Collaboration with the Global Reporting Initiative (GRI) and the World Business Council for Sustainable Development (WBCSD), is a remarkable example of such a tool. The SDG Compass explains how the SDGs affect enterprises – offering tailored tools and knowledge to incorporate sustainability into business strategy.

10 See, for instance, this report from The Guardian using data from Risk Analysts Maplecroft: https://www.theguardian.com/environment/damian-carrington-blog/2011/oct/26/climate-change-developing-country-impacts-risk

Figure 4. SDGs and business

GOAL 1: End poverty in all its forms everywhere

GOAL 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

GOAL 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

GOAL 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

GOAL 10: Reduce inequality within and among countries

GOAL 12: Ensure sustainable consumption and production patterns

GOAL 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

GOAL 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development

Source: (ILO, 2019b).

The emergence of international carbon markets is linked to the development of the Kyoto Protocol and the Paris Agreement. Unlike national carbon markets, like China's national ETS or local carbon markets, like the California ETS, international carbon markets directly require an underlying global architecture that sets common guidelines, and goals. International emissions trading systems require global collective action and global oversight, which as shown below, can be the driver of utter failure or success of an international ETS. ETSs put a price on carbon emissions and make pollution less attractive. However, carbon markets often produce prices which are deemed too low relative to the social cost of carbon. The perceived failure of the European ETS has been compounded by the fact that the accompanying EU's of 20 percent emissions reductions by 2020 was widely acknowledged to have been too low, generating a massive surplus of emissions allowances with the potential to undermine the system through a collapse in the prices. An important note, however, is that despite low prices, research has found that carbon markets can help reduce emissions. Using a statistical model and sectoral emissions data, Bayer and Aklin (2020) find that the EU ETS, which initially regulated roughly 50% of EU carbon emissions from mainly energy production and large industrial polluters, saved more than 1 billion tons of CO2 between 2008 and 2016. While this sounds like large amount, it only translates to reductions of 3.8% of total EU-wide emissions compared to a world without the EU ETS.

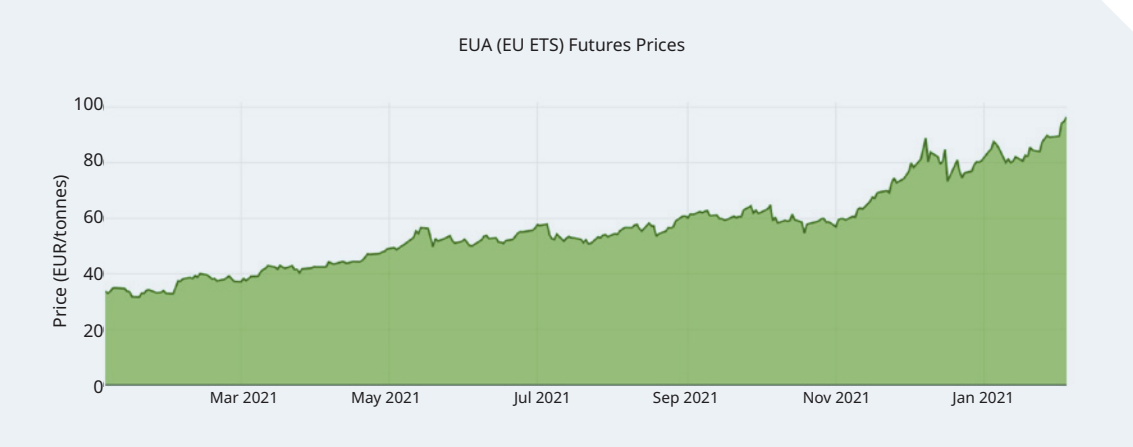
Policymakers should incorporate lessons from experience with international carbon markets for greenhouse gas (GHG) emissions reductions and related regulatory systems. After the initial testing period, the carbon markets entered a phase of great expansion. This period was characterized by significant changes in markets and regulatory frameworks as the EU ETS became operational and was linked to the CDM creating a large source of demand for carbon credits from the private sector adding to the demand from governments, for example, in Japan. Large developing countries, such as China, India, Brazil, Mexico, and South Korea became the largest suppliers of carbon credits under the CDM. This raised concerns about the uneven distribution and limited participation of LDCs. In terms of the sectoral breakdown, the supply of carbon credits was initially dominated by industrial gas projects that provided a cheap GHG abatement opportunity but raised criticism for creating perverse production incentives and not contributing to sustainable development. Additionality also emerged as a key issue particularly for large-scale renewable energy projects, such as large hydro. In the second part of the gold rush period, regulation regarding assessment of CDM project additionality and verification was strengthened significantly, with validators and verifiers becoming more careful following suspensions of accreditations by the regulators due to low quality work. Additionality is still a concern in environmental regulation at all scales today. An environmental policy satisfies additionality if it produces measures that truly would have not been implemented in absence of such a policy.

Carbon prices collapsed between 2011 and 2013. This downfall was related to both domestic and international regulatory regimes. At the domestic level, the issuance of carbon credits started reaching the quantitative limits on the use of carbon offsets in the European ETS effectively eliminating the largest source of demand. At the international level, the uncertainty surrounding the second Kyoto Commitment Period resulted in decreased demand from governments. The carbon market price collapse also led to multiple bankruptcies or scaling down of specialized consulting enterprises, in turn resulting in the gradual loss of expertise as specialists moved to other fields.

Negotiators in Glasgow reached a breakthrough on the rules for global carbon emission reduction trade. After five years of unsuccessful deliberations since the Paris Agreement laid down the framework for a new market where states and private entities can generate and trade carbon offset credits, COP26 finally saw agreement on the "rulebook" for this new market, which proponents see as a way to increase climate ambition in both developed and developing countries. However, critics say it could result in greenwashing and nothing but shifting CO2 credits from one side of the world to the other without any benefit for the atmosphere. Whilst the worst loopholes that would have allowed the double counting of the same emission reductions have been fixed and a share of the money generated in the trade will go to climate change adaptation in the global south, other areas remain dangerously unspecified and could allow for a continued sprawl of a largely uncontrolled voluntary carbon offset market (Appunn, 2021).

Furthermore, according to De Vos and Sawin (2012), at pre-2020 carbon prices, the Kyoto mechanisms—the CDM and JI —had only marginal impact on the financial attractiveness of most renewable energy projects. Moreover, because these mechanisms did not provide payments before project construction, they are not capable of directly tackling the high up-front costs associated with renewable energy projects. High transaction costs exacerbate these challenges. After Glasgow, negotiators agreed to limit the use of pre-2020 credits from the UN's CDM and JI in the Paris architecture, avoiding a wholesale flooding of the market for carbon credits that could have sent their price plummeting. This has had massive impacts on carbon prices. For instance, CORSIA-eligible carbon credit (CEC) prices increased by 944% in 2021 and were assessed at $8.35/mt CO2e at the close Nov. 12, according to S&P Global Platts assessments, compared with 80 cents/mt when the assessment was launched Jan. 4. Meanwhile, nature-based credits (CNC) have increased by more than 180% in 2021 and were pegged at $13.05/mt CO2e at the close Nov. 12, according to Platts assessments, compared with $4.65/mt when they were launched on June 14. Although some renewable energy technologies are already cost competitive with fossil fuels, and others are under some circumstances, higher carbon prices would help close the competitiveness gap. Carbon prices are on the rise. In February of 2022, prices for carbon in the EU reached a record €96.45/mt CO2e (Figure 5). Prices at this level are likely to have a significant impact.

Figure 5. Carbon prices in the EU (2021-2022)



Source: (EMBER, 2022).

In sum, past experiences with carbon markets show key necessary conditions for a successful operation of this mechanism. First, markets are dependent on mitigation ambition and the willingness of governments to create direct or indirect demand for emission credits. Second, the direct involvement of the private sector is crucial to rapidly mobilize mitigation activities of various types and scales. Third, the environmental integrity is crucial to ensure credibility and acceptability in a time where markets generally are put into doubt. Fourth, complexity and related transaction costs have to be managed carefully not to stifle activities. Finally, additionality is a question that should be asked for every single environmental program: would the technology have been adopted in absence of the incentives? Would the trees have been planted? Would the wind farm have been built?

Progress is being made, but it is also clear that more needs to be done. A key area that is lagging behind is the closing of the financing gap. For instance, the Just Transition Mechanism embedded in the EGD is set to receive €7.5 billion of fresh funds from Member States, with the goal of leveraging about €100 billion of public and private funds over the period 2021 to 2027 (EC, 2020b), an amount which does not reflect the resources that will be needed to ensure the social restructuring associated to the climate transition (Storm, 2020). In addition, the potential for developing clean technologies and raising capital for green investments is highly uneven across European countries. At present, there is no consideration of how the Green Deal could contribute to reverse the divergence between "centre" and "periphery" in Europe (Pianta, Lucchese, & Nascia, 2016).

The creation of the "rulebook" for an international ETS is an important example of international cooperation at the policy level. We now have regular Assessment Reports from the IPCC. There is, as always, more to be done. Should governments be involved in subsidizing climate risk insurance, for example? The market has the most important role to play but there are clearly areas of the world where insurance is seen as an unaffordable luxury, or where it doesn't exist at all. Governments could also play a key role in communicating and educating some of those at most risk. These would include many of the world's SMEs who feel they don't have the knowledge or the resources to undertake investment in what is ultimately in their own interest.

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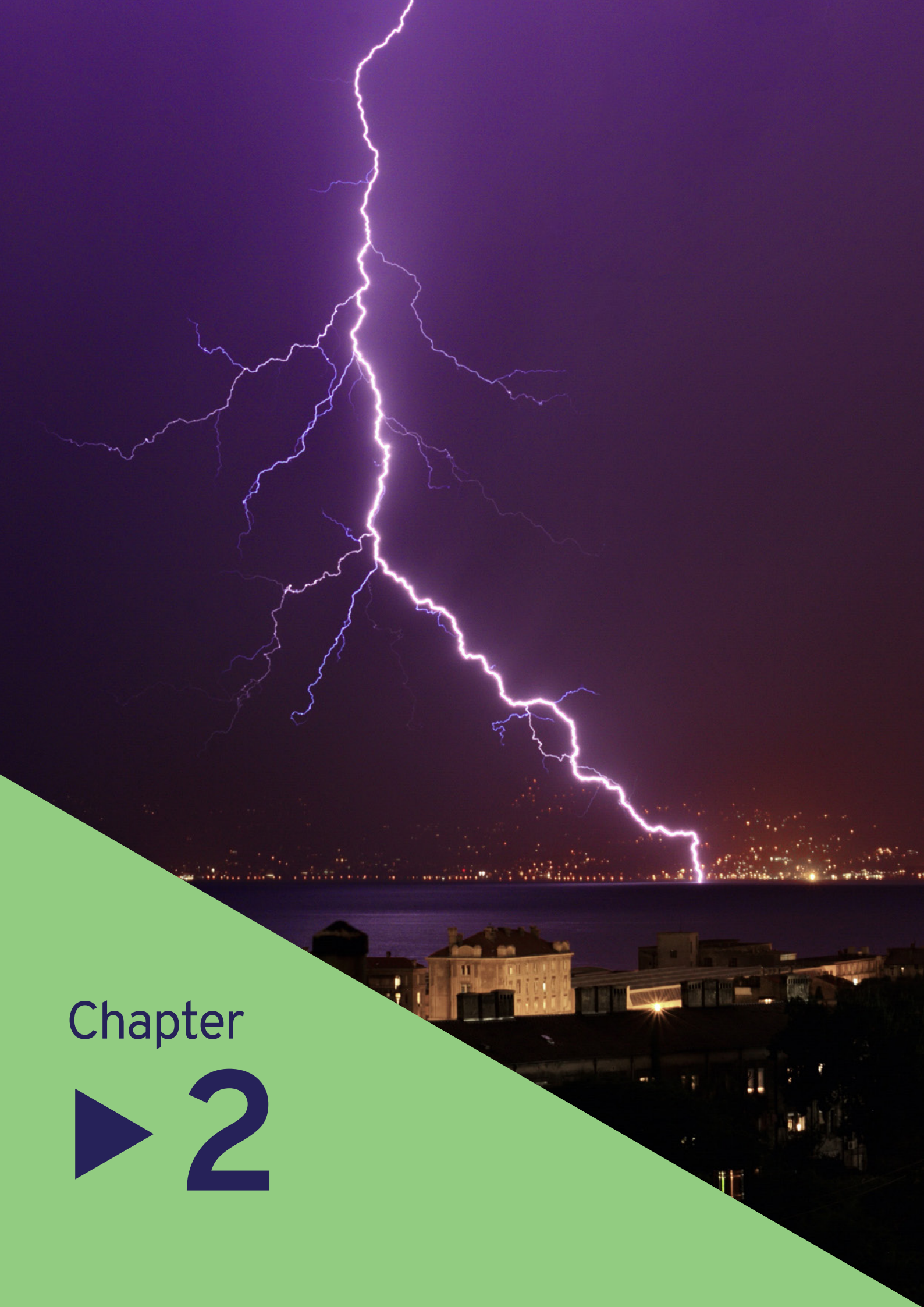


Chapter

2

Barriers to business adaptation to climate change across regions and sectors

Climate change has enormous costs for enterprises. A report authored in 2019 by the Carbon Disclosure Project (CDP) estimated that roughly 200 of the world's largest listed enterprises could face combined total costs of climate change of almost $1 trillion, with much of the pain due in the next five years. This estimate, which for reference is equivalent to 6% of Europe's GDP, is only considering the costs faced by the largest enterprises. Due to their high heterogeneity, there is a lack of such estimates for SMEs. However, overall, climate change could cut global income by $23 trillion in 2050, approximately 14 percent of global income.

> "Most enterprises still have a long way to go in terms of properly assessing climate risk".
>
> ▶ **Nicolette Bartlett,** CDP's director of climate change.

While some enterprises face direct costs from changes in the physical climate, others are adversely affected by policies and regulations implemented to combat global warming. At the same time, climate change provides opportunities for some enterprises, such as those operating in renewable energy, electric cars, or energy storage. Chapter 3 discusses how policies can help enterprises find opportunities from climate change even if they do not belong to these sectors.

The effects of climate change are heterogeneous across enterprises, even within the same industry. This is because many factors that plausibly affect an enterprise's ability to adapt to a warmer world and a greener economy exhibit significant enterprise-level variation (e.g., managerial skills, innovation, or financial constraints). The optimal policy mix will entail a combination of mitigation and adaptation that allows enough flexibility to encompass this heterogeneity. Mitigation, in this context, implies the reduction of emissions and prevention of the worst aspects of gradual climate change (GCC). Adaptation to climate change entails preparedness and resilience to face the unavoidable effects of the damage that has already been done. There is growing international interest in the planning, financing, and implementation of adaptation measures. In its early days, this discussion was primarily focused on the public sector's role, with the private sector viewed primarily as a source of funding or financing. Increasing attention is being paid to how the private sector responds to the risks and opportunities of climate change. However, there are some deep knowledge gaps in climate impacts for enterprises, what climate policies they should promote, and how hard it will be to transition to production modes that are compatible with the goals currently established to avoid the worst-case scenarios. The CDP report cited above suggests that many enterprises still underestimate the dangers. "Most enterprises still have a long way to go in terms of properly assessing climate risk," said Nicolette Bartlett, CDP's director of climate change, who authored the report.

The Economist Intelligence Unit highlighted that up to 30% of the world's total stock of manageable assets may be at risk due to climate change impacts, pointing at the potential costs of climate change as a major blind spot for enterprises and their investors (The Economist, 2015). The future success of the private sector will not only depend on how successfully it can mitigate, but also on how it can adapt to climate change. Extreme weather events (EWE) are already causing havoc to operations, supply chains, and commerce all over the world. Adaptation measures can be as specific as early warning systems for cyclones, switching to drought-resistant crops, or redesigning government policies.

▶ 2.1 Barriers to business adaptation to climate policy across regions and sectors

This section explores the barriers that exist to business adaptation that hinder progress towards the common goal of building resilience amongst enterprises to the deleterious effects of climate change, which are already inevitably baked-in, in even the most optimistic scenarios. Large corporations in general have the financial resources, knowledge, and the managerial structure to plan for and invest in the adaptation necessary to ward off the most damaging short-term effects. SMEs, by contrast, are less well-equipped in this regard, and as such will be the primary focus.

Despite their heterogeneity, SMEs have many common characteristics that influence their approach to environmental issues and the implementation of green practices (OECD, 2018):

- Ownership and management are concentrated in the same hands. The entrepreneur plays a key role in the enterprise and his personal preference is usually the most influential factor when deciding about investments and business strategies.
- This entrepreneur is very likely to suffer from important time and task pressure. This could imply that investments that are not related to the core business are regarded as secondary and suffer from a lack of attention.
- The entrepreneur can face information barriers about opportunities of the relevant green practices, their costs, and benefits. Given this time and task pressure, SMEs usually rely heavily on the opinion of their professional surrounding (business organizations, suppliers, clients, accountants, etc.), which often have the same lack of information.
- The entrepreneur is often risk-averse given the relatively small economic size of the enterprise. Uncertainty may be associated with operational issues within enterprises. These include uncertainty about the most appropriate technology to be used and the lack of knowledge on how to incorporate green practices into the core business planning.
- The required pay-back for new investments is often as short as two-three years (it is also a function of the cost of capital). Generally, environmental technologies encompass higher costs in the short term whereas the extra benefits are realised in the longer term, which hinders their adoption by SMEs. Limited access to finance is also a key barrier.

Given these common characteristics, the majority of SMEs are "vulnerably compliant" of environmental regulation (European Commission, 2022), in the sense that they do not know enough about environmental requirements to ensure that they always comply with all of them. Governments, researchers, and NGOs are increasingly interested in addressing the existing barriers to business adaptation to climate change. The most recent Eurobarometer asked more than 17,000 enterprises from 27 countries about their main obstacles to going green and becoming resource efficient. The most common difficulty SMEs encounter when setting up resource efficiency actions is the complexity of administrative or legal procedures (34%), followed by the cost of environmental actions (24%). Compared to past surveys, SMEs are also considerably more likely to report that they were hindered by a lack of supply of the required materials, parts, products, or services (24%, +9 pp compared to 2017). Human capital is being employed to address these barriers. The report found that just fewer than four in ten surveyed SMEs have at least one full-time employee working in a green job part or full time: 33% say there are between one and five 'green' employees in their SME and 5% report that their number is higher than five.

According to the Carbon Disclosure Project (CDP) latest survey, 192 of the world's largest 500 enterprises reported both their potential financial risks and the costs to manage these risks. The results were clear. It is cheaper to manage these risks than tackling them when they hit. Goldstein, Turner, Gladstone, and Hole (2019) study climate change adaptation in the private sector. As described in the previous sections, climate risks can be categorized as climate change risks and transition risks. The authors argue that enterprises have made larger efforts to internalize transition risks, so they focus on physical risks from climate change itself. They use CDP adaptation data to conduct an empirical analysis using all voluntary

disclosures to investors on climate risk management in a given reporting year. These data focus on 1,630 enterprises, many of them multinational corporations with global operations.

Through content analysis of these disclosures, Goldstein et al. (2019) develop a novel typology of corporate adaptation strategies, assess the frequency with which private-sector actors are implementing different strategies and assess the extent to which enterprises disclose costs of climate risks and adaptation. The authors found that the most common physical climate risks reported were changes in precipitation extremes and droughts (46% of enterprises), tropical cyclones (26%), changes in temperature extremes (25%), changes in average temperatures (25%) and changes in precipitation patterns (19%). Notably, 299 enterprises, or 18% of respondents that reported facing a physical climate risk, did not disclose any adaptation strategy.

The costs of management strategies to cope with climate risks vary widely in scope, from the incremental costs of building retrofits to setting up community disaster relief funds, and timeframes, from one-time investments to annual ones, that a summed figure is meaningless. Enterprises need to have estimates of their sector and context specific – and sometimes establishment-specific and product- or service-specific-strategies and costs. Furthermore, while some of these costs might seem exorbitant, the authors highlight that reported adaptation costs overwhelmingly represented upfront investment figures with little indication of how those compare to the estimated costs of inaction. Finally, the authors note that because most reported investments make business sense even in the absence of climate risk, these disclosures of climate risk management costs do not necessarily represent additional expenditures on adaptation, which tends to be one of the metrics of interest to investors.

It is evident that there is a lack of awareness on the part of enterprises in recognizing a potential material, and in some cases an existential, threat to their operations. Examples include the destruction of infrastructure and physical capital in the case of EWEs, or the erosion of the viability of business models (BMs) by the effects of more gradual climate change (GCC) over the longer term. Rising seas and stronger storms will likely severely damage physical infrastructure, placing capital investments at risk, requiring costly adaptation measures, and threatening the profitability of insurance providers. EBMO's can play a significant role in this respect by providing local and situational awareness of the threat to their members. It is necessary to fully define the threat before appropriate adaptation measures can be devised and implemented.

Securities law mandates that publicly traded corporations disclose material risks. But few enterprises currently provide information about how climate change will impact their operations (Young, Suarez, & Gladman, 2009). Enterprises will be increasingly expected to report these risks. Investor concerns over climate risk have risen sharply in parallel with an upsurge in climate activism in many countries as the heat waves, droughts, wildfires, and super-storms fuelled by climate change have become harder to ignore (Green, 2019). Although most of the world's largest economies require enterprises to report on GHG emissions, disclosing climate risks is typically 'encouraged' rather than required. In practice, few enterprises report on climate change risks and risk-management strategies through mainstream financial filings (Goldstein et al., 2019). In April 2019, Bank of England Governor Mark Carney and Francois Villeroy de Galhau, head of the French Central Bank, warned of the risk of a climate-driven "Minsky moment" – a sudden collapse in asset prices - unless enterprises embraced greater disclosure. However, a relevant question is whether enterprises are not only unwilling to report risks but also unable to fully quantify and manage these risks. The mismatch between the short-term nature of financial decision-making and the long-term impacts of climate change could generate suboptimal paths.

Finally, Peace, Crawford, and Seidel (2013) identify one important barrier to adaptation that crosses virtually every region and sector alike: the necessarily long timeframes involved, which are exacerbated by the inherent uncertainty associated with the impacts of both EWEs and GCC. Complexity in the context of multiple stresses represents an additional obstacle: it is often difficult to disentangle the effects of increasing climate risks from pressure caused by rising populations, migration, urbanization, or coastal development. Another hindrance is the fact that many enterprises tend to focus on quantifiable mitigation efforts rather than on long-term adaptation strategies in which future returns are less certain and often unquantifiable.

2.1.1 Regional barriers to business adaptation

Informational barriers to adaptation exist across all regions, industrialized nations and LDCs alike, though the problem is particularly acute in poorer nations, where the education and knowledge gaps are inherently wider. Agrawala et al. (2011) conducted 16 case studies of enterprises active on adaptation issues, as well as public information, supporting literature and an analysis of responses to the 2009 Carbon Disclosure Project (CDP) questionnaire. Interestingly, the authors found that all surveyed enterprises were aware of potential risks, though not all perceived their enterprises were vulnerable to them. Furthermore, while the physical risks from climate change manifest in both acute hazards (such as tropical storms experienced over one or several days) and chronic impacts (such as the gradual increase average surface and ocean temperatures), enterprises focused more on risks from extreme events than on those from gradual changes (Agrawala et al., 2011). These findings suggest an imperfect assimilation of information.

The study by Agrawala et al. (2011) also sheds light on the adaptation responses of enterprises. They find that not all enterprises carry out assessments of risks or of possible adaptation responses: while the study was conducted on enterprises that are relatively selected into climate engagement[11], only a third of them assessed possible adaptation options.

Scholarly literature has documented how enterprises' environmental strategies and practices are influenced by pressure and critique from regulators and competitors as well as internal champions and external entities such as nongovernmental organizations (NGOs) (Delmas & Toffel, 2010; Murillo-Luna, Garcés-Ayerbe, & Rivera-Torres, 2008; Reid & Toffel, 2009). Enterprises have sought to address environmental concerns through the practice of "corporate environmentalism," which seeks to balance competing demands between the market and the environment (Hoffman, 2001; Jermier, Forbes, Benn, & Orsato, 2006).

LDC's generally face greater hurdles in adaptation. According to the IPCC, they are most likely to be affected by climate change, and the least likely to be able to adapt (Chambwera, 2009). Regions such as sub-Saharan Africa and South Asia are the most likely to face the most extreme effects of a warming planet. Most LDC's are heavily reliant on agriculture, which makes management of a more extreme water cycle particularly crucial. Water management is also one of the costliest sets of adaptation measures, whether it be storage and distribution at the national level, or day-to-day management by small and subsistence farmers who may be faced with more droughts, more floods, or both. EBMOs are uniquely equipped to help disseminate information at the local level, such as by way of introduction to new crop varieties or sharing of best practices.

The EU has made progress in significant funding for the EGD. The USA looked set to provide material financial support for climate-based initiatives, however, inflationary and geopolitical concerns may possibly threaten any meaningful additions of governmental support for climate action in the near term. In the Global South, governmental coffers are comparatively more fragile, where lower revenues and competing priorities threaten climate investment on a national level. Once again EBMOs have a role to play, acting as an interface between their members and policy makers. They can amplify the dialogue and press for a greater degree of urgency in their advocacy role. At the enterprise level, and specifically with SMEs, the lack of financing, an issue particularly in LDCs, is a substantial hurdle.

Across all regions, business management of large and small corporations alike depend on satisfying the needs of a wide variety of stakeholders, including customers, suppliers and employees (Surminski, 2013). As such, enterprises must take a more collaborative approach. EBMOs can help facilitate this through their multiple levels of relationships at the local level. Another barrier affecting all regions is the lack of effective means to measure and evaluate adaptation measures. Surminski (2013) also highlights lack of expertise on measuring degree and effectiveness of adaptation measures as a barrier that many enterprises face. As the author highlights, while there is a range of case studies and illustrative examples,

11 The data used by Agrawala et al. (2011) comes from the Carbon Disclosure Project (CDP), which is an international non-profit organization based in the United Kingdom, Japan, India, China, Germany and the United States of America that helps enterprises and cities disclose their environmental impact. Hence, enterprises present in this data set are likely to perform better in climate issues than the common enterprise. Hence, while the data is from 2009 and might not reflect the current status of these trailblazers, it is more likely to reflect the current situation of many enterprises.

no comprehensive measure exists to calculate the impact of adaptation activities. Without the ability to measure its impact and effectiveness, it is inherently difficult for many enterprises to justify an upfront investment in adaptation measures. Measuring and tracking climate resilience is inherently tricky. For enterprises, some indicators could be used — losses avoided, reduced insurance costs, adaptation strategy activities, investment in resilience measures, and change of production location — but this is not enough to have a complete picture of the company's resilience. It is also crucial to measure how an enterprise takes advantage of business opportunities arising from climate change (such as rising demand for specific technologies and goods and services). Here, an indicator could be the range of products and services that address 'adaptation needs,' for example, resilient building materials or flood risk management services. In Tables 4 and 5 of Section 2.5, we present a series of example indicators proposed by the World Bank to measure resilience to climate change at the aggregate level. While Table 6 is designed primarily for policymakers, it can provide a helpful starting point for enterprises seeking to develop indicators of resilience and adaptation. Enhanced collaboration between the private sector and academia is needed to further advance on the measurement front. This collaboration can also help enterprises engage in policy discussion to determine the right mix of policies and regulations. EBMOs can play an effective role here as liaison between its member enterprises and policy makers.

Another important factor in building resilience against climate shocks at the enterprise level is climate insurance. In the developed world, insurance markets are generally more sophisticated, and are more likely to provide offerings targeted towards specific issues important to the enterprise in question. Even in the developed world, however, insurers are having difficulty in quantifying, and thus pricing, risk. Historical data is no longer sufficient to assess the risks going forward. More frequent catastrophic events and the changing regulatory landscape may mean that for insurers, certain policies may no longer be feasible, or they may simply be too expensive for their customers. For reasons already outlined, these barriers to resilience are only magnified in LDCs, as they will face the brunt of climate change. In the developing world, vulnerable populations will be affected disproportionately, and insurance costs will be higher, if in fact insurance is available at all. Indeed, according to McKinsey, the long-term viability of the industry itself may be at stake (Grimaldi, Javanmardian, Pinner, Samadari, & Strovink, 2020). EBMOs can work with local enterprises to identify specific needs, and then advocate on their behalf to both insurers and policy makers. Regional barriers to adaptation are summarized in Box 4.

Analysis by sector often implies comparison of public and private sector challenges, as well as those of NGOs. The remainder of this section looks at barriers to adaptation in the private sector, by focusing on the enterprise level in the areas of energy, skills development, and technological transitions, as well as investigating the challenge of greenwashing. Case studies will provide illustrative examples of the challenges facing adaptive strategies by way of an amalgamation of real-world examples. Public sector barriers associated with institutions and regulatory frameworks as well as policy challenges will be explored later in this chapter.

Box 4. Key Barriers to Adaptation Across Regions

Global North

- Long time horizon.
- Some informational barriers remain, but progress has been significant.
- Some SMEs still do not recognize the material or possibly existential risk to their business, awareness must be improved.
- Lack of governmental funding for large-scale adaptive measures such as flood control.
- Complexity due to many different groups of stakeholders, such as customers, suppliers and employees (Surminski, 2013).
- Lack of measurable effects, adaptation impeded where results are not quantifiable.
- Confusing nature of availability of support and financing mechanisms, and lack of clear communication.

Global South

- Long time horizon.
- Informational barriers and the knowledge gap are much more severe and are often exacerbated by a lack of strong underlying institutionalized education in the first place, leading to an inadequately skilled workforce.
- LDC's are likely to experience some of the most severe climate-related outcomes, therefore adaptation is likely to be inherently more expensive.
- Lack of available financing at the enterprise level.
- Lack of climate insurance, or too expensive to fit within BMs.
- Large informal economy and unfair competition.
- Lack of or insufficient clean technology adoption.
- High density of low-productivity economic units, which face challenges to reach a minimum efficient scale and economic viability. This has a negative impact on capital accumulation and investment rates for business continuity and adaptation.
- Lack of adequate physical and digital infrastructure.
- Scarcity of expertise in dealing with adaptation to climate change.
- Often little focus on long-term planning, time horizons are shorter where margins are thinner.
- Lack of government funding at both the national and enterprise levels.
- Smaller networks of partners serve to impair knowledge and technological transfer.
- Weaker governmental institutions with respect to policy elaboration, regulations, and enforcement.

Source: authors' elaboration.

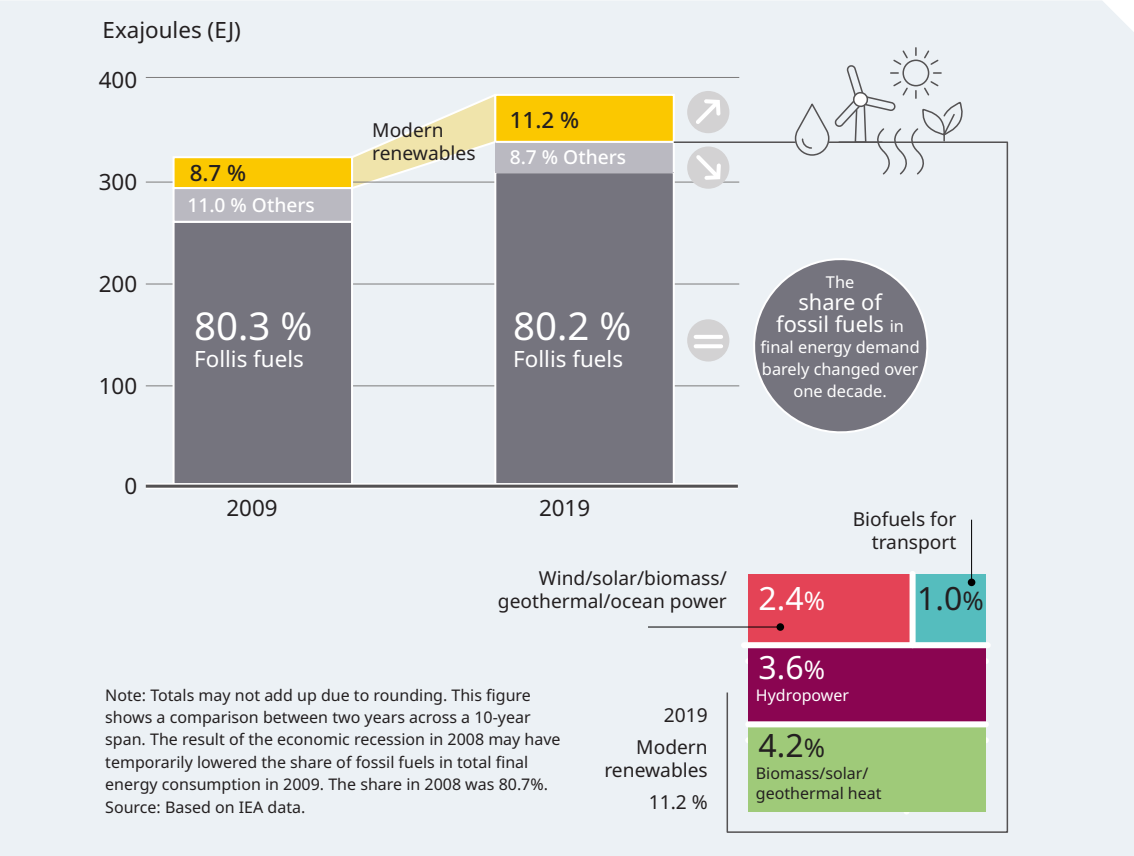
2.1.2 Barriers to Adaptation in the Private Sector

Barriers to energy transition

In its broadest context, energy transition can be thought of in terms of two central constructs. The first is increasing energy efficiency, i.e., achieving the same productive output while using a smaller amount of energy to begin with. The second is the transition to energy sources that are not dependent on fossil fuels. We will explore each of these themes in relation to both large corporations and SME's, each of whom have their own specific sets of challenges in adaptation.

Increasingly, large multinationals have been pledging to achieve net-zero. The world's largest online retailer has recently announced a $2 billion climate pledge fund with the goal of getting to net zero carbon emissions by 2040, a full ten years ahead of the Paris Agreement (Jackson, 2021). To do this, funds are being allocated to innovative smaller organizations and potential future suppliers, for example, in the areas of renewable fuels and exploring ways to reduce the volume of its packages utilizing custom packaging techniques. A widely known European furniture manufacturer has also invested over EUR 2 billion in improving energy efficiency and moving towards sustainable fuels (Franklin-Mann, 2021). The world's preeminent bricks-and-mortar retailer is working to become self-sufficient in energy, using solar panels, biomass, and biofuels. These enterprises typically have the financial resources, technical knowledge, and human capital to undertake these broad-based initiatives. These are but a few examples, there are thousands of the world's largest enterprises making similar commitments and progress in energy transition. They understand not just the urgency of the threat, but also acknowledge the fact that these investments are favoured by consumers, and that they can have a positive impact on the bottom line.

Figure 6. Estimated global renewable energy share of total energy consumption (2009-2019)



Source: (Murdock, Gibb, & André, 2021).

Still, even large enterprises face significant barriers towards energy transition, one of the largest of which is the simple reality of the scarcity of sustainable energy alternatives. Figure 6 illustrates the growth in renewable energy sources to 11.2 percent of the global total in 2019, though only by a relatively modest 2.5 percent of the total over the previous decade. Interestingly there was no reduction in the consumption of fossil fuels, which remained at the same level over the period. The good news is that the pace of growth of renewable sources is accelerating, up 42% from 2010 to 2020 in the US, where renewables now account for nearly 20% of utility-scale electrical generation (Ye, 2021). Another barrier applicable to larger enterprises is the cross-sectoral nature of energy transition. It needs to be a collaborative effort to have meaningful impact, encompassing the full spectrum of stakeholders involved.

The role of SMEs in energy transition is crucial. SMEs comprise 99% of the enterprises in the EU, they employ 60% of the total workforce, and they account for 13% of global energy demand. Some 86% of those enterprises are micro enterprises, with fewer than 10 employees (Franklin-Mann, 2021).

In the case of SMEs, barriers are usually more pervasive, and more obstructive. Most SMEs do not have the necessary knowledge and expertise required to make intelligent and sustainable choices. They are not likely to have in-house sustainable energy departments or managers. Many are daunted by the timeframes involved. They are less likely to have access to capital, and even when assistance programmes exist, they are not always likely to know about them. In the EU, the myriad of energy-related funding programmes for SMEs is extraordinarily complex, to the point where even those well versed in European policy and climate have a difficult time navigating the complex web of agencies involved (Franklin-Mann, 2021).

SMEs may be well-positioned to take advantage in some areas once the informational and financial barriers mentioned above are overcome. For example, the shift towards more energy efficient equipment or to renewables such as small-scale solar is demonstratively measurable. An SME can undertake a cost-benefit analysis with a reasonable degree of certainty. Small-scale solar generation is a mitigative strategy, but it can also be an adaptive one. Take for example an EWE that knocks out power to portions of the grid. Those enterprises which had already invested in solar will be better positioned to limit the negative impacts to their operations. This is especially true at the micro and small enterprise levels, those who have probably made no back-up strategies for power failure such as generators and the like.

Research involving consultation with over 100 enterprises from a range of industry sectors found that 33 functional skills were used in conducting energy efficiency assessments in large energy-using enterprises.

These 33 skills can be grouped in the following broad categories:

- **Project planning and management** - ability to direct and guide a group in completing tasks and attaining goals of energy efficiency assessment.
- **Communication planning and implementation** - ability to exchange, engage, convey, and express knowledge and ideas in an energy efficiency context.
- **Understanding energy use** - ability to collect and analyse energy and financial data for the purpose of identifying energy use and savings.
- **Identification of potential opportunities** - ability to think strategically and creatively.
- **Decision-making** - ability to develop and assess business cases for implementation of energy efficiency opportunities.
- **Monitoring and investigating** - ability to assess, install, and use appropriate monitoring equipment and develop analysis systems.

Additional skills, knowledge and experience that were identified include:

- Understanding the legislative and compliance requirements of energy efficiency programmes.
- Financial planning, accounting, and audit skills.
- Understanding of new trading and reporting mechanisms, and their strategic business implications.

The research highlighted the importance of team-based approaches to energy efficiency. The most effective approaches require involvement of people from across an organisation, bringing a diversity of backgrounds and skill sets. This might include staff from corporate management, procurement, site management and operations, with appropriate backing and resources from senior management[12].

2.1.3 Barriers to skills development transition

The transition to a low-carbon and sustainable economy will necessitate an entirely new skills set on the part of the majority of workers in all regions and in all countries, one that can be defined as having "the knowledge, abilities, values and attitudes needed to live in, develop and support a sustainable and resource-efficient society" (OECD, 2017b). New skills are going to be needed and workers in so-called "brown" jobs will increasingly need to update or even re-tool their skill sets completely. Policy makers and the market itself are already redefining the skills needed in an increasingly knowledge-based and green economy. The necessary skills are not only technical in nature, but they also include management skills and techniques required to manage change. The need is imperative, yet barriers to this transition also remain and threaten to obstruct urgent progress. Box 5 summarizes some of the key berries to the development of such a skillset. Green skills may be thought to include adaptive necessities, from the modification of products, services, and physical infrastructure, as well as the overhaul of operations including new managerial responsibilities focused on navigating the regulatory framework, designing, and implementing environmentally sustainable adaptive actions, and managing change.

12 To read more, see the factsheet Functional skills for an energy efficiency assessment.

Box 5: Summary of key barriers to adaptive skills transition

- Lack of capacity at local level to support job creation in a green economy.
- Women's underrepresentation in STEM, opportunity cost to the skilled labour market globally.
- Scarcity of green-specific skills training opportunities.
- Lack of awareness of available green skills development programmes.
- Lack of coordination between skills policies and environmental policies within governments.
- Lack of awareness of the need for green skills in the future by enterprises and workers alike.
- Adjustment cost for employees making the transition to new green energy jobs.

Source: Authors' own elaboration.

Perhaps one of the most fundamental challenges to upgrading skill sets in LDCs is the dearth of any such meaningful skills in the first place. Public educational institutions are typically of poorer quality and more fragile. Opportunities for higher education are severely limited and there exists a paucity of STEM graduates upon whom to tap for jobs in the green economy (Strietska–Ilina & Mahmud, 2019). This is a systemic capacity issue, and while it needs to be addressed, the effects are necessarily generational in nature. Women too, in both the wealthiest nations and in LDCs are significantly underrepresented in STEM education, having the impact of curtailing what might otherwise be a significant addition to the skilled labour pool for climate change adaptation specialists. In the event vocational training is solely focused on topics related to STEM, many women will end up foregoing the chance of participation, to the detriment of women and the adaptation effort itself (OECD, 2017a).

Skills development measures have historically been underestimated (Strietska–Ilina & Mahmud, 2019), and while things are improving, this has led to scarcity in terms of green-specific skills training opportunities. Once again there is the recurring theme of informational barriers, in this sense it can be directly related to skills development programmes. As far as programmes do exist, progress is often impeded by a lack of awareness and poor communication with respect to their availability. In many countries there exist substantial disconnects between skills policies and environmental policies, and between labour and enterprise policies and skills development programmes. This policy coordination gap ultimately serves to inhibit rather than foster new green-skills development.

We have seen that many enterprises and individuals alike have yet to fully understand or assess the material level of risk that they face. Peace et al. (2013) also analysed the adaptation strategies of 100 large enterprises. They found that enterprises rely heavily on traditional risk management approaches that probably underestimate future climate risk, and as a result they fail to invest in anticipatory adaptive measures. Limitations in skills development opportunities are the likely result. Having improperly assessed the need for adaptive strategies, there is inherently less urgency in trying to address skills development and advancement, especially in an area as specific as pre-emptive adaptation.

Another instrumental roadblock to skills development is the adjustment cost borne at the individual level for employees looking (or indeed being forced) to make a change towards the green economy. It is widely agreed that the costs of this transition must be just, fair, and equitable for all concerned, and this is especially true for individual workers. These individual costs may include the cost of new training, the opportunity cost of lost wages while attending new schools or vocational programmes, expenses associated with relocation, and the human health and mental costs of the added stress burden on individuals.

2.1.4 Barriers to technological transition

Recurrent Barriers

Barriers related to technological transition affect both the innovation (the development phase) and then a subsequent diffusion phase involving the distribution or uptake of the technology in question. A number of these barriers have already been identified in our discussions regarding energy and skills transitions above, and it is true that there are numerous recurring themes which will need to be considered by policy makers. However, it is also true that the problems are heterogeneous and context-specific; there is no one-size fits-all solution. While barriers to the technological transition largely follow these recurrent patterns, there are additional barriers specific to the technological transition where differing sensitivities may be involved. There is also the question of barriers to the diffusion of existing technologies and that of the development of new technologies which are characterized by a much longer timeframe.

The challenges impeding technological transition involve, once again, significant informational barriers. Awareness of the technology is necessary for it to be adopted in the first place. There may be a significant time lag before an effective technological advancement in a wealthier nation may take root in an LDC, simply due to a lack of communication and awareness. There is also the broader question of the knowledge gap between higher-income nations and LDCs, and of labour skills capacity. The World Bank Development Research Group defines this as the absorptive capacity of a nation's ability to do research designed to understand, implement and adapt to newly arriving technologies (Popp, 2012). A basic understanding of the new technology is essential, without it as soon as something breaks down there is a tendency to regress to the old ways of doing things. There are similar cross-sectoral barriers, where difficulties exist in navigating the complex interdependencies amongst various stakeholders. Financial barriers also exist, including the lack of financing for SMEs, particularly in LDCs, but in the developed world as well. It is inherently difficult for an enterprise, especially a smaller one, to procure financing for adaptation measures solely on the basis of anticipated cost savings in the future.

There are however additional barriers that are more specific in terms of technological transition, both with respect to the diffusion of existing technologies and in the development of new technologies. Diffusion of course may be seen as a more immediate issue, while innovation and development of new technologies is inherently a longer-term proposition.

Short-term barriers: diffusion

Current barriers to technology diffusion, in addition to those above, include a lack of incentive for those initiating the technological transfer. Technology transfer involves the exchange of products and equipment (embodied technological transfer), and of the exchange of knowledge and expertise (disembodied technological transfer) (Popp, 2012). The transfer itself typically occurs by way of international trade, foreign direct investment (FDI) and licensing. In the first case, existing trade legislation and regulatory frameworks have not been optimized for the transfer of technology; they may serve to actually impede the transfer. Tariffs are not likely to encourage efficient market responses; they may end up favouring one particular technology over another or may encourage the continued use of less-green alternatives. Trade is also subject to disruptive geopolitical externalities, as is evident in the ongoing economic tensions between China and Russia, and the West. FDI will always be subject to local regulations, which may or may not be conducive to technology transfer and the protection of intellectual property. The World Bank Development Research Group points out that many enterprises are reluctant to license technology for fear of knowledge spillover effects which might foster the development of new international competitors. Indeed, knowledge spillovers tend to provide a public and societal benefit, but the rewards rarely accrue to the innovator (Popp, 2012).

There is also the fundamental question for receiving nations of which technologies to adopt amongst a competing range of alternatives (UNEP, 2016). Mistakes and the misallocation of scarce capital resources can create significant setbacks. This circles back to the notion of a country's absorptive capacity. Not only is it sufficient to thoroughly research the new technology in question, but it is also necessary to research and understand all the competing alternatives prior to deciding upon a particular technology.

Long-term barriers: radical innovation

Longer-term innovation and the development of new technologies may well be more relevant to mitigation strategies overall, but they are important to put into context. For example, does the imminent or expected release to market of a new technology suggest altering adaptation strategies today? We will touch just briefly upon a few of the barriers inhibiting long-term, drastic, and radical changes which are needed to save our planet.

Radically transformative technologies will ultimately be required for long-term sustainability. Examples include nuclear fusion, cheap hydrogen, and new carbon capture sequestration techniques. Sustainable Earth points to three obstacles for enterprises in this respect. The first is risk, suggesting that long-term risk-taking for unproven technologies is beyond the capacity of existing private capital markets, due to the massive amounts of up-front capital involved and the lack of any assurance that a meaningful technological breakthrough will ultimately occur. The second is a weak incentive structure for private enterprise, where the risks of knowledge spillover are significant, for example through reverse-engineering. Finally, new green technologies often face an unfair competitive landscape vis-à-vis the "brown" incumbents, who are often subsidized, or who have reaped the benefits of earlier investment in a less stringent regulatory environment (Söderholm, 2020).

▶ 2.2 Barriers associated with poor business performance and the productivity trap

A growing and prosperous enterprise, one that caters to the needs of all of its stakeholders, one that has healthy free cash flow and a strong balance sheet, is much better positioned to invest in climate adaptation measures. This does not mean that they are necessarily aware of the threat, but once they are, they are in a better position to act. As discussed, it is much cheaper to address a problem through anticipatory adaptation measures than to deal with the costly aftermath of an EWE.

Conversely, an enterprise with poor performance metrics, or struggling even to survive is not at all likely to be focused on long-term climate adaptation issues. There is not the time, nor probably the human capital to address the issue when problems are day-to-day in nature in terms of keeping the business afloat. As previously indicated, adaptation measures can be expensive, and they require investment now without any quantifiable metrics for a return. Climate adaptation is not generally a priority for enterprises on shaky financial ground. As a result, to advance overall participation in adaptation, the aforementioned "whole-of-society" approach must be incorporated to ensure that enterprises have the resources they need to be profitable in the first place. This also points to the need to develop coherent policy frameworks to foster sustainable enterprise development.

Most micro and small enterprises (MSEs) face challenges to reach a minimum efficient scale and economic viability, particularly in developing and emerging-market economies. They to tend to be caught in a low productivity trap, which translates into low revenue, low savings and investment rates, lack of or insufficient capital accumulation, and lack access to credit. This creates a vicious circle of low productivity-poor business performance-business stagnation, which has implications on the quality and quantity of job creation, and on their ability to adopt business adaptation measures. Hence, fostering MSME productivity growth using a holistic approach is indispensable to enable business mitigation and adaptation to climate change.

▶ 2.3 Barriers associated with institutions and regulatory frameworks

Institutions can be broadly defined as formal and informal rules and procedures. They are the mechanisms by which individual and collective decision-making take place, and they are highly dependent upon context. This contextual nature leads to a high degree of fragmentation, which in turn can lead to conflicting institutional structures. They include multiple levels of policy processes and involve various actors and stakeholders. The high number of participants often leads to competing interests and viewpoints and divergent responses from the many actors involved.

Biesbroek, Termeer, Kabat, and Klostermann (2009) suggest that the traditional ways of acting no longer suffice. They identify several institutional barriers to adaptation in the form of uncertainty, fragmentation, the existence of an institutional void, and conflicting time horizons. As has been discussed, climate adaptation is an uncertain business, with little in the way of evaluative metrics to draw upon. When different types and levels of uncertainty are combined, they accumulate to the point of becoming a serious inhibitor of effective decision-making. Fragmentation refers to the numerous actors involved at various levels of governance. This can lead to confusion and incoherence in policy processes. Fragmentation of leadership or steering mechanisms can result in intractable conflict and policy stagnation. A third factor is that of the institutional void. It may be that there simply are no climate adaptation institutions in place or that there is a lack of formal rules and coercive mechanisms to ensure that policymakers define appropriate long-term adaptation-related policy. Finally, there is an inherent conflict between long-term adaptation strategies and the often short-term perspectives of politicians who may be looking to be re-elected or focused on other more immediate issues they perceive to be of greater importance.

Oberlack (2012) synthesized 52 case studies of public adaptation in Europe and identified 31 recurrent patterns in institutional barriers to adaptation. As is often the case, there is a corresponding opportunity for each barrier. One of the most frequent institutional barriers was found to be that of miscoordination. Miscoordination traps exist when institutional procedures do not coordinate the actions of the many actors involved or do so in a suboptimal way. An example of one such trap is a situation where different public organizations are acting upon the same land system. A lack of coordination in this context may hinder decision-making through lengthy procedures, leading to maladaptation or misallocation of scarce resources.

The lack of clarity of responsibilities and the incentive trap were frequently observed barriers. In the absence of clearly defined responsibilities, individual actors may undertake their own internalized cost-benefit analyses and act according to what they perceive to be in their own best interest and not those of the institutional or policy objectives. A third prominent institutional barrier is the leadership trap. Strong leaders may wield asymmetric power and steer the institution away from superior policy choices, further exacerbated by the leader's personality or special interests. Strong leaders can also disenfranchise the many stakeholders and participants involved by not including them in the conversation from the beginning. If stakeholders do not have a voice, they are less likely to buy into the institutional objectives and remain engaged.

▶ 2.4 Bottlenecks associated with public policy inadequacy/incoherence

In 2015 the UN agreed upon the 2030 Agenda for Sustainable Development, which set forth 17 sustainable development goals (SDGs), and provided for a wide range of targets, actions, and research to support these aims. One such target, SDG 17.14, seeks to improve policy coherence for sustainable development (PCSD) as a critical factor in achieving the Goals of the 2030 Agenda (Soria Morales, 2018). PCSD is an OECD-based approach and policy tool that builds upon an earlier recognition of the need for "policy coherence for development" (PCD), originally developed on the assumption that policy actions undertaken by the wealthier nations could have a cross-border and negative impact on the development prospects of LDCs. An example might be when a more affluent nation supports agricultural development in another country while simultaneously undermining that same sector by way of tariffs, which create market and pricing distortions.

PCSD takes a significant step further. It seeks to evolve from a "do-no-harm" approach to an inclusive partnership perspective by taking a holistic view of cross-border and cross-sectoral impacts (OECD, 2016). PCSD seeks to ensure that institutional and governance mechanisms are both effective and inclusive. Single-sectoral approaches cannot achieve the 2030 Agenda. PCSD seeks to 1) identify where critical interactions lie, 2) enhance policy coherence by strengthening institutional and governance mechanisms, 3) monitor and report to collect evidence on the benefits of policy coherence, and 4) engage in partnerships across a broader range of stakeholders (OECD, 2019).

Sustainable development in general, and climate adaptation in particular, is complex involving, as we have seen, many varied stakeholders, actors, and governments on a local, sub-national, national, and international level. The fragmented nature of the current approach to policy decision-making leaves considerable room for incoherence. Policies that fail to cohere on multiple levels may result in a misallocation of scarce resources, or worse, they may actively serve to undermine one another. An additional hindrance to the elaboration of effective policy is the existence of sectoral silos, limiting more integrated approaches towards decision making by ignoring the complex inter-linkages existent with the many actors involved. Removing policy silos is necessary to move from a sectoral approach to a cross-sectoral perspective in multi-sector value chains (OECD, 2014).

Additional bottlenecks can arise due to a lack of clear and time-sensitive action plans and limited (or non-existent) arbitration mechanisms for dispute resolutions pertaining to incompatible or conflicting policy interests. Monitoring systems and measurement capabilities are also inadequate (or non-existent) in identifying fragmented policy breakdowns, highlighting the need for increased awareness in this area. Without proper monitoring, it is difficult to capture the potential synergies between economic, social, and environmental policy spheres, leading to suboptimal outcomes (OECD, 2014).

▶ 2.5 What needs to change?

A myriad of obstacles hindering climate adaptation measures has been outlined, across regions and sectors, across levels of government, and specific to several key adaptive measures themselves. As has been demonstrated, optimal climate solutions depend strongly on local contexts of countries, regions, enterprises, communities, and organizations. The complexities of the interdependencies of all the actors involved make it difficult for old decision-making models to meet the challenge. New methods must be found. Looking to this analysis of the adaptation barriers involved, it is evident that changes

by policy makers in their decision-making and planning processes are appropriate, and that future planning policies should attempt to address these barriers head-on. Information barriers and misaligned incentives suggest that there is room for policy makers to strengthen regulatory frameworks conducive to adaptation, and also to foster the development of well-informed demand for adaptive measures (Cimato & Mullan, 2010).

In this section, we present a synthesis of case studies on adaptation, followed by a set of lessons learned from existing experiences. We conclude by providing a set of policy recommendations and tools to assess barriers to adaptation. In chapters 3 and 4, we analyse in more detail the policy makers' toolkit for climate change adaptation and mitigation, as well as implications for EBMOs.

Case studies

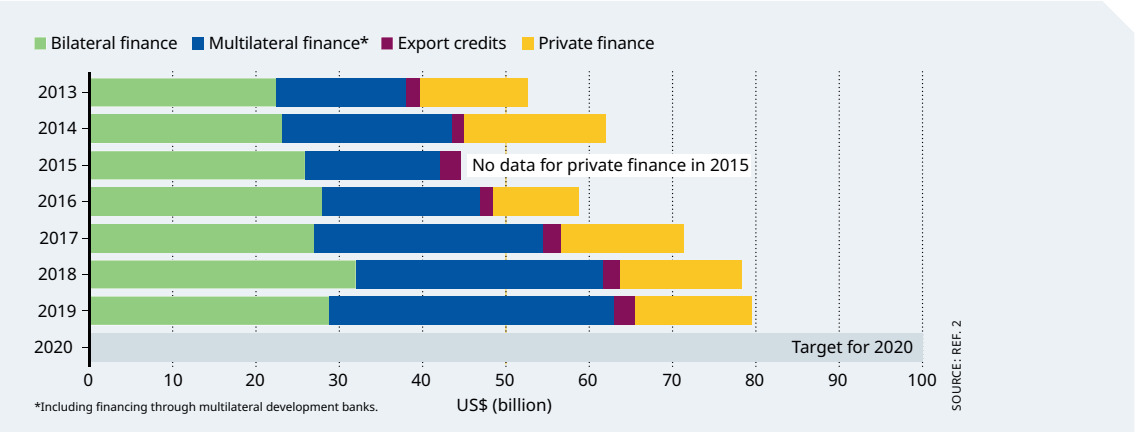
In the literature, individual case studies of climate adaptation abound, whether by country or region, sector or enterprise-specific. As we have already demonstrated, LDCs are the most vulnerable group to the deleterious effects of climate change. As such, we will focus our attention primarily on LDCs. Rather than delve into the minutiae of local case studies on a micro level; we look at research that has already aggregated the results of individual case studies by country or region to identify general principles that hold in the real world. Utilizing this approach will enable the identification of the most frequent barriers to adaptation and what is effectively being done about to alleviate them. Once we know what is needed based on practical experience, we are better suited to make policy recommendations and discuss the optimal role of EBMOs.

Historically, mitigation strategies, going back to Kyoto, have been at the forefront of discussion and actions on climate change. However, the need to focus on adaptation as a co-equal area of concern has become more apparent in recent years, with governments increasingly aware of the need to include resiliency in sustainable economic development planning and policy. This is especially true in LDCs. An analysis of case studies from the LDC Group[13] by Patel and Gebreyes (2020) found that LDCs are growing in their knowledge, relying upon a growing and wide-ranging evidence base accumulated through their own experience. This has implications for policy to which we will return.

Patel and Gebreyes (2020) also note that human adaptation to climate change has been going on for centuries. Human societies have always been tackling climate adaptation in a manner suited to their specific circumstances. This suggests that incorporating indigenous knowledge into modern solutions and policy is integral to success in building resilience at the local level. Climate change is also likely to push millions more into poverty in LDCs, in a vicious circle that will inhibit the ability to recover. As a result, support for adaptation is vital. Governments must place equal priority on sustainable development for current generations through adaptation and those that will follow through mitigation. Current funding for adaptation is a fraction of what is required. According to UNEP, the already high cost of adapting to climate change in LDCs could rise to between $280 and $500 billion per year by 2050, up to five times greater than previous estimates (UNEP, 2016). The developed world has thus far failed to meet its pledge under the Paris Agreement of $100 billion annually. This figure is for all aspects of climate change, including mitigation, which receives the lion's share of the funding. According to the journal Nature, some of the largest per capita contributors to the Paris pledge (e.g., Japan) do so through loans, not grants (Timperley, 2021). Loans for adaptation measures do not generate any monetary returns, and they must be paid back. Thus, the face value of climate contributions likely overstates the reality. Also inflating the figures is the fact that some countries are incorrectly counting development aid already committed as going towards new climate projects. Finally, even as climate funding has increased as a whole, funding for adaptation has been lagging. Figures 7 and 8 depict the true state of climate funding as it exists today.

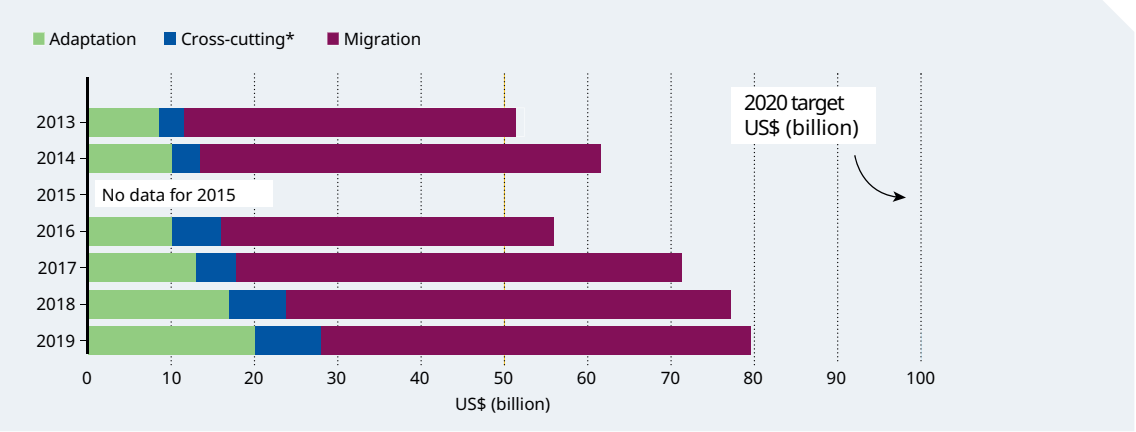
13 The LDC Group is a group of 47 of the least developed countries that work together within the UNFCCC and which tend to negotiate as a bloc demanding action on the part of wealthier and high-emitting nations.

Figure 7. The amount of climate financing from developed nations to LDCs has fallen short of the goals of the Paris Agreement



Source: Timperley (2021).

Figure 8. The share of funding for adaptation has been lagging



Source: Timperley (2021).

UNDP undertook a comprehensive synthesis of case studies in Africa from the period 2000-2015, including for example mainstreaming across Africa, the inclusion of women in Zimbabwe as part of a collaborative approach towards food security, forecasting technology in Niger, early warning systems in Ethiopia and evaluation and monitoring processes in Namibia (Troni, 2018). Taken individually, and while interesting, these studies are not likely to direct us towards substantive policy recommendations and the proper role of EBMOs. Collectively however, there are identifiable and recurrent patterns based on this real-world experience that can serve to point us in the right direction. There have been several success stories, such as improved food security in countries such as Mali, Niger and Sudan, while other governments have improved upon forecasting and early warning systems and have aided communities in protection from wildfires and floods. More women have been empowered as effective change agents and have been exposed to new opportunities both on the farm and off.

Ryan and Bustos (2019) also tackled a comparative case study analysis of six Latin American countries with a focus on climate adaptation, namely Argentina, Brazil, Chile, Costa Rica, Paraguay, and Uruguay. The authors point to systemic knowledge gaps related to the production, integration, transfer, and uptake of knowledge needed for adaptation. They also found that a low level of institutionalization was inhibiting both knowledge transfer and appropriate long-term adaptation policy.

Lessons learned

Amalgamation of this collective case study experience suggests the need to focus on several specific areas. UNDP has created a simple acronym, ADAPT, that encompasses a holistic approach to the problem (Troni, 2018):

A daptive capacity
D ecision-making
A ccess to markets
P olicy mainstreaming
T echnical information

It is urgent that LDCs continue to build adaptive capacity, to lessen the knowledge gap and to mainstream[14] and accelerate adaptation initiatives. Capacity development takes time and requires ongoing support. Decision-making directs focus to the critical need to involve all stakeholder groups, and to consider the complex interrelationships and competing priorities involved. Access to markets involves recognizing the need to dramatically scale-up both adaptive capacities and measures, but it also refers to access to capital, which as we have seen is nowhere near what is required. Policy mainstreaming seeks to embed adaptation measures firmly into institutional frameworks and policy, and to develop a monitoring feedback loop that can be used to influence future policy decisions. Technical information must be made available to support planning and policy decisions, including economic information suitable for quantifying returns on investment and building a strong economic case.

World Bank (2011) also looked at 7 country case studies spanning Africa, Asia, and Latin America. It notes that economic development must go together with adaptation to climate change, and points to the need to not lose focus on actions that make sense even without climate change, such as improved road networks which serve to lower transportation costs and fuel usage.

Experience from the LDG Group amalgamation of case studies by Patel and Gebreyes (2020) suggests that a whole-of-society approach is what is required, noting that adaptation means enhancing not only the obvious physical measures and addressing knowledge gaps, but also the socioecological systems at play. It also necessitates an understanding of the complex interplay between human behaviour and the ecosystems that societies rely upon. They too agree that climate risks and adaptation strategies must be integrated into national plans and policies. Adaptation requires long-term planning that is also context-specific and flexible, allowing for experience gained in practice to be fed back into future policy decisions. The good news is that the feedback loop is working. LDCs are demonstrating an ever-widening evidence base of experience, upon which they can draw upon to avoid maladaptation and make better decisions in the future.

Policy recommendations

Peace et al. (2013) identified the lack of investment by governments in public infrastructure among the seven critical barriers for business adaptation to climate change. Extreme weather will impact public infrastructure that enterprises rely on, but which are beyond their "fence line"—roads, public transport, water provision, and communications systems. Some national governments have built their resilience to climate change by upgrading public infrastructure. But the willingness—and capacity—to do so varies from state to state and country to country. In many places, including the United States, in the absence of government efforts to upgrade its infrastructure or even guidance on what is needed for preparedness; many enterprises are adopting a more cautious "wait-and-see" approach. Without clear government

14 Mainstreaming refers to the incorporation of climate change adaptation objectives in sectoral policies and plans. More broadly, it involves educating and empowering all stakeholders early in the process to encourage their collective ownership of the plan or initiative.

signals, some enterprises believe that it is simply too early to act, or they consider that "building resilience" and committing to preparedness is as much the government's responsibility as it is theirs.

Policy makers must address their own perspectives to consider the long-term nature of climate change. This requires a far-sighted approach which is often at odds with the more short-term focus of many politicians. It also suggests that policy makers would be wise to strengthen institutional resiliency towards long-term climate and adaptation goals to insulate them from the vagaries of changing political parties and landscapes.

The knowledge gap and technological transfer is another area in which policy makers need to do more. First and foremost, it is essential to address the lack of awareness of the need for green skills in the future by enterprises and workers alike. A streamlining of the numerous and confusing agencies and programmes which exist for example in Europe, and better communication as to their availability, should be made a priority. Education itself needs to be prioritized. Policy makers should work to boost capacity at local levels to support job creation in a green economy, by investing more in green-specific skills training opportunities. Policy makers could do more to encourage women's participation in STEM, especially in LDCs, to provide more opportunity for women to become a larger and productive segment of the labour force, both on and off the farm.

More needs to be done to communicate the material risks involved in failing to undertake anticipatory adaptation efforts. Communication of the risks involved is dependent upon an adequate means of measuring and monitoring outcomes, which is sorely lacking. As such, policy makers should give due consideration to additional funding for research in this area.

The lack of funding itself is one of the most onerous barriers to climate adaptation. This applies to all levels of government, from international to local, as well as to the private capital networks. As of 2019 for example, developed nations had still not met their Paris-based funding commitments of $100 billion annually, even though this target remains woefully short of what is going to be required. Policy makers need to effectively coordinate access to what financing is available for the most vulnerable groups, especially in LDCs. In effect policy makers need to reorganize their priorities and make more public money available across the board. Greater investment in climate adaptation measures today is cost-effective. The alternative involves catastrophic consequences, with far more damage being done to the global and to regional economies. In addition, policy makers need to work with the insurance industry, to ensure its continued economic viability and that climate-specific offerings are both available and fairly priced. EBMOs have an important role to play here. There should also be some consideration by policy makers towards reducing the capital requirements that banks must adhere to when lending for green initiatives. Current capital requirements act as brakes on loans to small enterprises, when policy should be seeking to incentivize adaptation (FSB, 2021).

As stressed before, there is a need to focus more on climate risk assessments. To be more transparent on how risks are assessed and managed, enterprises would benefit from a clear regulatory framework for reporting on anticipated impacts from climate change. Regulatory authorities and EBMOs, especially those in the world's largest economies, should make climate risk disclosure mandatory for publicly listed enterprises. As risks become more transparent, better understood, and more accurately priced, the private and public sectors can better share costs and benefits. Finally, there is also a need to prioritize new partnerships that can support climate adaptation. The public sector has an essential role in helping prepare a framework for enterprises across sectors and industries to collaborate.

The Taskforce on Climate-related Financial Disclosures (TCFD), a voluntary initiative launched by the G20 in 2015, aims to create guidelines for enterprises to avoid these suboptimal paths. It does so by generating guidelines for enterprises to report the financial implications of climate change. In 2017, the TCFD recommended that enterprises disclose actual and potential impacts of climate change on their operations, as well as risk management processes, metrics, and targets. Although these recommendations draw on existing disclosure frameworks, they are relevant primarily because of their high-profile messenger, the Financial Stability Board, and their intent to supersede existing frameworks.

The TCFD delineates climate change risk into two major categories: the transition risks of shifting to a lower-carbon economy and the physical risks of climate change itself. Throughout this document it is possible to review the implications of these two categories. Climate change risks have generally received less scrutiny than transition risks, which are more likely to fall within a corporation's traditional strategies

of preparing for shifts in markets or regulations (Goldstein et al., 2019). The risks include potential loss of financial assets at risk due to physical impacts.

Policy makers should also seek to find a way to incentivize technology transfer, recognizing that the costs and benefits are rarely in alignment, and that existing trade frameworks are prone to creating distortions in the market through tariffs and other restrictions.

Problems associated with the institutional void have been noted. Policy makers must ensure that the necessary institutions are in place and that there is an effective set of formal rules and of coercive mechanisms to ensure that the policy makers themselves are elaborating appropriate long-term adaptation-related policy.

The complexity of climate adaptation systems and their interdependencies across many actors, levels of governments, and stakeholders has been well illustrated. Policy makers must seek to adopt, and enshrine, the principles of PCSD to use a holistic and collaborative approach, one designed to avoid conflicting cross-sectoral policy objectives. Governmental institutions also tend to require capacity building in areas of policy elaboration, regulation design and enforcement, especially in LDCs.

The LDC Group, as referenced by Patel and Gebreyes (2020) in their amalgamation of case studies in LDCs, identified six best practices linking international climate decisions and interventions with national implementation. These practices serve to embody in one form or another all the above recommendations. They consist of 1) taking national ownership of the intervention, i.e. the need to fully buy-in; 2) adopting long-term perspectives; 3) ensuring that interventions are far-reaching and involve large-scale roll-outs; 4) establishing coherent and coordinated delivery; 5) grounding interventions in social justice, inclusion and gender identity; and 6) strengthening local knowledge systems and improving access to technical knowledge.

Hallegatte, Rentschler, and Rozenberg (2020) published a guide for policymakers that seek to design strategies for climate change adaptation and resilience. In this document, the authors identified four policy areas: 1) facilitate the adaptation of people and enterprises, 2) adapt land use plans and protect critical public assets and services, 3) help enterprises and people manage residual risks and natural disasters, and 4) manage financial and macro-fiscal issues. Numbers 1 and 3 are the most directly linked to business resilience and most helpful for EBMOs to identify policy priorities to bring to their local and federal officials. Private actors have an incentive to increase their resilience and adapt to climate change. However, they face a range of obstacles, from the lack of information and behavioural biases to imperfect markets and financial constraints. Governments need to minimize these obstacles to maximize the economy's adaptive capacity and prevent climate change impacts and natural disasters. Furthermore, governments must develop strategies to ensure that when disasters do occur, people and enterprises can cope without devastating long-term consequences, and can recover quickly.

Hallegatte et al. (2020) handbook is particularly helpful because it contains clear actions and precise indicators to monitor outcomes. As has been stressed throughout this report, effective monitoring and evaluation gaps exist to properly diagnose business resilience to climate change. Considering this debate, the indicators in the guide, especially the policy areas summarized in Tables 4 and 5, will prove extremely helpful for EBMOs and policymakers in bridging these gaps. According to this work, priority area 1 is most intrinsically linked to the ministry of economy's mandate. In contrast, priority area 3 would most likely fall under the responsibility of the environment or interior ministries. However, since government structures and attributions vary widely between countries, some other agencies may be in charge or have the data access to monitor these outcomes. Furthermore, a significant challenge is a potential disconnect between the data agency that would have the attributions to implement the actions listed in Table 4 and 5 below and the agency that has the data to monitor the relevant outcomes.

The most common environmental issues for SMEs, such as resource efficiency (including energy savings), which usually are not related to the core business of the company, are only addressed if actions are likely to result in a substantial cost reduction in the short term. Over 90% of SMEs in the EU are taking at least some actions to be more resource-efficient for purely economic reasons (OECD, 2018). Most common actions relate to minimising waste, saving energy and raw materials. These lines of action represent a good starting point to design policy to directly address SMEs. What can governments do to make environmental improvements more cost-effective for small enterprises? In Chapter 3, we present an overview of existing and potential policies to include SMEs in the green transition.

Table 4. Facilitating the adaptation of people and enterprises to climate change

ACTIONS	DESCRIPTION	INDICATORS	EXAMPLES
Assess disaster and climate risks, and make the information available	Governments must ensure the information people need to adapt to climate change and manage natural risks is widely accessible, free (or cheap enough), and in a simple format that decision makers can use. People and enterprises need information on many kinds of threat—those from natural hazards, threats to human capital and key sectors, and cross-border threats, including risks linked to food prices. One important consideration relates to uncertainty on future climates and the likelihood of various natural hazards. Governments must ensure they communicate the large uncertainty around future climate change impacts, and not only one "most likely" scenario.	- Number of weather or hydrological observation stations operational in the country - Real-time availability of hydromet observations - Time series of hydromet observations are freely available - Percentage of country covered by high-resolution digital terrain model - Percentage of country covered by high-resolution hazard maps for current and future risks, with multiple scenarios - Risk assessment for main economic sector done and publicly available - Data platform providing easy access to hazard and climate change scenario data - Guidance materials and methodologies available to users on how to access and include disaster and climate information in decision making	
Clarify responsibilities and align incentives with resilience and adaptation objectives	To ensure that private actors—households and enterprises—are making the right decisions to manage climate change and natural disasters, governments should clearly establish responsibilities and liabilities in law, and communicate these to all actors. Private actors should be informed about the extent of disaster protection provided by public investments and infrastructure. And when private enterprises provide public service, then regulation is needed to define risk management responsibilities in a way that aligns private actors' incentives with public interest.	- Law allocating responsibilities and liabilities for disaster risk management and climate change impacts passed - Target level of residual risks published and publicly available (for example, through residual flood risk maps) - Specialized agencies to manage watershed-level water sharing established	For example (private actors), in the Netherlands, the level of flood protection that the government is required to provide to the population is legally defined, so individuals and enterprises can decide where to live and invest, and what additional flood management measures they need to invest in. For example (private enterprises): electricity supply.
Facilitate access to technologies through trade policies and investments in research and development	Effective adaptation will depend on countries being able to draw on the best available technologies for mitigating climate change impacts, especially in the agriculture and health sectors. But there are many obstacles that impair access to and adoption of technologies. International patent registrations show that innovation in adaptation is not growing as a share of total innovation and is concentrated in highincome countries and a handful of middle-income countries. Transfers of this innovation are also insufficient, with almost no transfers to low-income countries.	- Share of farmers using improved crops and climate-smart practices - Share of R&D (or percentage of patents) related to climate change adaptation - Total amount invested in R&D on adaptation- or resilience-related challenges - Amount invested by the public sector in R&D on adaptation- or resilience-related challenges - Amount invested by the private sector in R&D on adaptation- or resilience-related challenges - Average tariff applied to imports of resilience-related technologies	
Ensure financing is available to all, and provide support to the poorest and most vulnerable people	High upfront costs or affordability issues may stop private actors from implementing effective solutions. Even if these costs are more than compensated in the long term by avoided impacts and losses, the lack of financing can be a serious obstacle for credit-constrained enterprises and households. And in the absence of external support, hundreds of millions of people in or close to poverty will be impacted by climate change and have limited ability to respond and adapt. Direct support through social protection or subsidies for resilience-building interventions can play a key role in reducing their vulnerability.	- Number of enterprises/people accessing dedicated financing instruments (for example, guarantees, subsidized loans) - Total borrowing for adaptation through dedicated windows - Most vulnerable populations and communities (occupations, localizations, poverty, ethnicity, and so on) identified and information published - Share of poor and vulnerable population receiving support for adaptation - Total subsidy/spending targeting poor and vulnerable populations to support adaptation action	
Facilitate structural change in the economic system	Climate change will affect latent comparative advantage. Governments need to manage and facilitate economic transition, deal with coordination issues, and ensure social consequences are minimized. In practice, however, the risk is that an important sunset sector (one that is bound to lose competitiveness in coming years and decades) becomes non-profitable exactly when the country needs to be making large investments to boost another sector. Governments have various options for addressing this situation: - Support sunrise sectors and activities to maximize their development potential. - Manage sunset sectors and activities to facilitate a smooth transition. - Support economic diversification to hedge against climate risks.	- Strategy to manage the decline of negatively affected sectors published - Strategy to support the development of nonaffected or positively affected sectors published - Share of GDP in sectors expected to be negatively affected - Share of GDP in sectors expected to be positively affected - Share of employment in sectors expected to be negatively affected - Share of employment in sectors expected to be positively affected - Share of exports in sectors expected to be negatively affected - Share of exports in sectors expected to be positively affected - Measure of economic diversification (e.g. number of exported products) or latent diversification	For example, it will make some countries less productive in certain types of agriculture, to the benefit of others; it will also cause the decline of some sectors and the growth of others.

Source: Authors' elaboration with information from Hallegatte et al. (2020).

Table 5. Helping enterprises and people manage residual risks and natural disasters

ACTIONS	DESCRIPTION	INDICATORS	EXAMPLES
Save lives (and money) with hydromet, early warning, and emergency management systems	Weather forecasts enable the anticipation of and preparation for extreme events, and timely evacuation can save thousands of lives. Preparation reduces physical damage and economic losses—for example, shuttering windows ahead of a hurricane can reduce damage by up to 50 percent. The benefits of providing universal access to early warning systems globally have been repeatedly found to largely exceed costs, by factors of at least 4 to 10. There is also a set of good practices to ensure that early warnings are communicated properly so that people can act upon them and that shelters meet communities' needs. This includes considering gender issues, access for people with disabilities, and how to organize shelters in times of epidemics and pandemics like COVID-19.	- Daily weather forecasts produced by the hydromet agency and easy-to-communicate alert system in place - Communication channels to efficiently communicate early warnings to the population and emergency services are in place - Average error in early warning (both missed events and false alarms) - Share of population with access to early warning systems - Share of population covered by evacuation plans - Capacity of shelters and averange distanceto closest shelter - Capacity of emergency services - Duration communities can operate safely and independently - Number of disaster drills performed	For example, number of emergency medical service units, trained health emergency professionals.
Provide all enterprises and households with risk management instruments	Helping households cope with and recover from shocks requires a holistic and flexible risk management strategy with a range of policy instruments appropriate for different disasters and affected populations. Poorer and richer households have different needs and can be supported with different instruments.	- Overall strategy to manage residual risks and disasters prepared and approved. - Coordination mechanism in place between the various preparedness actors. - Fraction of population covered by at least one financial instrument to cope with shocks.	For example, ministry of interior for crisis management, social protection, ministry of agriculture for food security and agriculture, ministry of finance. For example, insurance, social protection, or access to emergency borrowing.
Develop the insurance sector, building on publicprivate partnerships	Domestic disaster insurance markets can be an effective channel for developing the resilience of disaster-exposed households and businesses. Governments can use their own resources to support domestic insurance markets and reach households and businesses with insurance products, realizing their policy goals of expanding the population's financial resilience to disasters. But developing insurance markets is challenging, particularly in low-income environments. Where insurance is not compulsory, pick-up rates remain low. This includes high-income countries, even where insurance is heavily subsidized.	- Share of population with disaster insurance - Share of population with access to emergency loans from financial institution - Share of population receiving remittances - Share of population with financial savings (in a bank account)	The Turkish Catastrophe Insurance Pool and the Mongolian Livestock Insurance Pool are good examples of public-private partnerships that have substantially increased insurance penetration at the local level.
Build a social protection system and make it responsive to shocks	For the poorest households, savings are often not an option, and high transaction costs and affordability issues make access to private insurance challenging. These households need well-targeted and easily scalable social safety nets. Adaptive social protection systems have proven to be critical for channeling resources to those who are most in need due to climate stresses. Based on existing social protection systems, adaptive systems can respond quickly to disasters or slow-onset climate crises by: - Scaling up or providing additional resources to regular beneficiaries. - Scaling out or providing support to additional beneficiaries during bad times or years.	- Share of population covered with social protection - Stress test of existing systems completed, including delivery mechanisms - Contingent plan to scale up social protection systems developed and approved. - Share of population in social registry - Delivery mechanism in place (e.g. bank account for each household in the registry)	- For example, in Fiji, all beneficiaries of the Poverty Benefit Scheme received exceptional transfers after Tropical Cyclone Winston in 2016. - For example, the number of beneficiaries of Ethiopia's Productive Safety Net Program depends on rainfall."
Help enterprises develop business continuity plans and financial preparedness	Individual enterprises ability to cope with a shock and continue to produce in the aftermath of a disaster depends on many factors, but they can do a lot to become more resilient. The usual recommendation is to identify threats, assess risks, and consider mitigation options. Preparing BCPs can ensure a enterprises's management and workers know what to do in case of disaster, to maintain or restore production as fast as possible. BCPs should consider a enterprise's full supply chain and include issues that may affect suppliers and clients. Other things to consider include financial issues, such as how to manage a drop in sales, increased supply prices, or the urgent need to replace expensive pieces of equipment. Access to contingent credit lines and appropriate insurance are among the many tools that enterprises can include in their BCP.	- Fraction of enterprises with BCPs - Number of area-based BCPs - Fraction of enterprises with disaster insurance coverage	This allows enterprises to invest in prevention—for example, by adding a generator in case of power outage, investing in movable flood protection, or even elevating critical equipment. It also helps them prepare for residual risk.
Be prepared to build back better after disasters with contingency plans and financing	When a disaster hits and old or low-quality assets are destroyed, countries can build back better, under improved building norms, thereby improving both productivity and resilience. But this does not always happen, often because the urgency to reconstruct leaves little time and few resources to rethink the design or spatial footprint of cities and infrastructure. Building back better depends on the ability to plan and implement the reconstruction process efficiently, or on the existence of plans prepared before the crisis occurs.	- Resilient recovery and reconstruction plans, with revised land use and standards, ready for implementation - Pre-approved contracts for emergency interventions (for example, debris removal) or reconstruction (for example, road repairs) approved, with enhanced standards	

Source: Authors' elaboration with information from Hallegatte et al. (2020).

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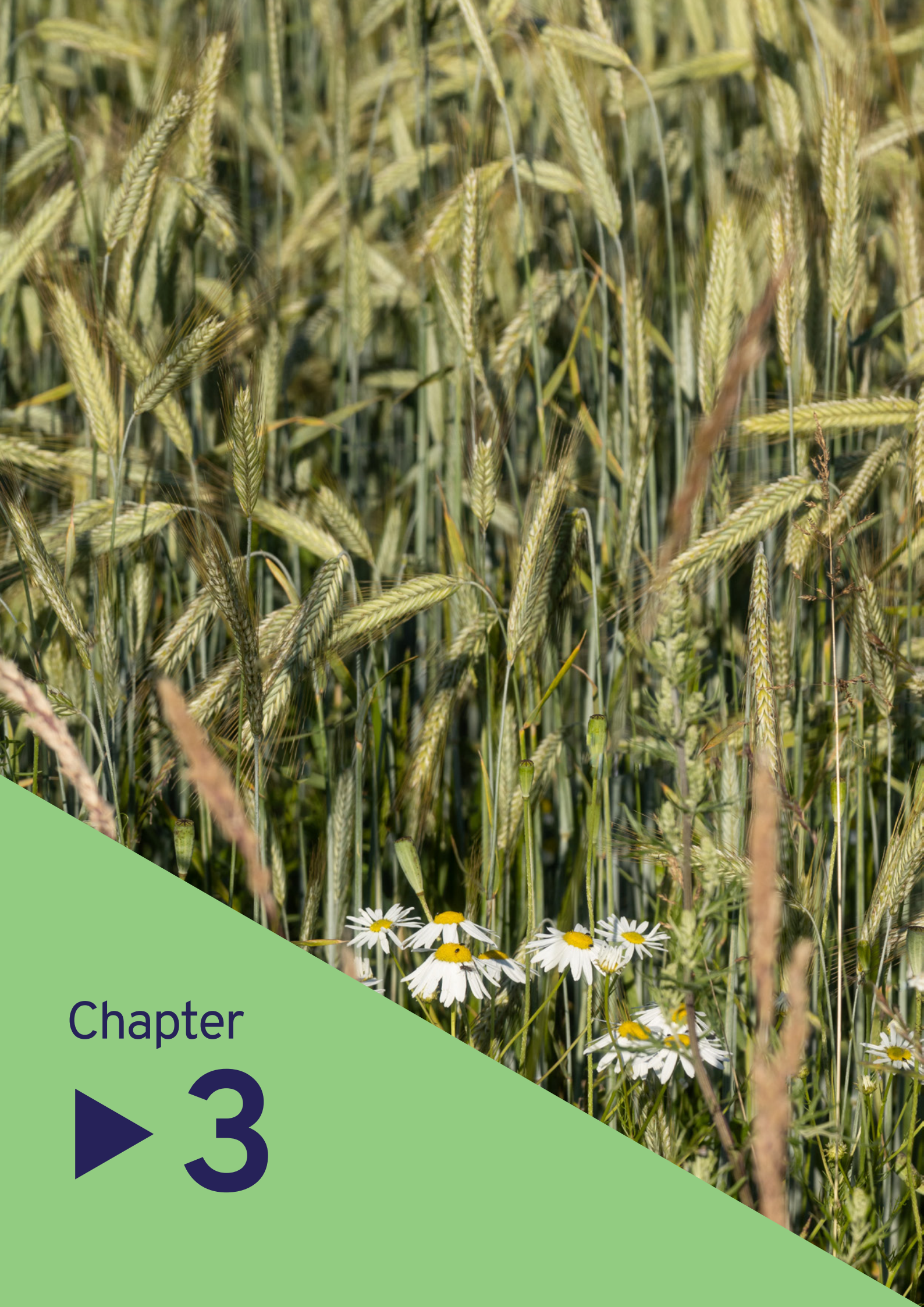


Chapter 3

Policies and institutions to decarbonize the economy and accelerate the structural transformation towards a net-zero carbon emissions economy

Policies and institutions to decarbonize the economy, and get to net-zero, are inherently mitigative, not adaptive in nature. Nevertheless, it is important to understand the backdrop of the mitigation landscape, as it is in this contextual environment that policy, institutional, and regulatory instruments will operate with respect to building resiliency. This chapter will endeavour to portray the net-zero policy and institutional landscape as it exists today, with a view to its influence on business adaptation measures across a range of sectors and disciplines.

The greening of economies presents many opportunities to achieve social objectives: it can be a new engine of growth, both in advanced and developing economies. The International Labour Organization, as well as economists and policy scholars, whose work will be reviewed in this section, have argued that managed well, transitions to environmentally and socially sustainable economies can become a strong driver of net job creation and upgrading. Greening enterprises and jobs by introducing more energy-efficient practices, avoiding pollution, and managing natural resources sustainably can lead to innovation, foster resilience, and generate savings that drive new investment and employment (ILO, 2015).

This is not to say that mitigation will not come at a cost. The IMF has found that it will take a carbon price of $75 a ton price on CO_2 worldwide by 2030 to limit warming to 2°C. At $75 a ton, electricity prices would rise, on average, by 45 percent, and gasoline prices by 15 percent by that year (Behsudi, 2021). On the other side of the scale are the benefits: the research shows reducing global emissions over the next 50 years to meet the goals of the Paris Agreement would prevent about 4.5 million premature deaths, 1.4 million hospitalizations, and emergency room visits, 300 million lost workdays, 1.7 million incidences of dementia, and 440 million tons of crop losses only in the United States (Shindell et al., 2021).

Focusing only on the reduced mortality risk from lower levels of harmful air pollution, Alexander et al. (2015) study how mitigation would look like if countries incorporated such benefits in their cost-benefit analysis of mitigation policies. Their results show that the emissions gap in 2030 between the six significant emitters' NDCs and the 2°C goal could be closed by 27-46%, without imposing additional economic burdens on those undertaking the additional effort. For the 1.5°C temperature goal, the larger emissions gap in 2030 of around 23 GtCO2e could be closed by 20-34%. It is essential to highlight that their estimates do not include other health benefits or the actual costs of climate change – human, economic, environmental, and social - such as those due to sea-level rise, extreme weather events, reduced crop yields, and the need for adaptation. The authors highlight that if these factors were taken into account, the cost-effectiveness of mitigation in many regions would become even more attractive.

A low carbon strategy has many other benefits by stabilizing the climate, and the magnitude of the net cost (at 1–2% of GDP) is small when seen as a means of reducing climate impacts overall and when seen as insurance against the more extreme outcomes if no action is taken. When evaluating climate policies, policymakers need to look beyond climate impacts. The social and economic co-benefits of climate change mitigation offer an essential opportunity to mobilize a strategic and interest-oriented approach to support effective and timely climate actions. Hence, the question is not whether countries should set highly ambitious abatement policies that will set in motion the decarbonization of economic activity. The question is how governments and EBMOs can make this transition inclusive for enterprises, and how enterprises can lean in and participate in the innovation processes required to fulfil our global climate ambitions. This section first presents the milestones that we need to achieve mitigation requirements. Then alternatives of policies and institutions that will bring decarbonization and productivity growth together are offered, emphasizing measures to support enterprises.

▶ 3.1 The goal: decoupling economic growth to achieve net-zero

Studies of the relationship between per capita emissions and income find that per capita emissions of pollutants rise with rising per capita income when policies and other factors are held constant. However, changes in these other factors may be sufficient to reduce pollution. In rapidly growing middle-income countries, growth overwhelms these other effects. In wealthy countries, growth is slower, and pollution reduction efforts can overcome the growth effect (Stern, 2017). The separation between economic growth and increased per-capita emissions is called decoupling and is at the core of sustainable development. Decoupling happens when the increase of an environmental pressure or impact in a country or region is slower than the growth of GDP for a given period.

The most instructive tool for analysing decoupling processes is the Kaya identity, which states that for a region, over any given period, the following relation must hold between gross domestic product (GDP), Y, energy use, E, and carbon emissions, C (Deutch, 2017):

$$\Delta C = \Delta \text{Energy Intensity} + \Delta \text{Carbon intensity} + \Delta Y$$

The Kaya identity decomposes the linkage between economic growth and carbon emissions into two links: energy intensity (E/Y) and carbon intensity (C/E). Energy intensity declines, for example, when higher energy prices cause enterprises to make energy efficiency investments that reduce the amount of energy needed to produce. Carbon intensity decreases, for example, when utilities shift from coal to natural-gas-fired generation since coal emits almost twice as much CO2 per kWh-hr as natural gas. Between 2008 and 2015, carbon and energy intensity improved globally, but the improvement was insufficient to reduce carbon emissions over the period.

Net-zero refers to the balance between greenhouse gas produced and the amount removed from the atmosphere. We reach net-zero when the amount we add is no more than the amount taken away. The number one message that came out of the COP26 in Glasgow is that collectively, countries need to ensure global net-zero by mid-century to keep 1.5 degrees warming within reach. In that line, governments are being asked to come forward with ambitious 2030 emissions reductions targets that align with reaching net zero by the middle of the century (UNCC, 2021).

The International Energy Agency (IEA) presented a roadmap to achieve this global mitigation goal by 2050 (Bouckaert et al., 2021). It is important to emphasize that this roadmap is not a projection or something that will happen without significant active engagement from the public and private entities. EBMOs can engage in promoting the policies that will support the global economy in achieving the milestones that constitute that roadmap. It is more like a recipe: what needs to be done to achieve the 1.5-degree warming target to keep the Earth safe. In this report, we analyse a set of policies that are more relevant for the private sector. Furthermore, as with any transformation, there are winners and

losers in the proposed path. We also address how governments and EBMOs can support policies that will make this transition just.

In their report, IEA presented the broader implications of achieving net-zero emissions. It offers a valuable preview of how the global economy could look like if the pledges proposed in Glasgow in 2021 were fulfilled. We highlight three relevant aspects Bouckaert et al. (2021):

- **Economy:** In the Net Zero Emissions by 2050 Scenario (NZE) investment rises across electricity, low-emissions fuels, infrastructure, and end-use sectors. Clean energy employment increases by 14 million to 2030, but employment in oil, gas, and coal declines by around 5 million. There are varying results for different regions, with job gains not always occurring in the same place, or matching the same skill set, as job losses. Policymakers will have to address these bottlenecks. The increase in jobs and investment stimulates economic output, resulting in a net increase in global GDP to 2030. But oil and gas revenues in producer economies are 80% lower in 2050 than in recent years, and tax revenues from retail oil and gas sales in importing countries are 90% lower.
- **Energy industry**: The IEA envisions a significant contraction in fossil fuel production. However, they highlight enterprises that produce these fuels have skills and resources that could play a key role in developing new low-emissions fuels and technologies. In their scenario, the electricity industry scales up to meet demand rising over two-and-a-half-fold to 2050 and becomes more capital intensive, focusing on renewables, sources of flexibility, and grids. Large energy-consuming enterprises, vehicle manufacturers, and suppliers adjust designs and retool factories while improving efficiency and switching to alternative fuel supplies.
- **For the 790 million people** who lack access to electricity and clean cooking, the IEA proposed that the NZE delivers universal access by 2030. This costs around USD 40 billion a year over the next decade and adds less than 0.2% to CO2 emissions. Under this scenario, the proportion of disposable household income spent on energy over the period to 2050 remains stable in emerging markets and developing economies, despite a significant increase in demand.

3.1.1 Government action is central to achieving net zero emissions globally by 2050

Government action underpins the decisions made by all other actors. An unprecedented level of international cooperation is needed. This helps to accelerate innovation, develop international standards, and facilitate new infrastructure to link national markets. Without the cooperation assumed in the NZE, the transition to net-zero emissions would be delayed by decades. The NZE depends on actions that go far beyond the remit of energy ministers within federal and local governments: it requires a coordinated cross-government approach.

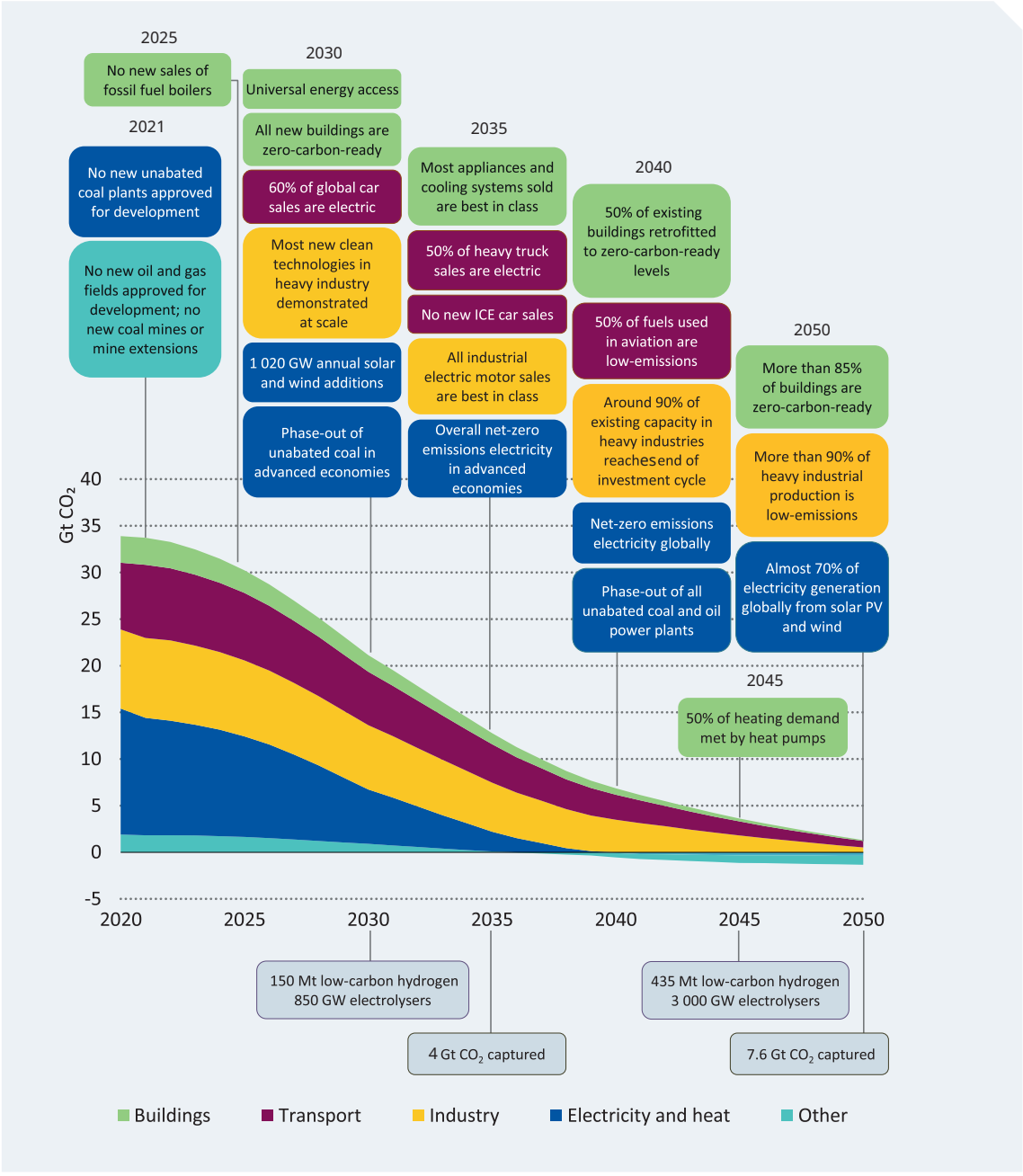
A vital aspect of the IEA report roadmap is that accelerated innovation is needed. The emissions cuts to 2030 can be mostly achieved with technologies on the market today, **but almost half of the reductions in 2050 depend on technologies currently under development** (Bouckaert et al., 2021).

Figure 9 presents a series of milestones that the IEA considers crucial to reach net-zero by 2050. The rapid increase in electricity demand in the net-zero roadmap and the transition to renewable energy call for an expansion and modernization of electricity networks, which governments need to facilitate and, in many cases, invest themselves. Some of the primary investment priorities highlighted in IEA include (Bouckaert et al., 2021):

- **Long-distance transmission**: Most of the growth in renewables in the NZE comes from centralized sources. Yet the best solar and wind resources are often in remote regions, requiring new transmission connections.
- **Distribution network capacity**: Energy efficiency gains and broader use of solar PV mean surplus electricity. At the same time, electric heat pumps and EV charging points will require electricity to be more widely available.
- **Grid substations**: The massive expansion of solar PV and wind requires new grid substations.
- **EV charging**: Major new public charging networks are built in the NZE, including workplaces, highway service stations, and residential complexes.

- **Digitalization of networks**: With a significant increase in connected devices, the digitalization of grid assets supports more flexible grid operations, better management, and more efficient demand response.

Figure 9. Selected global milestones for policies, infrastructure, and technology deployment in NZE



Source: International Energy Agency (Bouckaert et al., 2021).

Global efforts have driven innovation and the scaling up of decarbonization technologies for the energy sector. This has led to major reductions in the costs of these technologies, which have been crucial to the energy transition and will continue to be instrumental in the decoupling of global economic growth. Examples are the recent reductions in the costs of solar photovoltaic modules and electric vehicles. Less

innovation and cost reduction have taken place for industrial decarbonization technologies. As industry accounted for one-third of global greenhouse gas emissions in 2014, decoupling cannot be reached without decarbonizing industrial activities. Industrial enterprises can reduce CO2 emissions in various ways, with the optimum local mix depending on the availability of biomass, carbon-storage capacity and low-cost zero-carbon electricity and hydrogen, as well as projection changes in production capacity (de Pee et al., 2018).

The greening of economies in the context of sustainable development and poverty eradication will require a country-specific mix of macroeconomic, industrial, sectoral, and labour policies that create an enabling environment for sustainable enterprises to prosper and create decent work opportunities by mobilizing and directing public and private investment towards environmentally sustainable activities (ILO, 2015). The aim should be to generate decent jobs all along the supply chain, in dynamic, high value-added sectors that stimulate the upgrading of jobs and skills and job creation and improved productivity in more labour-intensive industries that offer employment opportunities on a wide scale.

Policy Assessments

Industrial policy

Contemporary industrial policy has been focused mainly on protecting existing industries, rather than encouraging pathways to net zero and interim adaptation. Indeed, modern industrial policy grew out of a desire for protectionism of what were viewed as key local, regional, and national interests, with tools such as state-owned enterprises, tax breaks and direct subsidies. Trade and tariffs are also mechanisms that have been heavily employed, often resulting in market and pricing distortions, and suboptimal economic outcomes overall. It is precisely the whole that needs to be in focus, as competing national and international interests will not save our shared atmosphere. More recently industrial policy has targeted specific high-tech growth industries such as biotechnology and information and communications technology (Nilsson et al., 2021). To the extent that industrial policy does encourage greener practices, it is mainly focused on areas such as energy efficiency and recycling, not adaptation. The enhancement of these practices is noble and necessary, but in themselves they do not come close to what is required to decarbonize the economy, nor to provide adaptive strategies along the way. The industrial sector accounted for nearly half of all energy-related GHG emissions in 2019, with some 9 Gt of direct CO_2 emissions and another 7 Gt of indirect emissions, resulting in roughly one third of all anthropogenic GHG emissions (Nilsson et al., 2021; Rissman et al., 2020). Highly emissions-intensive industries such as steel, cement, aluminium and chemicals account for over 70% of direct industrial emissions (Nilsson et al., 2021), yet there is little in the way of actual policy elaboration seeking to encourage these legacy industries towards climate adaptation. These industries are characterized by large capital investments, immovable physical assets, and long investment cycles. Adding large-scale adaptive measures to these assets now will almost certainly reduce the perceived returns the original investors had bargained for. These traits, combined with a dearth of specific policy measures, present a significant hurdle on the path to both decarbonization and adaptation. Nilsson et al. (2021) argue that an industrial policy for the transforming of these heavy emitters to net zero requires a structured and coordinated approach, one that does not exist today. Such a policy might include a greater focus on directionality, i.e., communicating the net zero objective clearly, and fostering innovation and knowledge. They also suggest a need for policy makers to reshape existing markets to create demand for new innovative processes, building adaptive capacity within governments, a renewed focus on policy coherence and establishing policy for the socioeconomic upheavals inevitable with phasing out existing legacy assets. Reporting and compliance in environmental, social and corporate governance (ESG) standards is also expected to grow, and CFOs across industries are stepping up their efforts to collect and measure ESG data (PwC, 2022).

Fiscal policy

Finance ministries will play an increasingly central role in decarbonizing their economies. Current fiscal frameworks in much of the world originated with different priorities. As discussed, one of the biggest obstacles to eliminating the global reliance on fossil fuels is their relative cheapness, much of which comes from the fact that they are heavily subsidized and the fact that, for the most part, they do not reflect the real price of the long-term environmental damage and health impacts that they cause.

According to the International Monetary Fund, direct subsidies for the fossil fuel industry totalled $472 billion in 2020 (Yale School of the Environment, 2021). When the indirect costs of environmental damage and the effects on human health are factored in, that number balloons to $5.9 trillion. In the fiscal realm, policymakers need to take a hard look at current taxes and subsidies and, where possible, realign them, as these price signals send clear directions to private sector activities. Fiscal policy can catalyse private investment in green technologies and adaptation by ensuring the proper regulatory structures are in place and by creating appropriate incentives through a realignment of taxes and subsidies.

The move toward ETSs is a step in the right direction, but without broad international cooperation, there is the danger of significant carbon leakage. The implicit question then becomes whether fiscal policy should intervene to provide consistency for planning purposes on both national and international levels, for example, in establishing a committed floor for carbon prices. As always, these actions involve many interdependencies and can have unintended consequences, such as fostering greater carbon leakage and the growth of productive capacity in countries with lower regulatory standards for emissions (Rajathurai, 2021).

The Inter-American Development Bank suggests that finance and planning ministries have an essential role in promoting sustainable fiscal policies and that the right fiscal policies toward decarbonization could lead to at least 15 million net new and higher-quality jobs for Latin America and the Caribbean (LAC) alone (Delgado, Eguino, & Pereira, 2021). Finance ministries can also play an important role in ensuring that any new public investment, in infrastructure, for example, is resilient and sustainable from the outset. As discussed previously, investing in adaptation strategies now is cheaper than dealing with the consequences later. This is as true in the public sector as for private entities. Finance ministries are important actors too in defining the rules as they pertain to public procurement, for example, in setting the standards for green government buildings, or indeed for *climate-resilient* public buildings, or for mandating the use of electric vehicles in fleets (Delgado et al., 2021) .

Environmental policy

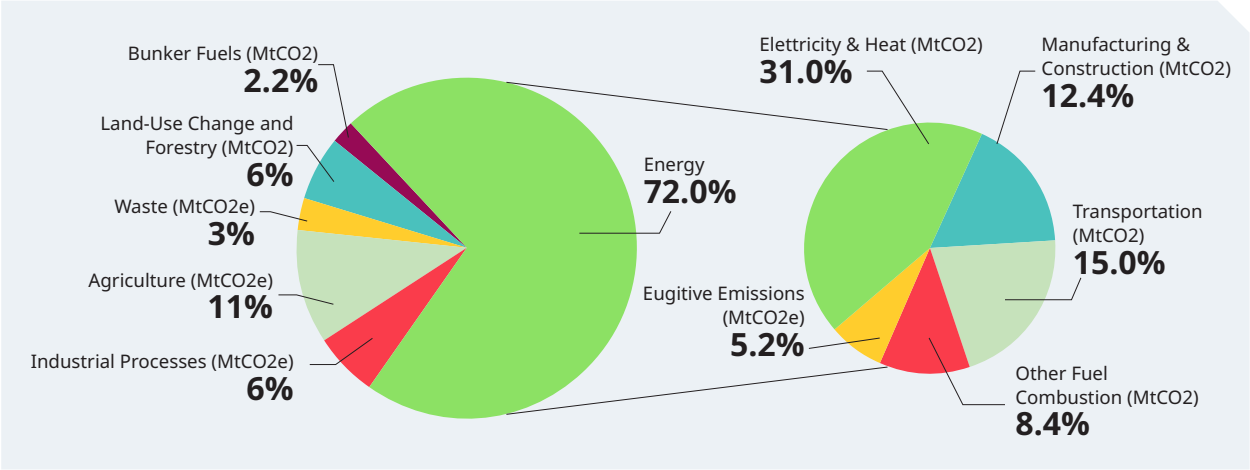
The inter-connectedness of the climate problem has been well established herein. A recent study by Cocklin and Moon (2020) suggests that there has been a significant shift in environmental policy and management towards a broader perspective that requires the direct involvement of communities, individuals, NGOs, and the corporate sector. The authors point to a shift from traditional models of government to one of governance, which recognizes the multitude of government levels and stakeholders involved. This shift is ongoing. An effective environmental governance framework touches on many of the points already identified in this report, including scale, adaptation, early involvement of all stakeholders, knowledge generation across sectors, and monitoring and transparency. The drive towards decarbonization is, for the most part, mitigation centric. It does not necessarily address the need for adaptation, but many synergies exist, for example, when using nature-based solutions or green financial instruments that catalyse investment in resilience.

Cocklin (2009) also highlights three main instruments in support of environmental policy: regulatory structures, market-based economic instruments, and voluntary approaches, which rely heavily on education and information. He also notes that in many western countries, there has been a marked trend towards self-regulation, in which individuals and corporations regulate the public good rather than governments. Examples include industry codes of conduct, environmental certification measures, eco-labelling programmes, and agreements between interest groups and industry (Cocklin, 2009). Governments, for their part, are seeking to encourage this trend, recognizing this as a fundamental shift in the elaboration of environmental policies. EBMOs stand to play an increasingly important role by ensuring that business views and concerns are considered when developing these regulatory mechanisms. They can also do so by helping to develop industry standards, bridging the divide between interest groups and industry, for example, and perhaps most importantly, working to ensure that the issue of adaptation remains central within the larger conversation.

Energy policy

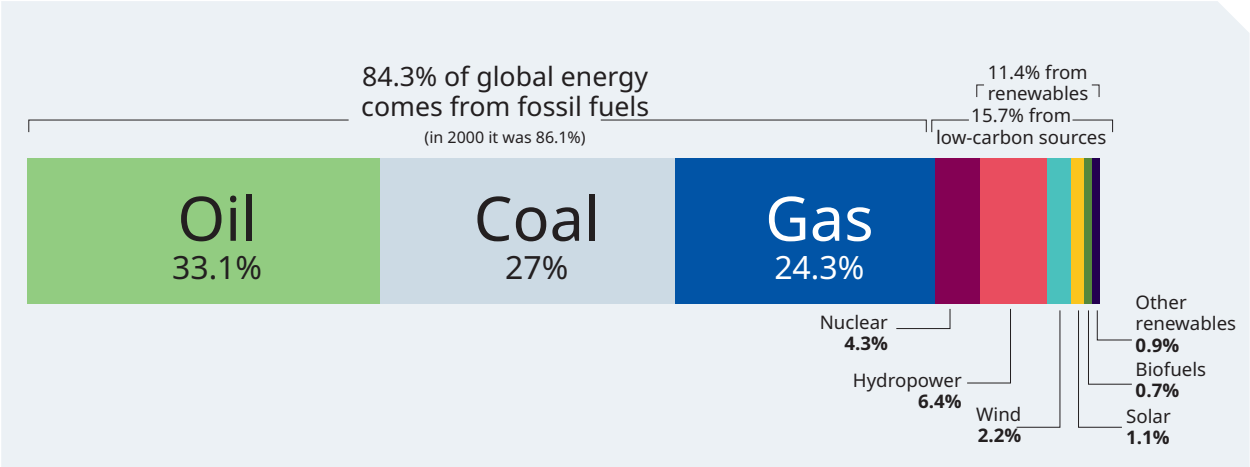
Deep decarbonization requires an integrated policy approach at all levels. This is certainly true for the structural transformation in the energy sector. Figures 10 and 11 below show that energy production of every kind accounts for 72% of all anthropogenic GHG emissions (C2ES, 2021), while fossil fuels today account for some 84% of that total global energy production (Ritchie & Roser, 2020). The figures are slightly better in Europe, with energy accounting for 75% of all emissions and fossil fuels accounting for roughly three-quarters of the total (Zachmann et al., 2021). Duan, Rogelj, Veysey, and Wang (2020) note that the preferred target of 1.5°C is still technically feasible but requires immediate and global action. Projections cited by the authors show a strong inertial effect in the existing energy structure of certain Chinese cities, suggesting it may be difficult for these cities to significantly reduce their CO2 emissions in the short term. This situation is likely to be reflective of other cities and regions.

Figure 10. Global manmade energy emissions by sector 2013



Source: (C2ES, 2021).

Figure 11. Global primary energy consumption by source 2019



Source: (Ritchie & Roser, 2020).

In most cases, current policy structures regarding energy are sorely lacking. For example, the existing subsidies for fossil fuels are hardly conducive to the rapid action required to overcome this inertia. Nevertheless, progress is being made in western nations, with the EU leading the way. The National Academies of Sciences Engineering Medicine (2021) illustrate structural deficiency in the US by pointing out policy changes that should be made, such as setting an official emissions budget to get to net-zero by 2050 and establishing an economy-wide price on carbon. Other energy policy initiatives could include a clean energy standard for electricity generation and zero-emissions vehicle standards. These policies set the backdrop for mitigation efforts in the energy sector. It is against this environment to some extent that adaptation policies must compete.

Zachmann et al. (2021) highlight that the most suitable solutions for some processes in the energy sector are not yet clear. Optimal energy policy is unknowable in its totality, and additional research in this area is required. Nevertheless, there is much that can still be done. Policy can still be enhanced and modified to push the path to decarbonization further, but the same can be said for adaptation. They suggest that there is no foreseeable scenario in which too much renewable electricity generation capacity might be built. Decarbonization in the energy sector will also require, in part, the use of alternative fuels involving technologies still in the developmental phase or which have not been widely commercialized, such as green hydrogen or synthetic methane. Energy policy, as a result, must be entrepreneurial and provide the correct market incentives and public investment in unproven areas.

Enterprise development policy

In its broadest definition, enterprise development refers to the growth and development of SMEs. Policy tools can be targeted towards creating an ecosystem that fosters growth, considering the multitude of stakeholders involved, or it can be focused on the micro-level, for example, towards an individual company through grants, loans, skills training, and other programmes. Chapter 2 identified specific barriers to climate adaptation for SMEs. The very existence of these barriers, whether informational barriers, low productivity, the lack of available funding, the knowledge gap, or others, suggests that existing policy frameworks and structures still have a long way to go in supporting sustainable development. Chapter 2 also provided specific policy recommendations in this area, such as strengthening regulatory frameworks, addressing informational barriers and the knowledge gap, streamlining the multitudes of agencies involved in offering programmes designed to assist SMEs in sustainable growth, and addressing the need for funding.

Effective policy mechanisms are necessarily diverse, and governments may not be the only ones who implement policy in the broader environment. As noted, larger corporations increasingly demand that their suppliers are also aligned with sustainable goals. Might their investors also be made more aware of the unknown and unquantifiable risks of more frequent EWEs and thus encourage them to nudge their boards of directors to undertake the necessary risk assessments, invest in resilience, and make transparency disclosure in this regard? EBMOs could potentially be a driver in this respect. Fortunately, there is an increased awareness about the need for sustainable development across business organisations, big and small alike. Historically speaking, enterprise development was focused almost entirely on growth. Now it is much more about sustainable growth. Policymakers, stakeholders, NGOs, and EBMOs need to ensure that the definition of sustainable includes the word resilient.

Skills development policy

There is a growing demand for skills within the context of the green economy. New skills are going to be needed across a vast array of different sectors and disciplines. The ILO defines "Green Jobs" as decent jobs which "improve efficiency in the use of energy and raw materials, limit greenhouse gas GHG emissions, minimize waste and pollution, protect and restore ecosystems, *and support adaptation to the effects of climate change*"[15] (ILO, 2019c). This section provides an overview as to the state of the policy landscape specifically with respect to skills training in adaptation.

Necessary skills for adaptation include scientific and technical skills related to modelling and interpreting climate change projections to better understand what adaptive measures should be developed. As

15 Italics added by Technical Advisor for emphasis.

referenced in Chapter 2, climate risks are often unknowable in terms of their local impacts, and assessing risk is a critical component to be able to adapt. Insurance enterprises are increasingly aware that historical data is no longer a confident information source for assessment of future risk. This suggests a need for more and better risk management, more insurance professionals and managers, and assessors of future resource availability. Overall, there will be increased demand for skills related to the design and adoption of technologies, products and processes related to building climate resilience. On a more local level additional skills will be needed by operators and installers, for example with installation of resilient technologies in water systems, or retrofitting and improving the capacity of heating, ventilation and air conditioning systems in buildings, factories and homes around the world (HM Government, 2011). Figure 12 presents a summary of skills necessary for the green economy.

The agricultural sector is paradigmatic of the skills development transition. It is projected that demand for new and skilled professionals will increase, which will need to deploy new skill sets in anticipatory adaptation measures. Examples of high-tech innovations that will need to become increasingly common include genetic crop modification to develop heat and drought-resistant varieties, new water management techniques, and better crop insurance schemes. Engineers and geneticists will continue to be in demand. Green careers in proactive climate adaptation will also include those related to seasonal climate forecasting, community-based disaster risk reduction, famine early-warning systems, measurement and monitoring infrastructure, water cycle management, sustainable and resilient building architects, engineers, and constructors, among others. Many of the skills required for climate adaptation will be based upon existing skill sets, but with increased awareness and understanding of the need to include building climate resilience into the process. The construction and the built-environment sectors provide a good example. New skills will be in demand for specialists in insulation, eco-construction, new heating and cooling technologies, and building energy management systems (UNESCO-UNEVOC, 2021).

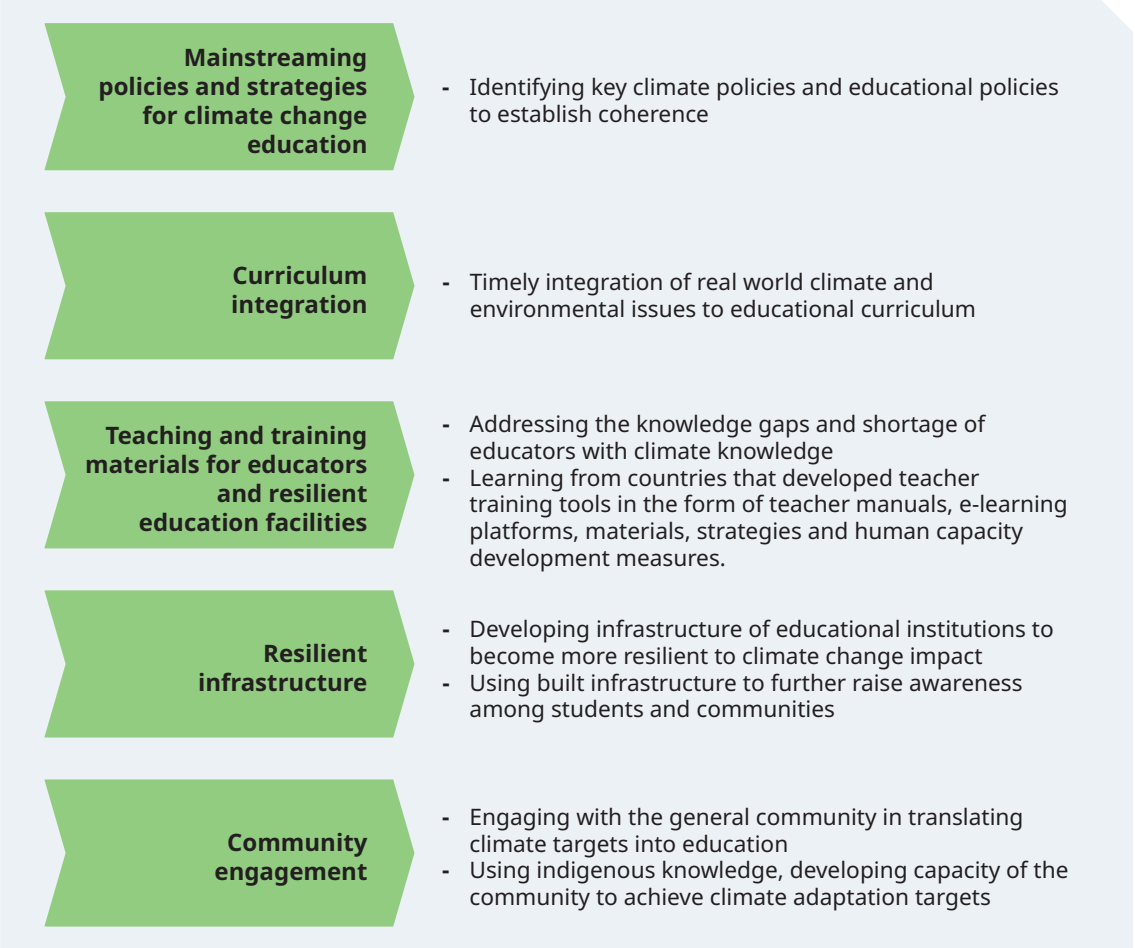
Figure 12. Skills necessary in the transition to a green economy

Required across the labour force	Required in medium to high-skilled occupations
Environmental awareness and protection; willingness and capability to learn about susteinable development	Analytical thinking (including risk and systems analysis) to interpret and understand the need for change and the measures required
Adaptability and transferability skills to enable workers to learn and apply the new technologies and processes required to green their jobs	Coordination, management and business skills that can encompass holistic and interdisciplinary approaches incorporating economic, social and ecological objectives
Teamwork skills reflecting the need for organizations to work collectively on tackling their environmental footprint	Innovation skills to identify opportunities and create new strategies to respond to green challenges
Resilience to see through the changes required	Marketing skills to promote greener products and services
Communication and negotiation skills to promote required change to colleagues and customers	Consulting skills to advise consumers about green solutions and to spread the use of green technologies
Entrepreneurial skills to seize the opportunities of low-carbon technologies and environmental mitigation and adaptation	Networking, IT and language skills to perform in global markets
Occupational safety and health (OSH)	Strategic and leadership skills to enable policy-makers and business executives to set the right incentives and create conditions conducive to cleaner

Source: (ILO, 2019c).

As highlighted in Chapter 2, several barriers in place for skills development transition, for example, awareness, measurement, the lack of skills training, the often confusing and complex web of programmes available, women's underrepresentation in STEM, in the incoherence between skills training policies and environmental policies within governments, and costs borne by the individual in jobs transition. These barriers reflect a lack of policy, or a lack of sufficiently coordinated policy, in these areas. It is clear also that curriculums need to change. UNESCO conducted a review of climate adaptation plans of 57 countries in 2018-2019, focusing on technical and vocational education and training (TVET). They found that very few countries have focused on technical and vocational skills development within their national adaptation plans (NAPs) for climate transition (UNESCO-UNEVOC, 2021). The study found that national climate adaptation goals could be broken down into five distinct components when viewed through the lens of skills development and education. These relate to mainstreaming policies and strategies, updating educational curriculums, providing teaching and training material for teachers, ensuring a resilient educational institutional infrastructure, and engaging with the community. They provide a practical strategic direction for policymakers (Figure 13).

Figure 13. Adaptation actions within the context of skills development and education



Source: (UNESCO-UNEVOC, 2021).

The need for increased coordination amongst policymakers has been identified. As policy makers improve policy elaboration in skills training, they must also have resilience on top of their minds. Once again, EBMOs are especially well-positioned to advocate for and improve awareness in this respect.

3.1.2 Institutions and regulatory frameworks

There are four ways in which existing institutions are currently failing to achieve optimal adaptation goals, namely in their dealing with uncertainty, fragmentation, conflicting time horizons, and the existence of an institutional void. The financial barriers to adaptation have also been discussed at length. Progress is being made in these areas; yet more remains to be done. It is widely understood that LDCs face disproportionate risk from the effects of climate change. However, they are usually the least prepared, informationally, and financially, to undertake forward-looking adaptive measures. Mitigation, it may be said, is global; adaptation tends to occur primarily at the local level and must be tailored to the risks specific to the communities in question.

Born of COP 7 in Marrakesh in 2001, the UNFCCC oversees a National Adaptation Plans (NAPs) programme to support LDCs in climate adaptation designed specifically for each nation's most pressing vulnerabilities. NAPs are designed to be country-driven and based on national circumstances. They recognize that grass-roots communities are the primary stakeholders and rely heavily on local knowledge and participation. During COP 7, an LDC Expert Group (LEG) was established to provide technical support and advice to overcome knowledge and information barriers. A Least Developed Countries Fund (LDCF) was also established as a pipeline for financing adaptation initiatives. As of March 2021, some 126 out of 154 developing nations were formulating and implementing a NAP, and 24 had already completed and submitted their plans (UNFCCC LCD Expert Group, 2012). Preparation and acceptance of a NAP can open the doors to knowledge and funding, with the LDCF and the GCF both active in funding approved adaptation projects. The GCF is mandated to invest 50% of its resources in mitigation and 50% in adaptation. At least half of its adaptation resources must be allocated to the most climate-vulnerable countries, primarily LDCs (GCF, 2020).

While the above provides evidence of tangible progress, there is more to be done by ensuring that institutional and regulatory frameworks manage climate risks and provide the proper incentives for investment in adaptation. Presently, incentives available to individuals are often based on non-climate-related institutional constructs and policies. Governments can coordinate enterprises, the wider public sector, and households (Cimato & Mullan, 2010). Governmental intervention in the form of regulations is often employed in the face of market failures, where pricing distortions can influence an individual's incentive to adapt and where social benefits accrue to society and the public good. Cimato and Mullan (2010) also suggest that governments should embed within their objectives a means to measure adaptation based upon the three principles: effectiveness – the policy should reduce vulnerability to climate change; efficiency – the benefits should outweigh the costs; and social equity – distributional consequences must be considered. Clear performance criteria can define the best adaptation strategies for a given circumstance in a positive loop that can continue to improve upon existing monitoring and evaluation (M&E) techniques. A well-designed system for M&E can reveal how social, economic, institutional, and political factors either foster or inhibit additional adaptation responses (UNFCCC Adaptation Committee, 2014). Good information and measurement can then continue to bolster future adaptation measures by clearly defining the benefits derived therefrom.

Adaptation must be integrated into existing regulatory frameworks across all levels of government to ensure that adaptation is central to their decision-making. This requires a higher degree of coordination between national governments, regional development authorities and local municipalities than generally exists today. The IPCC's Sixth Assessment Report (AR6) states that enabling conditions for adaptation must include "...political commitment and follow-through, institutional frameworks, policies and instruments with clear goals and priorities, enhanced knowledge on impacts and solutions, mobilization of and access to adequate financial resources, monitoring and evaluation and inclusive governance processes" (Climate-KIC, 2022). In addition, some adaptation initiatives are public goods that are unlikely to be provided for by the private market. Governments, in this case, can and should be direct investors in adaptation, irrespective of any support by exogenous climate funds. Failing direct investment, governments can also employ regulatory measures, such as loosening capital requirements on banks when lending in support of adaptation or other climate-based measures, as previously noted.

According to an assessment by Ernst and Young, increasing green innovation is among the three top government priorities for accelerating the green transition (Atalla, Mills, & McQueen, 2021). Governments must start by setting unequivocal long-term decoupling targets, ensuring that these are fully supported

by explicit, near-term targets and policy measures that set out the pathway and recognize each country's unique starting conditions to help each other deploy new infrastructure and technologies. Governments can bring together researchers, scientists, and climate experts to advice on which technologies are ready for deployment or development and potential new technologies to research. Continuous M&E of pilot projects should identify projects that can be scaled up or withdrawn in real-time.

Just as importantly, governments can stimulate more private involvement in R&D by creating an appropriate policy framework and enabling environment that helps lower risk and unlock the full potential of private investment. Increasing empirical evidence supports the contention that environmental policies lead to technological innovation (Veugelers, 2012). For example, creating flexible regulations to reflect the uncertainty of new technologies can speed up green innovation. At the same time, governments can also intervene to create alternative markets, break up monopolies, enhance competition and encourage entrepreneurship. The report by Atalla et al. (2021) highlights that clearer government commitments on infrastructure spending would help increase funding opportunities and provide long-term stability for institutional investors and insurers. Governments can also set a renewable portfolio standard, which mandates producing a certain amount of energy from renewable sources like wind and solar, among others (Behsudi, 2021).

The Eco-Innovation Observatory[16] (EIO) conceptualizes eco-innovation as being economically competitive while respecting the natural environment. Green innovation includes technological and non-technological breakthroughs (Ciocoiu, Colesca, Păcesilă, & Burcea, 2014), new devices, materials, and services as well as new business practices, which create new business opportunities, are environmentally friendly (Carrillo-Hermosilla, Del Río, & Könnölä, 2010), and optimize the use of resources, including energy (Diaconu, 2011; Melece, 2015). Eco-innovation can be an idea for a new start-up or product as well as for making improvements to existing operations. Creating new services and introducing organizational changes is just as important as developing new technologies. At its core, eco-innovation is about creating business models that are both competitive and respect the environment by reducing the resource intensity of products and services (EIO, 2010).

Through years of monitoring business activities, the Eco-Innovation Observatory[17] has analysed both challenges and opportunities enterprises face when reducing their environmental impact. Its analysis highlights potential business gains from incorporating environmental considerations at every stage of the product and operational cycle, from resource extraction to the end of life of the product. Although business leaders increasingly understand the importance of greening their operations, significant challenges still prevent many enterprises from becoming green enterprises. Some of these challenges include the following (ILO, 2016):

1. Often, there is a lack of information and awareness on the enterprise/entrepreneur side. However, early movers in business and industry have invested in developing sustainable products, but consumer preferences have not always matched corporate aspirations. Education and information tools are essential for enhancing consumers' and business/entrepreneurs' Sustainable Consumption and Production (SCP) awareness. The government can also bring about shifts in certain markets as a major consumer of SCP.
2. Business and industry require an enabling environment to help shift markets towards SCP. This includes a rational mix of legislation, regulation, voluntary agreements, economic instruments, integrated product policies, and stakeholder engagement. To shape this enabling environment, governments need to develop strategic and practical plans and engage business and industry in the process of consultation, policy formulation, and implementation.
3. Effective communication channels must be opened to enable business and industry to hold meaningful dialogue with governments and other stakeholders, for example, through industry roundtable discussions to address specific industrial sectors regarding which public policy instruments best promote resource efficiency and the life-cycle economy.
4. Many enterprises experience resource and capacity constraints in incorporating international standards in their business operations and purchasing the new technology needed.

16 Initiative financed by the European Commission's Directorate-General for the Environment (DG ENV).
17 See http://www.eco-innovation.eu/

Acemoglu, Aghion, Bursztyn, and Hemous (2012) take a close look at three policy instruments that are considered a priority – carbon pricing, regulation, and public support for clean R&D. The authors show that it is essential that they are deployed simultaneously and in coordination, as there are substantial complementarities to exploit. On that line, Aghion, Hemous, and Veugelers (2009) used economic models of directed endogenous technological change to identify optimal policy paths to generate green innovation. Their analysis strongly supports the case of a portfolio of instruments, including carbon pricing, R&D subsidies, and regulation. Pollin (2016) proposes a just transition fund to add to the policy mix. An important note, however, is that an overly complex system of regulations, incentives, and taxes makes impact assessment harder and raises the risk of unintended interaction effects or perverse incentives (OECD, 2013).

3.1.3 Innovation and technological diffusion

There is widespread consensus that innovation is crucial in addressing climate change, which is equally true in mitigation and adaptation. The International Chamber of Commerce notes that innovation adds social and economic value to the global economy and drives competitiveness and employment growth (ICC, 2015). Adaptation can be broadly defined as an adjustment in natural or human systems, while innovation can be seen as more of a continuous process, though not always associated with new technologies (Leal Filho, 2016).

Table 6 summarizes new technologies' role in climate change adaptation by sector and impact and includes coastal regions, agriculture, water, EWEs, energy, health, infrastructure, and tourism. In addition to these areas, continued innovation in other disciplines will be necessary. These include innovations in M&E and the design of new sensor technologies, coupled with advanced computing methods for weather forecasting and climate modelling. Insurance providers must continue to innovate to properly assess and manage risk in an environment where historical experience is no longer indicative of likely future outcomes. Financial markets will require innovation to properly account for the benefits of adaptation. New mechanisms to promote technological diffusion, such as strengthening intellectual property rights (IPRs) across borders, will be critical. The EU Strategy on Adaptation to Climate Change of 2015 identifies bridging the knowledge gap and promoting insurance and other financial products to encourage more resilient infrastructure as key priorities (Leal Filho, 2016).

Dechezleprêtre, Fankhauser, Glachant, Stoever, and Touboul (2020) studied high-value cross-border climate change adaptation patents to assess trends in innovation and diffusion of new technologies. They found that technological innovation to adapt to climate change is concentrated within very few countries. China, Germany, Japan, the Republic of Korea, and the U.S. accounted for nearly two-thirds of such high-value patents from 2010 to 2015. The authors found that few adaptation patents were transferred across borders relative to climate mitigation patents and that there was virtually no transfer of patented adaptation knowledge to LDCs. They also found that diffusion was hindered not so much by the lack of technology and adaptation needs but rather by a lack of absorptive capacity in receiving countries.

Table 6. Adaptation options and the role of technology

Sector/Impact	Examples of policies and measures	Examples of the role of technology
Coastal zones	Policies fall under headings of protect, *accommodate* and *retreat*. Protect includes construction of sea defences, etc. Accommodate includes modification of land use so that it is not affected by SLR. Retreat means abandonment of an area for most uses.	Provide effective low cost defences. Improve early warning systems.
Agriculture	Changes in crops and cropping practices. Development of new varieties that are more resilient to higher temperatures and water shortages. Information to farmers about techniques and weather.	Improve information delivery systems. Produce new varieties and new cultivation with technology.
Water	Increase storage availability where needed. Increase supply by irrigation.Increase supply from desalination. Reduce demand through chnages in practices.	All supply side measures entail some technology. Demand side measures could be enhanced with technology.
Extreme events inc. floods	Control of water flow systems. Strengthening of infrastructure to withstand events. Early warning systems. Reclassification of land use and realocation of people.	Control systems for water to mitigate flooding. Early warning systems.
Energy	Redesign hydro systems to take account of changed availability of water and flooding, etc. Resedign other components to allow for extreme events, water availability.	Technology is involved in all of these. Choices between them are influenced by how wide is the range of options.
Health	Reduce risks of water borne diseases through anticipatory methods. Reduce risks of water borne diseases through better water supply and sanitation. Early warning systems for heat related effects. Support systems for those affected by high temperatures.	Technologies to reduce risks of infection.
Infrastructure	Design infrastructure to withstand climatic variations.	Technology is involved in all of these.
Tourism	Design of tourist facilities, taking account of changes in demand and period of demand.	Mainly in ensuring physical structures are sound.

Source: (Christiansen, Olhoff, & Trærup, 2011).

Intellectual property rights (IPRs) are another area of note. Intellectual property protection is essential in allowing enterprises to justify that their investment in R&D is warranted and will lead to real financial returns. This is especially true for SMEs and innovative start-ups, where IPRs are critical in securing early-stage financing. Thus, IPRs can be seen as drivers of innovation, promoting technology partnerships and collaboration. Stable and well-enforced intellectual property protections are prerequisites to technological diffusion on an international scale (ICC, 2015). The International Chamber of Commerce has also identified several policy actions to foster technological innovation in adaptation. These include active measures to attract innovators from other countries while working to stimulate domestic innovation. Fiscal and tax policies can shape behaviour; for example, through tax incentives for R&D. Governments must provide a stable regulatory environment and protect IPRs as a foundation for creating a broad financial infrastructure to support adaptive innovation (ICC, 2015).

The UNFCCC and the international community have taken steps to bridge the knowledge gap and promote policies to encourage innovation and disseminate technological knowledge across LDCs. These include the UNFCCC Technology Mechanism comprised of the Technology Executive Committee

(TEC) and the Climate Technology Centre and Network (CTCN), which can help LDCs identify their own technological needs and address them. As has been noted, the GCF, through its mandate, provides ongoing adaptation financing to LDCs. The World Trade Organization (WTO) has sought to reduce tariffs on various environmental goods. While these are critical first steps, the lack of absorptive capacity in LDCs remains a significant challenge. Governments need more investment in education and advanced research institutions, ongoing technical training, friendly expatriate visa, and tax policies to encourage skilled foreign workers to immigrate and share their expertise.

▶ 3.2 Measures to support MSME adaptation

Micro- small- and medium-sized enterprises (MSMEs) represent over 90% of the business population, 60-70% of employment and 55% of GDP in high income countries, with a potentially larger share in LDCs (WTO, 2016). Estimates from OECD economies suggest that small enterprises contribute between 60-70 percent of total industrial pollution. Given its collective scale it is imperative that this diverse sector develops resiliency to future climate impacts. Included within this group are small and often subsistence farmers who are at particular risk to the exogenous weather shocks of a warming planet. Also highly vulnerable are the multitude of MSMEs operating in the forestry, fisheries, livestock, and tourism sectors critical to the economy of many LDCs. Many MSMEs have made strides adapting to climate change, particularly in agriculture, by experimenting with new crop varieties, irrigation methods, and crop cycles. MSMEs also have an advantage in that their size allows for nimble reactions and fast decision-making, allowing them to seize new opportunities quickly, which is not always the case with larger organizations (Constantinos, Sørensen, Larsen, & Alexopoulou, 2010). If supported by tailored policies to improve their competitiveness, small enterprises can leverage their agility and innovativeness to become major sources of growth and employment in emerging green industries.

Nevertheless, the barriers to adaptation for MSMEs have been well-defined within this report, and whether they be informational, financial, institutional, or even socio-cultural, they represent severe impediments towards building resiliency. While there are a growing number of successful initiatives and case studies in assisting MSMEs' adaptation efforts, there exists considerable scope for additional adaptive engagement with MSMEs.

The UNDP has been active in this respect, utilizing funding by the GCF and the Global Environment Facility (GEF) to increase the resilience of key agricultural value chains, and promoting access to markets and gender equality in doing so. The GEF was the first global source of funds for climate adaptation specifically, and it channels support for adaptation through the Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF). Its current funding cycle prioritizes three main objectives. The first is to reduce vulnerability and increase resilience through innovation and technology transfer for climate change adaptation, involving technological, social, and institutional innovations. Secondly the GEF aims to mainstream climate adaptation to involve entire systems in environmental and sustainable development, from climate-resistant smallholder food systems to integrated city-wide development and clean energy systems. Finally, the GEF seeks to create the conditions necessary to foster adaptation, for example, by supporting LDCs in the development of their NAPs (GEF, 2021). The UNDP has also developed its Climate Information for Resilient Development in Africa (CIRDA) mechanism to specifically tackle the information barrier by providing access to climate information, along with early warning systems and seasonal forecasts. Additionally, the UNDP also provides technical support and assistance in the elaboration of individual NAPs. The Inter-American Development Bank in partnership with The Lightsmith Group and supported by the GEF seeks to build an adaptation ecosystem via its Adaptation SME Accelerator Project (ASAP), which is designed to identify and support the development and deployment of adaptation technologies and measures amongst SMEs in LAC and around the world (The Lightsmith Group, 2017).

However, given the global economic impact of MSMEs and the complex diversities involved, there remains much more to be done. The annual costs of adaptation are estimated to reach $300 billion by

2030 and possibly as high as $500 billion by 2050, yet current funding is less than one quarter of the 2030 amount (UNCTAD, 2021). While the public sector needs to further step up, it is also vitally important to involve the private sector, and particularly MSMEs in the push towards more resilient local economies. Dougherty-Choux, Terpstra, Kammila, and Kurukulasuriya (2015) identify six public sector interventions designed to catalyse private sector investment by MSEs in climate adaptation. These are business-relevant climate information and risk analysis, technical assistance and training, government policies that enable investment in adaptation, market and business development, partnerships and cooperatives, and financial instruments (Tables 7 and 8). MSMEs typically have few resources to invest in an understanding of climate risks, but the public sector along with international organizations, NGOs, and EBMOs can facilitate the generation of business-specific climate information and assist in its dissemination, through for example early warning systems. Technical assistance and training can serve to build absorptive capacity for new adaptation technologies, and to provide the business and management skills necessary to be able to identify and indeed to commercialize new adaptation approaches.

Table 7. Interventions addressing barriers to MSE investment in adaption

	INTERVENTIONS				
	Business-relevant climate information and risk analysis	**Technical assitance and training**	**Government policies**		
			Laws and policies	**Public utility pricing**	**Subsidies and tax relief**
Lack of climate knowledge and risk assessment	✓	✓	✓	✓	✓
Weak evaluation and selection of cost-effective adaptation measures	✓	✓			
Limited technical capacity to implement adaptation measures		✓			
Limited financial capacity to implement adaptation measures					✓
Policy and regulation that hinder adaptation	✓		✓		
Social dimensions that hinder adaptation	✓	✓	✓	✓	

Source: (Dougherty-Choux et al., 2015).

Table 8. Interventions addressing barriers to MSE investment in adaption (cont´d)

	INTERVENTIONS					
	Market and business development		**Partnership and cooperatives**		**Financial instruments**	
	Demand driven products and services	**Public spending on infra-structure**	**Business partner-ships and cooperative**	**Public-private partner-ships**	**Risk transfer instruments**	**Risk compen-sating instru-ments**
Lack of climate knowledge and risk assessment			✓			
Weak evaluation and selection of cost-effective adaptation measures	✓	✓	✓			
Limited technical capacity to implement adaptation measures			✓	✓		
Limited financial capacity to implement adaptation measures	✓	✓	✓	✓	✓	✓
Policy and regulation that hinder adaptation	✓	✓		✓	✓	✓
Social dimensions that hinder adaptation	✓					

Source: (Dougherty-Choux et al., 2015).

Countries can have different levels of policy development in terms of support of greening SMEs. In the Environmental Policies and SMEs chapter of the OECD/ERIA 2018 SME Policy Index for the ASEAN region, a series of policy recommendations are proposed according to the level of development (Table 9).

Perhaps the largest obstacle for SMEs to pursue green innovation or to adopt green solutions such as energy efficiency investments, are the high upfront investments for acquiring capital equipment or developing new technologies. Being young and capital-light, small enterprises generally lack credit history and assets that can serve as collateral, which leads to limited and costly access to external financing. Some even face challenges to reach a minimum efficient scale and economic viability, making even harder to get access to financing. The combined effect of these constraints is that, without sufficient financial incentives and technical support, small enterprises would not be able to invest in green technologies. It is also not a realistic option for many SMEs to get a loan from a formal financial institution such as a commercial bank (Lashitew, 2021). The IFC estimates that SMEs in emerging countries suffer from a financing shortfall exceeding $2 trillion, with up to 70% of formal SMEs going unserved or underserved by the formal financial sector.

Table 9. Policy recommendations to boost the greening of SMEs

LEVEL OF POLICY	CHALLENGES	POLICY RECOMMENDATIONS
Early stage *Cambodia, Myanmar, Brunei, Darussalam and Lao PDR*	Disconnect between the agencies supporting SMEs and those supporting greener practices	- **Develop national policies that specifically support the greening of SMEs**, as opposed to industry broadly, and that have clear action plans and timelines.
	Lack of awarness about the advantages of greening and mechanisms available	- **Establish one-window agencies** that support SMEs in becoming greener with advice and signposting to available resources.
Mid stage *Indonesia, Philippines, Viet-Nam and Thailand*	Lack of awarness about the advantages of greening and mechanisms available	- **Develop communication strategies and information tools** to reach out to SMEs and help them understand the business case for adopting more energy and resource-efficient practices
	Monitoring mechanisms are generally already developed, but further evaluation mechanisms are still lacking	- **Strengthen monitoring and evaluation of the implementation of incentives** and support schemes targeting SMEs in order to track their effectiveness and improve them.
Advanced stage *Malaysia and Singapore*	SMEs might be disadvantaged compared to larger companies in having access to available incentives	- **Establish environmental regulatory regimes that differentiate between SMEs and larger enterprises**, and that take account of the risk level of the activity being pursued, with regulatory incentives for going beyond compliance and with assistance for SMEs to accomplish this.
	Potentially disconnect between the programmes supporting SMEs and those supporting greener practices	- **Mainstream strategies to support SME greening** within the overall approach to supporting SMEs, including technical assitance, access to finance, regulatory incentives and market access.

Source: (OECD/ERIA, 2018).

Unless climate policy effectively circumvents these disadvantages, there is a risk that small enterprises will be left behind in climate transition, which could eventually expose them to greater climate risk and loss of competitiveness. The process could hollow out local economies, increase the market power of large enterprises, and worsen income inequalities across individuals and communities (Lashitew, 2021).

Klapper and Beinker (2017) present some policy considerations to specifically address the financing gap that SMEs face in the green transition. Governments can establish minimum sustainability guidelines in procurement at the national level. By using their substantial purchasing power, governments could encourage suppliers to comply with labour and environmental standards. International development finance institutions can use a range of financial products, in association with technical assistance to help SME lenders implement standards assessments and implement environmental and social management systems. Governments, financial institutions, and enterprises can work together to support financing models that encourage SMEs to upgrade their production processes to comply with sustainability standards in value chains. For example, some major global buyers have started offering better supply chain financing terms to their suppliers in exchange for meeting higher environmental, labour, health, and safety standards.

Governments are developing green funds to provide priority funding to projects related to the green transition. An existing example of a good proposal to address the financing gap for SMEs is the US' Small Business Green Recovery Fund, proposed as part of the Build Back Better plan. The idea behind such a project is to address the diverse financial needs of small enterprises by offering financial support in the form of green grants, green loans, and green bonds. The green grants scheme aims to bolster the ability of the Small Business Administration to support green innovations and investments to small enterprises that face limited and costly access to financial markets.

Government policies can be enabling for adaptation, with both incentives and compliance measures geared towards climate resilience and sustainable development. NAPs are an excellent example of integrated planning. According to the UNFCCC LCD Expert Group (2012), the successful implementation of NAPs would "facilitate the integration of climate change adaptation, coherently, into relevant new and existing policies, programmes, and activities, in particular development planning processes and strategies within all relevant sectors and at different levels." National standards set by governments can combine with incentive programmes to create a meaningful impact at the local level. Governments must exercise proper judgement in public utility pricing. In many countries water and energy systems are heavily subsidized which creates improper and distorted pricing signals which can discourage investment in adaptation. If the real costs were priced in, MSMEs would be more likely to build adaptive capacity, particularly if this is accompanied by a comprehensive strategy to foster MSME development. Existing fossil fuel subsidies would be better employed in new adaptation technologies.

Enterprises need market demand to flourish. Governments can fund research and development, and they can help to build market demand and awareness of new resilient technologies, for example by undertaking pilot or demonstration projects to increase awareness and demonstrate a business value proposition. The public sector can also help to create linkages across different markets and the value chain. Governments can also promote collaborations and partnerships as a cost-effective means for MSMEs to pool their limited resources. Agricultural cooperatives for example can help MSMEs access financial resources, disaster relief, technical knowledge, and access to markets. Governments also have a critical role to play in overcoming the financial barriers many MSMEs are faced with when contemplating investments in climate adaptation. Risk transfer instruments such as government-backed loans and insurance products can shift risk away from MSMEs to the public sector. Risk compensation instruments on the other hand serve to increase expected returns for MSMEs for example through, direct investment, grants, or seed capital. The public sector can also highlight awareness on the part of financial and international institutions to encourage additional private investment in components of NAPs in LDCs.

Finally, governments of developing countries need to ensure active engagement with all stakeholders involved. Dougherty-Choux et al. (2015) also point to the fact that NAPs thus far have been primarily focused on the public sector's adaptation measures at the expense of the private sector. Linking the public and private sectors, and all relevant stakeholders and actors should be a priority in overcoming the barriers to adaptation at the MSME level. NGOs and EBMOs, in conjunction with local governments and development partners, are well-positioned to assist in bridging the knowledge and financial impediments to effective wide-scale climate adaptation.

▶ 3.3 The role of government as an investor of first resort

Private capital markets are oriented towards quantifiable returns on investment. The investment in radical transformative research provides little to no mechanism for evaluating returns. An investment in new technology might yield generational economic growth and massive financial returns, or it may yield nothing at all. The private sector will often not invest in higher risk areas until future returns become more knowable. According to Bill Gates "A key element to get an energy breakthrough is more basic research. And that requires the government to take the lead. Only when that research is pointing towards a product can we expect the private sector to kick in." This is true of many of the technologies we take for granted today: the internet, life-saving medicines, the GPS, and even the power of today's computers were all incubated and supported by government funding in initial research and development (Gates, 2021). In the journal Nature Sustainability, Mazzucato (2022) suggests that governments are the only actors capable of undertaking the scale of investments required in the transition to a green economy, while ensuring a socially just transition. Instead of trying to fix market failures, mission-critical thinking is the only way to achieve the UNFCCC SDGs outlined in the Paris Agreement. Rather than reacting to market failures, governments must work to actively shape new markets in the first place.

3.3.1 A green industrial policy

Countries, regions, or enterprises have a comparative advantage over others in producing a particular good if they can make that good at a lower relative opportunity cost. The traditional view of comparative advantage highlights that if an economic unit has a comparative advantage for a good or service, it should specialize in it and trade. Under a more complex view, comparative advantage is a dynamic attribute, and countries can invest today in their assets, technology, and skills of their labour force, to develop a comparative advantage in goods or services considered strategic. In the dynamic comparative advantage framework, developing economies may face a trade-off between specializing according to existing comparative advantage (in low-technology goods) and entering sectors in which they currently lack a comparative advantage, but may acquire such an advantage in the future by raising productivity (in high-technology goods). Comparative advantage is endogenously determined by past technological change while simultaneously shaping current rates of innovation. Specialization according to current comparative advantage under free trade may be welfare reducing (Redding, 1999); selective intervention may improve welfare; both for the economy undertake it and its trade partner.

A green industrial policy is an example of countries investing in developing a future comparative advantage in goods and services that are considered strategic (e.g., energy-efficient appliances, electric vehicles, inputs for the renewables sector, etc.). In this case, their relevance for the net-zero economy that we envision makes them strategic. Green industrial policies include investments, incentives, regulations, and policy supports designed to stimulate and facilitate the development of environmental technologies (Allan, Lewis, & Oatley, 2021). The distinctive feature of green industrial policies vis-à-vis other environmental actions is the policies' intent or goal rather than the instrument used. The intent to restructure and transform the economy into a green economy distinguishes green industrial policy.

One significant policy intervention that can facilitate the creation of a vibrant domestic market for clean energy will be for governments to become both large-scale investors in energy efficiency and purchasers of clean, renewable energy. A comparable historical experience was the development of the Internet within the U.S. military, beginning in the 1940s. In bringing the Internet to a commercial scale, the U.S. military provided a guaranteed market for 35 years, while private investors gradually developed effective commercialization strategies.

China's green industrial policy has resulted in manufacturing expansion and R&D that drove down the costs and increased the deployment of clean energy technologies (Helveston & Nahm, 2019; Lewis, 2012). By empowering new enterprises and redistributing regional power in China, the creation of new industries has altered the dynamics of China's energy policies (Lewis, 2012; Nahm, 2021). This is a crucial insight of the literature in the political economy of technological change: green industrial policy can break carbon lock-in by broadening the coalition for change (Allan et al., 2021).

Pianta and Lucchese (2020) highlight that integrating the green industrial policy into overall macroeconomic policy is key to its success. A joint approach to environmental and industrial policy has close connections with fiscal, monetary, competition, trade, technology, and labour and wage policies that have to be considered.

3.3.2 Building green cities

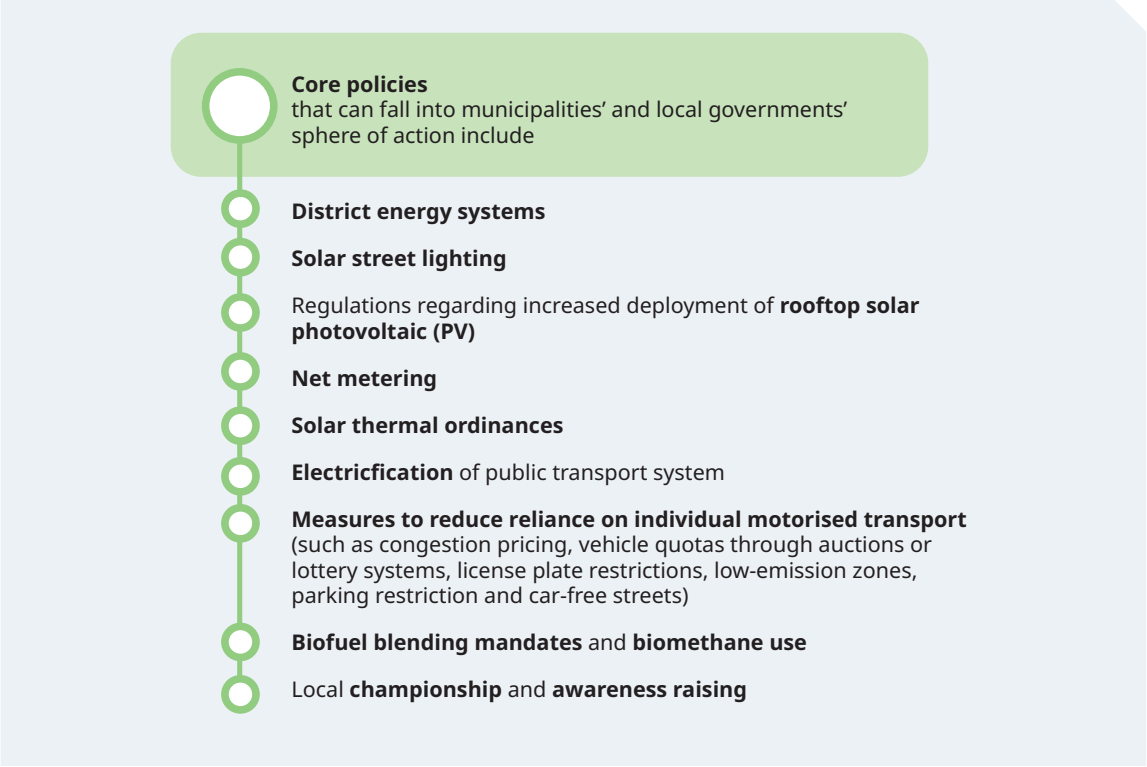
Central government action alone cannot ensure a green transition – cities, regions and communities can also be catalysts for environmental solutions. Furthermore, local and regional governments play a vital role in implementation of national and global green policies. Local governments, for example, will be heavily involved in housing retrofits and creating EV infrastructure. Cities are home to over half of the world's population and use two-thirds of the global energy demand and characterize many of today's environmental challenges. Urban policies (e.g. densification or congestion charges) can complement global climate policies (e.g. linked-up cap-and-trade systems) to reduce energy demand and greenhouse gas emissions, and lower the overall cost of emissions abatement. They can also deliver pilot projects before scaling up nationally. However, global research from the Climate Group shows only 21% of 121 states and regions surveyed had been consulted on national climate action plans. The conditions must be developed for local governments to engage policy design from the outset and given the necessary powers and resources to deliver green initiatives.

Lifestyles and sprawl, not urbanization, are at the heart of the problem. Urban sprawl has increased greatly worldwide. The OECD has estimated that emissions could be reduced by almost 1% by 2050 from densification alone. Research shows that dense cities have a range of benefits, including: higher productivity, more innovation, shorter commutes, better access to private services (such as restaurants), cheaper provision of public services, the preservation of green space and a lower carbon footprint (Ahlfeldt & Pietrostefani, 2019). With predictions from the OECD that almost 70 per cent of the world's population will be living in urban areas by 2050, local governments should pursue policies which encourage the building of dense cities.

There are several dimensions of the role cities play in shaping adaptation and mitigation and, as such, in accelerating the deployment of renewable energy solutions. The report of the International Renewable Energy Agency on the topic, *Renewable Energy Policies for Cities*, synthesizes some of the core policies that can fall into the sphere of action of local government (IRENA, 2021). Besides transforming the energy mix of a city, these policies can have the potential of transforming the urban landscape and the quality of life of the city's inhabitants. Car-free streets, electrification of the public transport system and solar street lighting are examples of policies mentioned in the IRENA report that have a strong connection with a city's walkability, air quality, and liveability. A list of such policies is presented in Figure 14. Some cities are also actively promoting the concept of green roofs, which can have both mitigative and adaptive impacts. Green roofs can significantly reduce heat islands in cities. The US EPA (2021) highlights some of the other advantages in actively promoting the greening of rooftops:

- **Reduced air pollution and greenhouse gas emissions:** By lowering air-conditioning demand, green roofs can decrease the associated air pollution and greenhouse gas (GHG) emissions from conventional power sources. Vegetation can also remove pollutants and GHGs from the air through dry deposition and carbon sequestration and storage, respectively.
- **Reduced energy use:** Green roofs remove heat from the air through the process of evapotranspiration, and also act as insulators for buildings, reducing the energy needed to provide cooling and heating.
- **Improved human health and comfort:** Green roofs, by reducing heat transfer through the building roof, can improve indoor comfort, and lower the incidence of heat stress associated with heat waves.
- **Improved quality of life:** Green roofs provide aesthetic value and habitat for plant and animal species. They improve human interaction with nature by introducing green space into the built environment. Such connections to nature have been shown to benefit human physical and mental health, productivity, and reduce blood pressure and hospital stays.
- **Enhanced stormwater management and water quality:** Green roofs can reduce and slow stormwater runoff in the urban environment, and also filter pollutants from rainfall. Green roofs can retain nearly all storm-related precipitation during the summer months, with lower retention during the winter months (< 20%). The actual stormwater management potential of green roofs is dependent on the season and rainfall patterns.

Figure 14. Roles of local governments in the energy transition



Source: (IRENA, 2021).

The role of cities in decarbonization differs drastically between countries that already have a large share of power generation sourced from renewables and countries where renewables contribute to a minority of national electricity supply. The IRENA report from 2021 looks at an example of the former, Costa Rica and an example of the latter, China.

In Costa Rica, key questions include the role to be played by the public and private sectors and the degree to which electricity generation should be based on centralized and decentralized sources. The country had set the goal of 16 municipalities measuring their GHG emissions by 2022. By 2019, 22 municipalities had joined the program, representing 43% of the population. The country, and its cities, are also finding themselves in a transition from short-run programmes[18] to long-run urban planning, aimed at a more structured and ambitious route of urban development that will allow the country to reach its net-zero by 2050 target. According to IRENA, the country needs to strengthen its municipal decision-making. However, municipalities still face significant obstacles that need to be addressed, including conflicts of interest, insufficient funding, and lack of technical expertise.

Because Costa Rica has already effectively decarbonized its power generation, tackling its oil dependence is essential – a challenge mostly centred on the transport nexus. Some actions included in the National Decarbonization Plan that directly tackle transport and sustainable mobility include integration and full decarbonization of the collective mobility sector, some of it by 2035. Other goals reflect the areas of improvement that Costa Rica has in terms of government capacity: for the freight sector, the goal is to have public data on emissions of the cargo truck fleet and strengthen logistics to improve transport efficiency. Electrification of the transport sector will inject a new dynamic into the power sector. The report highlights that municipalities could play a more active role in stimulating e-mobility choices beyond granting permits. The Cartago municipality in Costa Rica has a) deployed free EV charging stations in collaboration with private sector enterprises, b) planned to transition to an EV fleet, and c) acquired electric bikes.

18 Since 1968, the country has an urban development law in place mandating municipalities to design and execute "regulatory plans", yet most of them are in breach of the law.

A second case study analysed by IRENA is China, the largest producer and consumer of coal and the largest emitter of carbon dioxide, with the share of renewable energy in the primary energy mix still at around 12%. China's five-year plans (FYPs) constitute the government's fundamental policy instrument for target setting and strategy development and implementation. The latest instalment of China's FYP expects emissions to peak by 2030 and aims to reach carbon neutrality by 2060 (IEA, 2020). However, the implementation of national policies leaves considerable space for local actions and complementing policies. Cities need to be more ambitious than national targets in their mandate to foster sustainable urban growth and address local environmental and social challenges, including air pollution and poverty, and reap benefits such as local revenue and employment generation. Potential strategies include providing additional subsidies and other financial support and adopting renewables-friendly land-use and zoning policies. Such measures depend on local development strategies, renewable resources, financial revenues, and support from national or provincial governments. For instance, Zhangjiakou City, with support from the federal government and abundant wind capacity installation**,** announced China's first 100% renewable energy city target.

As highlighted by these case studies, the development of green cities can and should be linked to overall economic growth, job creation, and addressing social disparities. The OECD's city -level case studies provide urban leaders with new insights on how environmental policies can contribute to different types of sustainable growth (OECD, 2013):

- **Job creation:** the right urban sustainability policies can include retrofitting the existing building stock for improved energy efficiency. For example, the Chicago Tri-State metro region has built a regional specialty in green building design and retrofitting. In 2010 it gave 45,000 people green jobs, 36% of which were in the green building sector.
- **Attracting enterprises and workers:** efficient transport systems, and particularly, good public transport networks, help cities attract investors. The private sector in the Paris/Ile-de-France region has long recognized this, and enterprises that benefit from proximity to the transportation system contribute to its financing.
- **Innovation and entrepreneurship:** cities can foster the growth of the green technology sector by creating green regional clusters that build on existing industries, services, research, and innovation. Kitakyushu has built an impressive recycling cluster, the Eco-Town, which recycles hundreds of tons of industrial waste every day while producing energy for residential and commercial neighbourhoods.
- **Increasing the value of urban land:** redevelopment, infill, and eco-districts can enhance land values while increasing density and reducing residents' environmental impact. Following the success of its Hammarby Sjöstad eco-district, Stockholm is now working with the private sector to develop the Stockholm Royal Seaport eco-district. Buildings there will use less than the energy of others in Stockholm and the new district will have an advanced smart grid and district heating.

Local governments can engage in more ambitious climate targets than their national counterparts. Of the 121 states and regions disclosing their climate and environmental data in 2020 (Quintana, Gorman, Arpon, & Jacques, 2020):

- 18 states and regions, with combined economies of $7.2 trillion and total emissions equivalent to those of Brazil, have set net-zero targets.
- 55% of states and regions with a 2030 emissions reduction target are showing greater ambition than their national counterparts.

Greening cities present an opportunity to address issues of social equality, including gender equality. The transport sector provides a good example. At present, there are significant differences between how men and women use transport services. The average distances travelled also differ, as do the number of trips and the time of day. In many countries, women have less access to private cars than men and represent most public transport users (ITF, 2019). Women sometimes have to take longer trips to ensure safety, especially at night, adding monthly costs that can amount to $25-$50 (Kaufman, Polack, & Campbell, 2018). With these differences in mind, plans to get more women engaged in the transport sector need to be designed. Positive examples include the City of Guadalajara in Mexico, which employed the results from a comprehensive survey on the transport patterns of women and girls over a large corridor and incorporated its findings into their policy planning. Effective policies across the energy and

transport sector require a much greater push to support the collection of disaggregated gender data, which is still relatively rare. Many governments have also incorporated gender-related approaches in their government programmes or public procurement processes. These include demanding a minimum share of women in manufacturing or installation processes or incorporating a gender assessment when evaluating bids.

This section has shown the pivotal role that the public sector plays in creating the conditions for green investment to address the climate challenge. The correction of market failures and externalities that harm the environment—traditionally left to instruments such as taxes, subsidies, and sectoral regulation—has now reached other domains, given the sheer magnitude of the problems at stake. The need to mobilize a considerable amount of funds has led public authorities to extend the scope of climate action towards the financial sector to ensure that sufficient private funds are channelled into sustainable activities. In the following section, we discuss the deployment of green finance and what the government can do to support the mobilization of resources towards green projects.

3.3.3 Research and Development (R&D) support

Supporting research and development will address the knowledge externality associated with green innovation. Public R&D support is especially crucial for clean technologies in the early stages of development, as it will help to neutralize the base advantage of the older and dirtier installed technologies.

Government R&D subsidies can guide the directions of green R&D and account for the fact that green R&D has positive externalities. The majority of existing studies report positive effects of public R&D spending on innovation performance (Bai, Song, Jiao, & Yang, 2019). Government R&D subsidies can also compensate for the funds' shortage for green innovation and reduce the risks when enterprises urgently demand green innovation to comply with environmental regulations. In addition, the competition mechanism of government R&D subsidies distributed to energy-intensive enterprises can trigger green innovation among enterprises and stimulate them to create more green technologies (Květoň & Horák, 2018; Raz & Ovchinnikov, 2015). Recently, (Bi, Huang, & Wang, 2016) found that Government R&D subsidies significantly increase the green innovation tendency and performance of energy-intensive enterprises in China. The impact is stronger in state-owned enterprises and small and medium enterprises.

3.3.4 Just transition funds

Even though the net result of transitioning to a sustainable global economy is economically beneficial, policymakers would do a great disservice to the cause by denying that some enterprises will lose, and some sectors for which it will be harder to adapt. For example, even though the energy efficiency programmes expansion of renewables will generate large scale increases in job opportunities, during the transition period, countries will have to implement policies to support workers, enterprises, and communities now depending on the fossil fuel industry (Pollin, 2016). For this reason, the European Green Deal included the establishment of a Just Transition Fund. The European Just Transition Mechanism is set to receive €7.5 billion of fresh funds from Member States, to leverage about €100 billion of public and private funds over the period 2021 to 2027 (European Commission, 2020). In the US, a Just Transition Fund was put in place as a philanthropic effort to support communities and workers hardest hit by the transition away from coal, however, there is no publicly led or publicly funded initiative to address this issue.

▶ 3.4 Financial solutions for a sustainable and resilient future

Public policies and investments are not enough to fulfil the rapid global change required to mitigate climate change and reduce our economic systems' vulnerability to it. The participation of the private sector is more necessary than ever, but the scaling up of the involvement of enterprises requires a reconfiguration of the global financial system. For instance, while the total amount of financing that the European Green Deal envisages could reach €1 trillion over the next decade, this just represents a third of the European "green investment gap" to reach climate targets for the period up to 2030, as estimated by the European Commission (Claeys, Tagliapietra, & Zachmann, 2019).

Enterprises are typically reluctant to finance activities where risks are high, and technologies and processes have yet to be developed. There is a pivotal role of government to foster the allocation of resources in riskier—and socially desirable—green investments. Generally, financial institutions show more interest in fossil fuel projects than in green projects, mainly due to risks associated with these new technologies and their relatively lower rate of return. To achieve the Sustainable Development Goals, governments need to open a new file for green projects and scale up the financing of investments that provide environmental benefits through new financial instruments, such as green bonds, green banks, carbon market instruments, fiscal policy, green central banking, fintech, community-based green funds, among others. These instruments are known as "green finance" (Sachs, Woo, Yoshino, & Taghizadeh-Hesary, 2019).

Many national and regional governments have established publicly capitalized, commercially oriented green investment banks (GIBs) with this objective in mind. A GIB is a public entity established specifically to facilitate private investment into domestic low-carbon, climate-resilient (LCR) infrastructure. Using innovative transaction structures, risk-reduction and transaction-enabling techniques, and local and market expertise, GIBs are channelling private investment into low-carbon projects (OECD, 2015). The banks tap into new domestic capital sources (e.g., pension funds) and international capital (e.g., from development banks). Green banks have an impressive track record in catalysing new low-carbon markets and drawing private investment, having invested $24.5 billion of their capital since their respective inceptions (Atalla et al., 2021). Green banks can be viewed as an investor of first resort and may be structured through their mandates to accept additional levels of risk in funding climate-friendly initiatives. The European Investment Bank (EIB) is one such institution, and is progressively migrating to what may be described as a true climate-oriented bank (Vernoit, Dunlop, Hawkins, & Orozco, 2020).

State investment banks (SIBs) can also play an important role. Germany's state-owned development bank, KfW offers loans to the steel industry conditional upon reducing carbon footprints; the French and Dutch governments instituted similar conditionalities on recent COVID-related bailouts of their nationally flagged airlines. One nascent approach is that of exploring the concept of climate banks, lending institutions specifically focused on climate mitigation and adaptation projects.

Governments must also create the conditions for private enterprises to raise long-term funds in areas where financial organizations are not yet willing to make sufficient investments. Solutions- include structured finance tailored to specific sectors and mechanisms and policies that mitigate risks or allocate them appropriately to different parties. For instance, in the renewable energy field, feed-in tariffs and contracts for difference have helped drive growth in wind power and solar programmes:

- **A feed-in tariff (FIT)** program typically guarantees that customers who own a FIT-eligible renewable electricity generation facility, such as a roof-top solar photovoltaic system, will receive a set price from their utility for all of the electricity they generate and provide to the grid (EIA, 2013). Azhgaliyeva, Kapsalyamova, and Low (2019) found positive effects of feeding tariffs on private investment. Although feed-in tariffs are attractive for private investment in renewable energy, the cost of this policy is hard to predict for the government. Feed-in tariffs are paid per electricity generated. However, renewable energy sources produce intermittent (variable) energy, which is hard to predict, and thus it is hard to predict feed-in tariff payments. Also, feed-in tariffs could not necessarily pay for renewable energy

generation. When the share of renewable energy is high, renewable energy could be wasted if not consumed or stored.

- **Contracts for difference** incentivize investment in renewable energy by reducing price volatility, making future revenue streams more stable and predictable.
- **Low-interest rate** financing reduce risks for investors, buying time to scale up technologies and programmes, and achieve longer-term financial sustainability.

Climate finance taxonomies (CFT) and other classifications will also help align investments with climate goals. A CFT is a classification system, establishing a list of environmentally sustainable economic activities. It is a tool for issuers, investors, governments, and municipalities to help them understand what the key investments are that will deliver a low carbon economy. No single taxonomy can meet every need, but government policymakers, regulators, and market participants should agree on global guiding principles to be used across regions. Climate finance taxonomies are also crucial to scaling up green financial instruments. There is need for greater cohesion in the existing standards which vary regionally and across sectors.

3.4.1 Green financial instruments

Developing innovative financing instruments can change incentives and promote innovation and thus address the market, policy, and institutional failures that lead to the overuse of natural assets. Governments need to design strategies for developing green finance. They include improving rules and regulations of green finance to promote green growth, establishing green financial institutions, designing a code of conduct in green finance, developing new green financial products, integrating a global cooperative system, and setting up infrastructure (Noh, 2019). While there is a myriad of green financial instruments, three categories that have gained traction (and scrutiny) in recent years are green bonds, loans, and funds, which are discussed in this section.

Green bonds are fixed-income securities that fund exclusively green projects with environmental or climate-related benefits. Green bonds have experienced a massive expansion in the past decade. According to the Green Bond Initiative's latest report, total volumes for the sustainable debt market – including labelled Green, Social and Sustainability (GSS) bonds, Sustainability-linked bonds (SLB) and Transition bonds – are well on their way to an annual $1 trillion, reaching $779.2 billion in the first three quarters of 2021. This amount represents 54.8% year on-year growth from the equivalent period in 2020 (CBI, 2021), although the market size is still minimal compared with that of conventional bonds.

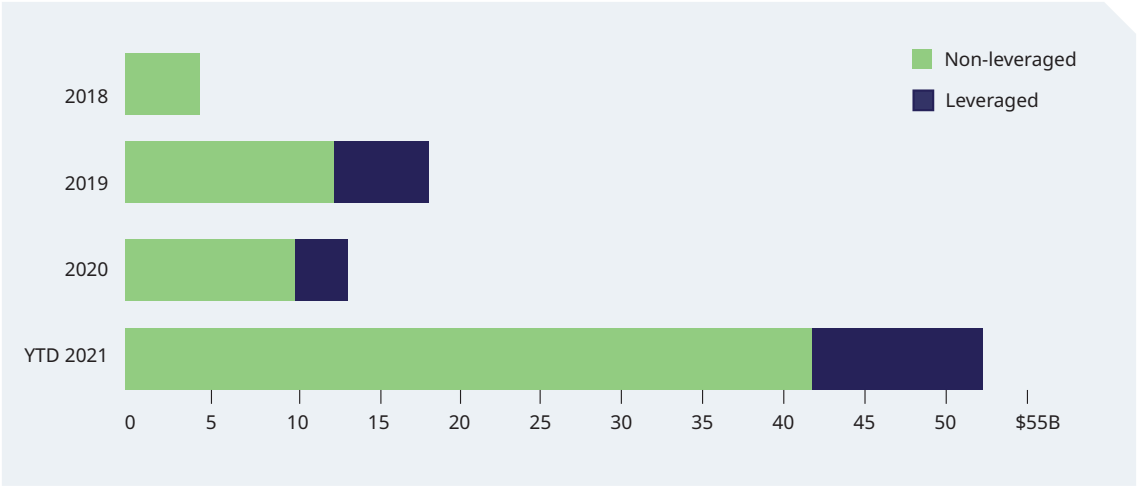
Regulations need to be advanced to establish a common ground and avoid greenwashing. Only China and India have defined green bonds legally. Hence, in most countries, issuers can label bonds "green" if they comply with the GBPs, the CBS[19], or the national governing green bond issuance. The only way to assure investors that the bonds they are buying are truly green bonds is for them to check the binding guidelines regulating green bonds' issuance and maintenance, because in most countries, any issuer can label its bonds "green" (Hyun, Park, & Tian, 2019).

Still, the data reflects that green bonds significantly contribute to enhancing green investments, which aim to mitigate and adapt to climate change (Lund et al., 2015). Recent research has presented encouraging results with respect to green bonds. With the use of matched bond-issuer data, Fatica and Panzica (2021) test whether green bond issues are associated to a reduction in total and direct emissions of nonfinancial enterprises. They find that green issuers display a decrease in the carbon intensity of their assets after borrowing on the green segment. Institutional oversight is important: a larger reduction in emissions in case of green bonds that have external review, as well as those issued after the Paris Agreement.

19 While the GBPs and the Climate Bonds Standard (CBS) serve as the general guidelines to distinguish between green bonds and conventional bonds, due to the lack of enforcement mechanisms, some countries have produced their own standards for regulating green bonds.

Sustainability-associated loans are debt instruments linked to key performance indicators that include various sustainability goals or ESG ratings, and have no restrictions on usage of funds. U.S. loans with terms tied to environmental, social and governance targets had jumped to about $52 billion by mid-2021, a 292% increase compared with all of 2020, according to Bloomberg data (Figure 15). While the loans lag those in Europe, where this debt structure originated, a green policy push by President Joe Biden and greater awareness of social justice is bringing scrutiny to both bank lending and corporate exposure to ESG risks. Borrowers under the sustainability-linked loan agreements will earn a discount or penalty on loan pricing based on whether their ESG-related targets are met (Poh & Seligson, 2021).

Figure 15. ESG Loan Boom



Source: Bloomberg (Poh & Seligson, 2021).

Green funds vary widely in size and scope. The largest such fund is the GCF, which as discussed is mandated to a 50/50 split between adaptation and mitigation efforts. The GCF also employs part of its funds to help mobilize financial flows from the private sector to compelling and profitable climate-smart investment opportunities.

In the middle of the spectrum, some governments have developed national-level green funds. In China, The National Green Development Fund was jointly initiated and established by the Ministry of Finance, the Ministry of Ecology and Environment, and the Shanghai Municipal People's Government. The central government, the Ministry of Finance, 11 provinces and cities along the Yangtze River Economic Belt, and related industries jointly contributed funds for a final scale of CNY 88.5 billion ($13.9 billion). The fund will be used to directly invest or provide financial support to projects that relate to environmental protection, pollution control, and ecological restoration projects. It will support the development of green industries in response to market demand and promote green technology R&D.

For small and medium-sized green projects, community-based green funds and village funds could be a suitable solution. The Hometown Investment Trust (HIT) funds are a new source of community-based trust funds created to support solar and wind power. The basic objective of the HIT funds is to connect local investors with projects in their own locality, where they have personal knowledge and interests. Individual investors choose their preferred projects and make investments via the internet (Yoshino & Kaji, 2013). For example, in Japan, wind and solar power projects have raised money from individuals (about $100 to $5,000 per investor) interested in promoting green energy. Through these funds, many Japanese people invest small amounts of money in the construction of wind power and solar power. Advertisements of each wind and solar power project on the internet play an important role in pushing people to invest in these projects (Yoshino, Taghizadeh–Hesary, & Nakahigashi, 2019).

There are three challenges in deploying green financial instruments: identifying the right projects, developing complex plans that involve both the public and private sectors (and often more than one country), and structuring the financing. To succeed, governments must be capable of effective long-term planning, budgeting, and project implementation.

▶ 3.5 Chapter synthesis

This chapter presented the myriad of available tools for EBMOS to support according to the local context and industry of interest. The consensus in the literature is that there is no one-size-fits-all. Different regions with different contexts and values will follow different sustainability transformation pathways, giving rise to tensions and opportunities as regional courses interact. To navigate these changes, we need a better understanding of how regional routes interact to produce outcomes for people and nature (Bennett, Biggs, Peterson, & Gordon, 2021). Acemoglu et al. (2012) propose that governments should act from all fronts, implementing a combination of carbon pricing measures, regulation, and public support for clean R&D. The authors show that it is essential that they are deployed simultaneously and in coordination, as there are substantial complementarities to exploit. To their list should be added that the governments should foster sustainable enterprise development and green finance to enable enterprises transition to sustainable production – including micro and small enterprises to reach a minimum efficient scale – and to close the massive financing gap that separates the current path of the global economy from the net-zero scenario. The specific implementation of these measures will depend on the size of the enterprises to support and regulate, and the current level of decarbonization of the country. This chapter presented the strengths and some weaknesses of an array of policy measures. A condensed list of the actions mentioned in this chapter is shown in Table 10.

Table 10. Policies and institutions to decarbonize the economy and accelerate the structural transformation towards a net-zero carbon emissions economy

Broad Policy goal	Specific objective	Main actions
The goal: decoupling economic growth to achieve net-zero	Government action to achieve net-zero emissions globally by 2050	- Accelerate the phase-out of coal. - Curtail deforestation. - Speed up the switch to electric vehicles. - Encourage investment in renewables. - New long-distance transmission connections. - Substantial increases in distribution network capacity. - New grid substations. - Major new public charging networks. - Digitalization of networks.
	Institutions and regulatory frameworks	- Adequate regulation to promote private sector investment in clean energy infrastructure; technology and green entrepreneurship; and green innovation ecosystems. - Create alternative markets. - Break up monopolies, enhance competition and encourage entrepreneurship.
	Innovation and technological diffusion	- Strengthen intellectual property rights (IPRs) across borders. - Redesign hydro systems to account for changes in water availability and EWE. - Improve early warning systems in a wide range of applications (diseases, EWEs, etc). - Invest in education, skills development, and advanced research institutions. - Create incentives to encourage skilled foreign workers to immigrate and share their expertise.
Measures to support green transitions in MSMEs	Develop national policies that specifically support the greening of SMEs.	- Develop holistic national plan to foster SME productivity growth and development, including capacity building to upgrade management practices, raise resource efficiency, and green production. - Establish one-window agencies that support SMEs in becoming greener. - Develop communication strategies to help SMEs for adopting more energy efficient practices. - Strengthen monitoring and evaluation of the implementation of incentives and support schemes targeting SMEs. - Establish environmental regulatory regimes that differentiate between SMEs and larger enterprises.
The role of government as an investor of first resort	A green industrial policy	- Governments to become both large-scale investors in energy efficiency, clean energy infrastructure, and purchasers of renewable energy.
	Building green cities	- Fiscal incentives to encourage the physical upgrading of the existing residential, commercial, and industrial building stock to improve energy performance. - Housing retrofits and creating EV infrastructure. - Involvement of local governments in the design of policies and provision of necessary resources. - Urban planning (short and long-run) and policies like densification or congestion charges. - Core policies: district energy systems, solar street lighting, rooftop solar energy, net metering, electrification of public transport, measures to reduce reliance on motorized transport, biofuel blending mandates and bio-methane use, local awareness. - Renewables-friendly land-use and zoning policies.
	R&D support	- Government R&D subsidies. - Tax incentives for R&D.
	Just transition funds	- Implementation of just transition mechanisms, ideally with public participation.
Financial solutions for a sustainable and resilient future	Green financial instruments	- Green bonds. - Green banks. - Community-based green funds. - Low-interest rate financing of projects with environmental externalities. - Climate finance taxonomies

Source: Authors' elaboration.

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Chapter 4

The role of EBMOs in supporting business adaptation and mitigation

As highlighted throughout this report, climate change is bound to constitute a major income shock unless substantial adaptation and mitigation actions are taken. According to the striking report "The economics of climate change: no action not an option" (Guo, Kubli, & Saner, 2021) by the Swiss Re Institute[20], the world stands to lose close to 10% of total economic value by mid-century if climate change stays on the currently-anticipated trajectory and the Paris Agreement and 2050 net-zero emissions targets are not met. Developing countries could have one-third less wealth than would otherwise be the case should governments fail to act more decisively on climate. All this evidence warrants the increasing awareness of Employer and Business Membership Organizations (EBMOs) that it is in their best interest to move on these two fronts -adaptation and mitigation- in parallel. On the one hand, EBMOS can sponsor concerted action to pressure governments to act on climate change and promote the greening of their members' productive activities. EBMOs can also take measures to help their members adapt to climate change. One of their main objectives is to serve as a source of support and knowledge in fostering business resilience and innovation. Many of the required strategies to promote green jobs can only succeed with the full involvement and participation of workers and enterprises under the leadership of EBMOs.

In the near future, responsible management should connect every step of the productive chain: from raw material extraction to production and to the use and disposal of manufactured outputs. Concerted action, mutual support, and policy change are central to adopting this life-cycle perspective of production.

Boris Vallée, a Harvard professor of Business Administration, proposes that enterprises have a role in aligning profit with decarbonization. "Business leaders should be able to drive large-scale impact while generating an abundance of profitable business opportunities. The awareness of the need for this alignment is rising among both business leaders and investors, but we need to turbocharge it if we want to have a shot at avoiding the worst" (Schenk & Gerdeman, 2021). The relevance of regional business organizations for resilience is also highlighted in the report for which this interview was conducted. John Mocomber, a senior lecturer at Harvard, states that "the most competitive districts and cities will figure out ways for many sources of capital to combine forces, region by region, toward coordinated long-view responses" (Schenk & Gerdeman, 2021) to climate change. Under coordinated action, regions and cities will obtain quantifiably better results than just by diffuse investments in scattered pockets of resilience.

20 Swiss Re also modeled the economic impacts of a 3.2-degree increase by 2050, described as the "severe case" for temperature gains. If that happened, levels of wealth in Malaysia, the Philippines, and Thailand would drop almost by half compared with a world with no climate change. The economy of Indonesia would be 40 percent smaller. India's would be 35 percent smaller.

▶ 4.1 The role of EBMOs in the transition towards a sustainable low-carbon economy

According to a recent survey run by the IOE and ILO/ACTEMP (ILO & IOE, 2019), sustainability is one of the five main mega-trends impacting enterprises. Enterprises are therefore increasingly looking for support to understand how to align their strategies with environmental and social objectives. In line with their role as representative organizations of the private sector, EBMOs have an important part to play. They can promote existing best practices so that on one hand, enterprises get access and knowledge of best practices, and on the other, show decision-makers and civil society that enterprises can contribute positively to the achievement of environmental pledges.

EBMOs serve two distinct but equally important roles for their members in the drive for sustainability. The first role is that of advocacy, providing a collective voice for the membership base, which can be used to influence the policy and regulatory environment in which their members function. EBMOs will often have a wealth of knowledge concerning their particular industry sectors, often more so than the policy makers themselves, and this expertise can be used to shape and influence policy decisions for the benefit of all concerned. Indeed, it is this advocacy role which often attracts new members to business and industry associations in the first place.

The second primary role of EBMOs is to provide services to its members. This is important since not all members are motivated to pay membership dues simply for advocacy, since the benefits of successful policy outcomes create spillovers to the benefit of members and non-members alike. To retain membership, EBMOs must provide real and ongoing value-added to its membership base, and they must be able to adapt to changing circumstances to remain relevant. This flexibility requires a well-designed organizational hierarchy and strong board level governance, a hallmark of the largest and most successful EBMOs. However, while adaptability is important, EBMOs must also have a clearly defined vision and mission both in terms of advocacy and in the provision of services if they are to be effective on behalf of their members. This represents a fundamental opportunity in decarbonization: by incorporating sustainability, in terms of both mitigation and adaptation, in their mission statements, EBMOs can have a profound impact across industry sectors. This can happen on three distinct levels. First of all, EBMOs who adopt a sustainable vision can work with members to educate them as to the benefits and existent opportunities in both mitigation and adaptation, where recognition of possible eco-friendly solutions might not otherwise have existed. It is also true that in some cases enterprises that adopt sustainable measures might be faced with additional costs, putting them at a temporary disadvantage vis-à-vis their competitors. EBMOs with a clearly stated sustainable mission statement can help level the playing field by encouraging, incentivizing, or requiring all members to embrace a common vision towards sustainability.

Decarbonization is a complex economic and structural transformation that cannot be achieved by either enterprises or governments alone. Rebecca Henderson, the John and Natty McArthur University Professor at the Harvard Business School, and author of the book *Reimagining Capitalism in a World on Fire*, proposes building meaningful partnerships as the key role of enterprises in confronting climate change. Decarbonizing the world's economy requires rebuilding not only the entire electric power industry but also transportation, infrastructure, construction, and agriculture. While action by individual enterprises can go a long way, climate change cannot be fully addressed without building real partnerships between the public and private sectors. These partnerships should enable a route towards a scenario where everyone has the skills and the incentives to reduce their emissions (Schenk & Gerdeman, 2021).

EBMOs can foster collaboration and communication to create efficient markets that allow enterprises to pursue their goals while still being responsible corporate citizens. EBMOs can act as a broker in dialogues between governments, enterprises, and citizens, seeking a path that is equitable to all stakeholders (ILO and IOE, 2019). For instance, the International Chamber of Commerce (ICC) has encouraged the private sector to increase the pace and ambition of innovative actions for the 2030 Agenda Sustainable Development Goals (SDGs) but also calls on governments to take action by implementing long-term policies, providing an adequate framework and incentives that enterprises can rely upon to tackle the sustainable development challenges while also increasing competitiveness, creating jobs and promoting sustainable economic growth (ICC, 2018).

A major question of the coming decades will be how governments and enterprises balance economic growth with sustainability. Enterprises can lead the way by fostering political action and policy reform. In doing so, they can contribute to creating a level playing field among enterprises by coordinating the development of common sectors' vision on sustainable development. EBMOs should seek innovative ways of cooperation and outreach, as it is increasingly clear that on this arena, there is not a one-size-fits-all collaboration model. Some governments, enterprises, and EBMOs have tackled major issues through broad partnerships, while smaller or localized challenges may be better handled by direct interaction between local enterprises and the public (GRI, 2015). It is likely that building more collaborative economies, in which all participants have a stake and voice in solving issues, will make up the bulk of EBMOs' work in the coming decades.

The 2030 Agenda, structured by the collection of SDGs, has served as a widely recognized roadmap that public and private actors have embraced to varying degrees. Even if the primary responsibility for assessing the implementation of SDGs lies with governments, the private sector has a role to play in the follow-up and review phase of the 2030 Agenda. EBMOs have the expertise, technology, and resources to partner with governments to facilitate the collection of data required to monitor SDGs. According to the 2019 Handbook *Employers' and business member organizations and sustainable development goals* developed by the ILO (ILO, 2019a), EBMOs can support this process by:

- Conducting surveys and collect relevant data among their members.
- Providing a comprehensive outlook of collective trends and progress on the 2030 Agenda and formulating an employers' agenda contributing to the achievement of SDGs.
- Promoting corporate reporting as a means of monitoring, review, and verification.

Governments are designing roadmaps to meet their NDCs and more recently, their increasingly ambitious net zero targets. Policy packages are being proposed; discussed and implemented that include regulatory reforms, changing fiscal and financial incentives. However, there is no consensus within the business sector over priorities, schemes, or enforcement mechanisms. Business organizations can take part in the process by monitoring and influencing the employment and social policy dimensions of sustainable development. They can raise awareness and participation by informing members of developments, help analyse the implications for enterprises; and provide effective employer advocacy in international fora. EMBOs can create guidelines to navigate this changing landscape. For enterprises operating across borders, EBMOs may need to address different sets of restrictive regulations (ILO & IOE, 2019).

As previously noted, many large organizations are insisting that their suppliers stay in line with their own sustainability and emissions targets, and there is a growing trend of customers and workers demanding that the products they buy, and the enterprises they work for are invested in a sustainable business model. Members of EBMOs with a clearly articulated green policy are likely to benefit from significant reputational enhancement, leading to greater success overall at the enterprise level in what amounts to a virtuous cycle. This can also feed into a third benefit for EBMOs and their members: EBMOs that demonstrate a strong and public commitment to sustainability are likely to find themselves better positioned with their governmental relationships, making their advocacy role that much more effective on behalf of their membership base.

Nevertheless, significant challenges remain. To be effective contributors towards decarbonization, EBMO's must have their vision strategically in line with sustainable development. Business associations in LDCs face their own set of challenges, often due to a lack of resources, poor organizational capacity, and limited technical skills.

▶ 4.2 Strategies for EBMOs to support business mitigation and adaptation to climate change

Research has shown that there exist contagion effects in innovation and adoption of greener techniques (Graziano, Fiaschetti, & Atkinson-Palombo, 2019; Niu et al., 2022). This is due to the characteristics of some of these technologies and techniques as experiential goods with high upfront capital and/or labour costs. By reducing information barriers, EBMOs can speed adoption. They can launch new services that can help members to deal with sustainability-related issues. By raising enterprises' awareness of the need to embrace these changes, the EBMOs can contribute to creating a conducive environment for a responsible and professional business that will benefit their members.

EBMOs have a pivotal role in making just transitions work. They are, by definition, active partners in policymaking at the national level. They have relevant expertise in conducive business environments and the needs of enterprises. EBMOs embody networks cutting across sectors that need to be engaged to create economies' coherent and systemic transformation. Finally, they participate as social partners of their trade union counterparts in framing labour market outcomes. According to the Guidance Paper on employment, just transition, and climate governance (IOE, 2022), employers' organizations can provide the following relevant services to their members as well as external stakeholders:

- Advocating vis-à-vis governments for just transition strategies that consider business needs.
- Providing critical guidance, especially to SMEs, to raise awareness, promote innovative approaches, and support governments in developing realistic and impactful policies.
- Analysing labour market impacts, particularly job losses and job gains, how to adapt to these impacts, and what resources and support members can access.
- Analysing skills needs and providing relevant and timely analysis on gaps and ways to improve skills and training systems while bringing attention to government and other stakeholders on sectors in particular need of skills development is also crucial.
- Engaging with educational institutions and other skills providers to create collaborative knowledge sharing and capacity-building approaches for enterprises to adapt to the new scenario.
- Advising members of new products and services and actively working with members to shape future sustainable markets.
- Hosting industry events that bring together industry leaders to allow for networking and relationship building, creating opportunities for future collaboration in sustainability.
- Providing industry-wide and sector-specific market information to members, allowing for more effective strategic planning and a more sustainable business climate.
- Improving awareness of existing support programmes upon which members may be able to capitalize.
- Improving corporate reputations through public awareness campaigns, for example, in the area of corporate social responsibility, and raising awareness of their sector's contribution to society.
- Developing industry and technical standards to provide a baseline that members might eventually adopt and adhere to, allowing for benchmarking and effective data tracking on corporate practices leading to improved resilience.
- Providing consulting services to individual members in areas of key strategic importance, including specifically matters of sustainability.

To be effective, the services referenced above must consider a long-term vision based on planning and strategic foresight. EBMOs must be also flexible and responsive enough to respond to a rapidly changing business and regulatory landscape, and to incorporate forward thinking into the development of future services. In measuring EBMOs' success, communicating a coherent vision and having strong governance and organizational structures are at the core. Without clear communication of goals and a strong foundation it is unlikely that any of the above approaches would be successful in achieving positive outcomes.

As highlighted by the report *World Bank Outlook 2050* (Mukhi, Rana, Mills-Knapp, & Gessesse, 2020), inter-sectoral dialogue is more important than ever. Understanding interactions among sectors can help policy makers identify synergies and avoid unintended negative impacts. This is true within development more broadly and even more so for climate action. If the goal is to reduce CO2 emissions from vehicles, for example, one way is to promote electrification; another is to use more biofuels. If the latter leads many farmers to stop growing food so they can grow biofuel feedstock that may affect food security. If transportation is electrified but the power supply derives mainly from coal or oil, any emission reductions might be offset by increases in the power sector. Mitigation and adaptation actions can be synergistic or cause unintended harm in other sectors. Inter-sectoral and inter-regional dialogue facilitated by EBMOs can engender proposals that channel the policymaking process towards symbiotic proposals.

Progress towards a net-zero economy drives new skill needs across a wide range of sectors and occupations. Providing the skills required to decarbonize an activity can create a need for a new occupation, or a very distinctive new specialization or set of new skills within an existing occupation. Important skills required for an initiative to improve the carbon footprint of production and consumption typically span a wide range of levels, from high policy, management, and professional levels, to technical, associate professional, skilled craft, administrative, skilled agricultural, and operative levels.

A skills mismatch between the requirements of a greener world and the current educational system can generate frictions in the labour market and delay decarbonizing transformations. EBMOs can contribute to bridging this gap by offering training services on sustainable business practices at different levels and types of work inside a enterprise. Bridging this gap so that enterprises adopt and embed efficiency and environmental performance improvements throughout their operations and business relationships. Energy efficiency, waste reduction, water-smart agriculture, circular economy design, and communication with the public on sustainability issues are examples of such topics that require managers and workers to overcome a learning curve. A well-known case is the renewable energy sector, in which the qualification level of workers tends to exceed that of the average qualification level for the rest of the economy. Technical and vocational education and training (TVET) play a crucial role in the transition to cleaner energy. The speed of this transition will therefore be determined to some extent by the responsiveness of training organizations and practitioners in strengthening the available offer, and by the interest and willingness of professionals to engage in initial and/or continuing TVET. The development and maturing of renewable energy markets have implications for the future of work: professionals with lower skill levels in several sectors will be able to move towards an increasing specialization of competencies and, consequently, better job conditions and opportunities (UNESCO-UNEVOC, 2020). In this respect, EBMO can play a key role in identifying skills needs across economic sectors and providing advice for the development of TVET programmes.

EBMOs can act as a forum for ideas and models that support enterprises seeking change and facilitate the exchange of experience. Concerted action from large players can go a long way in achieving sustainability. Large enterprises and buyers can offer suppliers better terms and bigger orders in exchange for upgrading their sustainability practices. Offering suppliers financial rewards – such as larger orders or higher prices – can provide a strong incentive for these enterprises to invest in stronger sustainability standards. Using new technologies such as e-invoices can speed up payments to suppliers, and help small enterprises build up the creditworthiness they need to access financing from other sources.

Finance organizations with capabilities to perform sophisticated global risk assessments have taken organised action. The Institutional Investors Group on Climate Change, whose members include several outstanding asset managers has warned the European Union not to label natural gas as sustainable under the bloc's new rulebook aimed at determining which investments are considered "climate friendly" (Abnett and Jessop, 2022). The move comes in response to a draft plan from the European Commission published in 2021 that proposed classifying certain natural gas investments as green. The Group stated that the inclusion of natural gas would "undermine the EU's ambitions to set the international benchmark for credible, science-based standards for classifying sustainable economic activities."

4.2.1 EBMOs and climate action around the world

United Kingdom

As highlighted previously, business leaders' contributions can lie in pushing the scale to strike a balance between decarbonization and growth, promoting fairness in the design and implementation of net-zero policies. The five largest business organizations in the UK, Confederation of British Industry (CBI), the Federation of Small Businesses (FSB), Make UK, the Institute of Directors (IoD) and the British Chambers of Commerce (BCC) have published a set of principles that they consider should guide the government's approach to deliver policy in pursuit of the country's long-term climate targets - namely net-zero by 2050. The central principle of this approach is fairness: a just transition. The report, authored by the business groups, highlights five core principles needed to achieve this goal: fairness in ambition, in accountability, in delivery, in opportunity, and in cost.

The CBI has strived to serve as a forum of exchange of ideas on environmental issues, sharing a plethora of resources, ranging from a roadmap of clear steps for individual enterprises to get started on environmental, social and governance (ESG) (Bernau, 2021) and for decarbonizing the fulfilment of industrial heating needs (CBI, 2020).

Colombia

With almost half of its territory covered by biodiversity hotspots, as defined by Conservation International[21] (CI, 2022), Colombia has materialized substantial contributions to sustainable development by preserving the integrity of the biosphere. Biodiversity is, according to the Stockholm Resilience Centre, one of the most threatened planetary boundaries[22]. The Millennium Ecosystem Assessment of 2005 concluded that changes to ecosystems biodiversity due to human activities were more rapid in the past 50 years than at any time in human history, increasing the risks of abrupt and irreversible changes (SRC, 2015).

The National Business Association of Colombia (ANDI) is the country's largest non-profit organization with more than 1.200 members that represent between 40% and 55% of the national GDP. The Biodiversity and Development Initiative was created by ANDI in 2014 to contribute to the integrated management of the country's biodiversity through collective work and investment schemes between enterprises, institutions, and local groups. It has been recognized internationally for its contribution to conservation (ANDI, 2019).

The initiative has successfully engaged stakeholders from different sectors and scopes: ANDI has partnered with the National Natural Parks of Colombia (PNN) and the Humboldt Institute, as well as other regional allies to guide the private sector on how to integrate biodiversity into their operations. The initiative also offers fora for intersectoral dialogue, creates capacities, supports the development of public-private partnerships, and fosters the formulation and implementation of policies and instruments to improve corporate environmental performance.

This initiative operates through four pillars: a) investments in territory, b) implementation and development of instruments, c) capacity building, and d) knowledge management and monitoring strategies. This initiative seeks to contribute to the national and international objectives of conservation management and sustainable use of biodiversity in the territories.

The initiative has become a platform to connect enterprises, institutions, and local groups for a common purpose, which has made it possible to reach agreements, high-value business investments, and better

21 Around the world, 36 areas qualify as hotspots. Their intact habitats represent just 2.5% of Earth's land surface, but they support more than half of the world's plant species as endemics — i.e., species found no place else — and nearly 43% of bird, mammal, reptile and amphibian species as endemics. To qualify as a biodiversity hotspot, a country must be irreplaceable in terms of biodiversity, and must have 30% or less of its original natural vegetation. In other words, it must be threatened.

22 The Stockholm Resilience Center identified the nine processes that regulate the stability and resilience of the Earth system, and proposed quantitative planetary boundaries within which humanity can continue to develop and thrive for generations to come.

rules for the planning and development of activities in the territories. It seeks to connect biodiversity and business through the following mechanisms:

- **Impact Offsets** - Associated with environmental offsets and investments by enterprises in the framework of projects, works and/or activities.
- **Value chain** - Linked to the sustainable use of biodiversity, as well as its relationship with the production chain, forward and backward.
- **Ecosystem services** - Related to the benefits that the natural supply provides to enterprises and on which sustainability over time depends.
- **Risk management** - Associated with ecosystem management as a means of adapting productive activities to climate variability.

Within this framework, the Biodiversity and Development Initiative has, for instance, promoted ANDI's mining and energy sector enterprises to collectively contribute to the restoration, sanitation, and management of national, regional, and local protected areas; in joint company strategies for biodiversity monitoring hand in hand with research institutes; in knowledge management and promotion of productive alternatives that incorporate the ecosystem services from birds and butterflies.

International organizations

By developing the employers' position on sustainability matters, the International Organisation of Employers (IOE), the International Chamber of Commerce (ICC), the World Business Council for Sustainable Development (WBCSD), and the Industry Advisory Committee to the OECD (BIAC), have been working to present the business sector's perspective in all international sustainable development forums.

These four worldwide business organizations have also helped national business organizations improve their advocacy and participatory functions, not only at the international level but also in national discussions and initiatives. Many national business organizations have supported enterprises that take voluntary initiatives and adopt innovative solutions for resource efficiency, emission control, waste management, protection of ecosystems, and food and energy security (ILO, 2016).

The Global Business Alliance for the Environment (GBA4E), which is part of the UNEP Business and Industry Major Group is another effort engaging business representatives from a wide range of sectors including manufacturing, oil and gas, food processing, crop inputs, livestock, conservation, finance, technology, and agritech, among others. They have worked to define priorities to strengthen business actions for nature (GBA4E, 2022).

▶ 4.3 The role of EBMOs bridging the knowledge gap to measure enterprises' carbon footprint

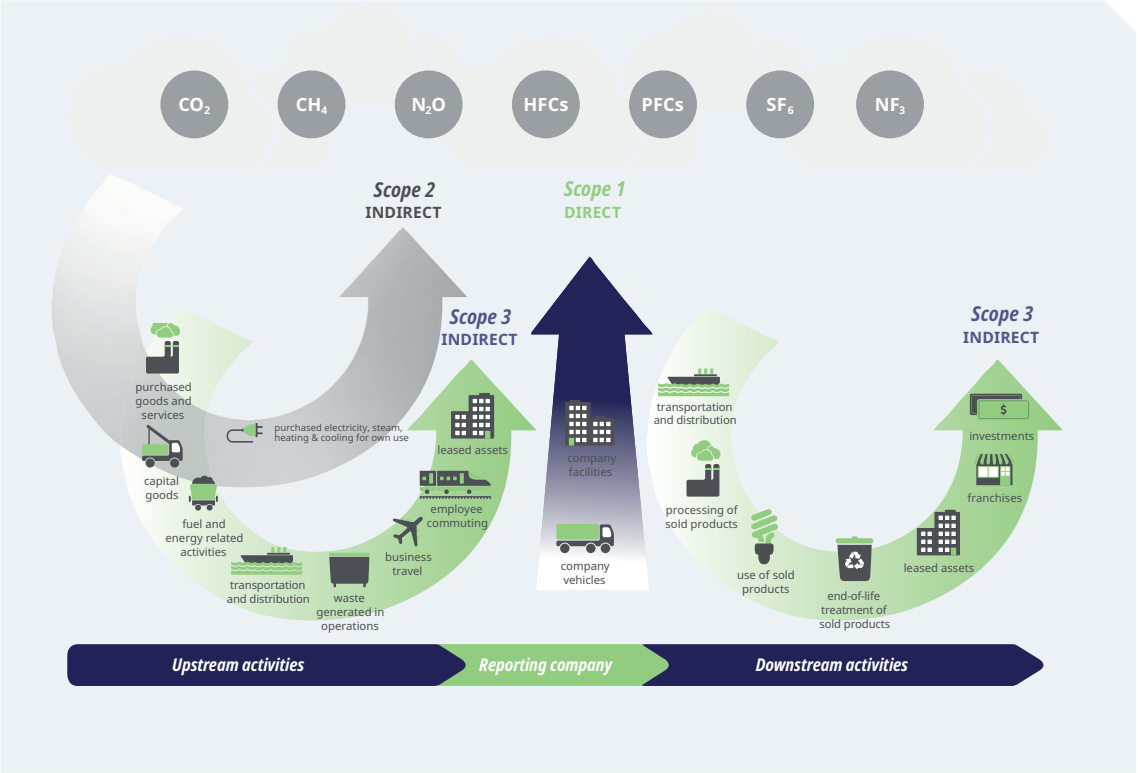
For any company to be sustainable and reduce their GHG emissions over time, it is important to know what their carbon footprint is. Once an enterprise's carbon footprint is known, it can serve as a baseline indicator as to whether the organization is meeting its sustainability targets. The measurement exercise itself can be useful in identifying specific areas of operation which are the most carbon intensive, allowing for strategic focus to be placed on subsequent mitigation efforts.

For aggregate information on carbon footprints to be useful, there must be a standard for measurement. Various standards have been developed over the last twenty years, but arguably the two most important standards today are ISO 14064-1, developed in 2006, and the GHG Protocol Corporate Standard, first published in 2001. Both standards seek to measure both direct and indirect emissions of corporate activities. The GHG Protocol Corporate Standard categorizes emissions into 3 Scopes.

Scope 1 comprises direct emissions that result from corporate activities that are under the control of the organization. This includes direct energy use, but also encompasses gases released in the production process such as carbon in cement production, methane in agriculture and sulphur hexafluoride (SF6) in the electrical industry (Issel, 2021).

Scope 2 encompasses indirect emissions such as those resulting from the production of electricity, heat or steam that an organization purchases for use in its production processes. Scope 3 refers to other indirect emissions that are outside of a company's direct control. Accompanying the GHG Protocol Corporate Standard is the more comprehensive GHG Protocol Value Chain Standard which provides measurement guidance across the entire value chain of a company, both upstream and downstream. For example, Scope 3 considers an entire product's life cycle, from transportation and distribution to end-of-life treatment of the product (Figure 16). Additional standards exist for calculating emissions exist for product life cycles (ISO 14067 and the GHG Protocol Product Lifecycle Accounting and Reporting Standard). While both ISO 14064 and the GHG Protocol generally attempt to measure the same thing, ISO 14064 is generally viewed as a blunter instrument, whereas the GHG Protocol is far more descriptive in methods and standards for indirect emissions (Spannagle, 2004), and many enterprises around the world are increasingly turning to the GHG Protocol for purposes of standardization and transparency.

Figure 16. GHG Protocol Emissions Scopes



Source: (Issel, 2021).

EBMOs can support members to calculate their carbon footprint by developing "how-to" manuals and trainings, disseminating practical information, and providing technical advice. In partnership with the UN Climate Change, the Swedish Fin-Tech *Doconomy* developed the **2030 Calculator**, which is a digital tool for enterprises that simplifies the process of calculating products carbon footprint. It can be downloaded here. Moreover, this tool is also linked to the UN Carbon Offset Platform, thus enabling users to contribute to green projects towards achieving the Paris Climate Change Agreement and the UN Sustainable Development Goals.

The UNFCCC has also developed a **Greenhouse Gas Emissions Calculator**, which helps enterprises estimating their emissions by relevant emissions source. It is an Excel template that can be downloaded here.

Once an enterprise has calculated its carbon footprint, it can focus on setting targets. In this respect, EBMOs can support members in setting emissions reduction targets grounded in climate science through the Science Based Targets initiative (SBTi). Science-based targets are instrumental for enterprises to know how much and how quickly they need to reduce their greenhouse gas (GHG) emissions to prevent the worst effects of climate change. Some of the benefits associated with setting science-based targets include enhanced competitiveness and business resilience; encouraged intra-enterprise innovation (intrapreneurship) and the creation of new business models; gained credibility; and gained capacity to influence public polices (SBTi, 2020) (Table 11).

Table 11. The benefits of adopting science-based targets

Opportunity	Common Practice – Incremental Goals	Science-based Targets
Build business resilience and Increase competitiveness	Incremental goals often lead to decreases in costs and increases in operational efficiency but may limit enterprises to only going after the "low hanging fruit".	Methods to set SBTs challenge business to re-align with the low-carbon economy, capitalizing on a range of opportunities beyond cost-savings and avoiding the risk of stranded assets.
Drive innovation and transform business practices	Setting goals can inspire enterprises and supply chain actors to discover novel solutions and product offerings. Because incremental goals are near-term (defined as within five years into the future) and not a "stretch", enterprises may not be pushed to transform business practices.	As SBTs include a long-term vision, enterprises can think beyond the near-term, common solutions for GHG emissions reductions. New technologies and financing options can be developed in a corporate environment that prioritizes preparing for a low-carbon economy.
Build credibility and reputation	Enterprises that are transparent in their GHG reduction efforts garner reputational credibility through demonstrating their commitment to addressing climate change. However, investors and other stakeholders are now demanding targets based on external, science-driven projections, which could put enterprises who fall short of this requirement at risk.	SBTs have higher credibility with stakeholders. Enterprises with SBTs are often lower-risk options for long-term investment since they can demonstrate that they are planning based on the latest available science.
Influence and prepare for shifts in public policy	Incremental targets send a signal to policy makers that enterprises take climate change seriously, but the credibility of this signal is limited by the ambition of the target.	SBTs help enterprises adapt to changing policies and send a stronger signal to policymakers, allowing enterprises to better influence policy decisions. Enterprises that have SBTs are much better positioned to respond to future regulatory adjustments as governments ramp up their climate action.

Source: Science-Based Target Setting Manual (version 4.1), April 2020, p. 12-13.

Business organizations can also disseminate information about available methods for setting science-based targets and provide practical guidance on how to do it. According to SBTi (2020), there are three methods:

I. Absolute emissions contraction.
II. Sectoral decarbonization approach (SDA).
III. Economic intensity contraction.

Which are made up of the following elements: a carbon budget, an emissions scenario, and an allocation approach (convergence or contraction). Table 12 provides an overview of the three methods.

The Science Based Targets initiative has developed several products to support enterprises: a "how-to" guide for setting near-term targets, which is available here; a science-based target setting tool, which can be downloaded here; a Target Validation Application for SMEs available here; a Corporate Manual, available here; a guide with criteria enterprises' targets must meet to be approved as science-based, available here; a Net-Zero Getting Started Guide, available here; and a Framework for Financial Institutions to Set Science-based Targets to align their lending and investment activities with the Paris Agreement, available here. More SBTi resources for enterprises can be found here. EBMOs play a key role in disseminating these resources among members, designing trainings, and providing "hands-on" technical advice to set science-based targets, implement, monitor, and report.

Table 12. Methods for setting science-based targets at enterprise level

Method	Company input	Method output
Absolute emissions contraction	- Base year - Target year - Base year emissions, disaggregated by scope	- Overall reduction in the amount of absolute GHGs emitted to the atmosphere by the target year, relative to the base year.
Sectoral Decarbonization Approach (SDA)	- Base year - Target year - Base year emissions, disaggregated by scope - Activity level in the base year (e.g., building floor area, distance travelled, etc.) - Projected change in activity by target year	- A reduction in emissions relative to a specific production output of the company (e.g., tonne CO2e per MWh).
Economic intensity contraction: GHG Emissions per Value Added	- Base year - Target year - Base year emissions, disaggregated by scope - Value added in the base year - Projected change in value added by target year	- A reduction in emissions relative to financial performance of the company (e.g., tonne CO2e per value added).

Source: Science-Based Target Setting Manual (version 4.1), April 2020, p. 19-22.

Moreover, EBMOs can promote and encourage members to report regularly on their carbon footprints. Encouragement can be effective through communicating the advantages of carbon reporting to its members, highlighting, for example, the benefits of efficient energy management and the potential for cost savings, demonstrating environmental credentials and enhancing a company's reputation, meeting increasingly rigorous supply chain tender requirements, and motivating employees' sense of pride in the organization. Members can also be incentivised, for example, by the bestowing of eco-friendly certifications and green labels. Finally, EBMOs can simply require certain environmental standards to be considered for membership in the organization.

EBMOs can also provide direct consulting and measurement assistance to its members. Many private websites provide a carbon footprint calculator. EBMOs might consider doing the same for its members, providing structure to the process of data collection and calculating emissions, and by offering support in

verifying the results. EBMOs can also liaise with government to provide standardized emissions factors for the national context for different products and services, to simplify and make more precise monitoring and evaluation systems for measurement of emissions. One of the challenges of measuring carbon footprints is the accuracy of the data for emissions factors for different products and services, which are often global averages and don't consider local specificities such as the energy mix.

Global value chains are increasingly governed by sustainability standards. For instance, as part of the Green Deal, the European Commission is planning to establish uniform reporting standards for corporate sustainability performances through the so-called Corporate Sustainability Reporting Directive (CSRD). The corresponding guidelines will specify which sustainability-related information will be mandatory to disclose, as well as which key measures need to be implemented by more than 50,000 enterprises across the EU. Extensive requirements are expected, especially for the climate management of enterprises.

These practices can be costly. A study of 16 emerging countries estimated that compliance with standards cost about US$425,000 per enterprise, largely due to increased spending on labour and capital. SMEs need to spend money over time to maintain and document their compliance. Even voluntary certification standards cost money to achieve and maintain: audits are needed to document ongoing compliance. Importantly, there is evidence that standard-compliant enterprises get better access to markets, attract stronger demand for their goods and services, and ultimately make more money. One study found that produce exporters in sub-Saharan Africa earned €2.6 million more than they would have if they didn't meet standards. Workers also benefit from improved conditions. Pesticide-related illnesses and health expenditures plunged in Kenya after small-scale export farmers complied with export standards (Klapper & Beinker, 2017).

EBMOs can take leadership in supporting certification processes and the adoption of CSRD requirements, and more broadly, environmental, social and governance (ESG) indicators. RespACT – the Austrian business council for sustainable development – is Austria's leading platform for Corporate Social Responsibility (CSR) and sustainable development. The association has developed webinars and materials to support business leaders so that they can prepare their enterprises for the new CSRD requirements (RespACT, 2022).

▶ 4.4 How can EBMOs support their members in adapting to climate change?

A prerequisite impacting EBMOs in their ability to support their members in climate mitigation and adaptation efforts starts at self-definition and articulation as to the purpose and vision of individual EBMOs in the first place. For industry associations to be effective in this respect, sustainability must be integral to the vision and mission of the EBMO in question.

Much like the business environment around them, EBMOs in LDCs are often poorly funded, lacking in skills and plagued by poor organizational structures. Nevertheless, industry associations can play a central role in sustainability in LDCs so long as they have a well-articulated vision in this regard, one which is fundamentally inclusive of SMEs.

4.4.1 Measures by EBMOs specific to mitigation

As noted, the two primary roles of EBMOs are advocacy in the policy environment and the provision of services to members. Each of these avenues can be effectively employed towards the goal of climate change mitigation. Business associations, chambers of commerce and the like can advocate for changes in climate policy, both in codifying new climate-based legislation and in promoting the acceleration of GHG reduction targets.

EBMOs are well positioned to assist their members in measuring their carbon footprints. They can assist members in navigating the complexities of the GHG Protocol, provide consulting in the data collection

process, assist in the actual emissions calculation, and monitor and verify the results. They can provide a repository for aggregate data collection and analysis and reward members with green certifications. EBMOs can also work to encourage sustainable behaviour on the part of its members, by outlining the benefits of an efficient energy strategy and increasing awareness as to the increasing economic competitiveness of renewables.

As referenced, suppliers' operations indirectly impact the overall carbon footprint of a company. EBMOs can also be effective in certifying and providing approved lists of eco-friendly industry suppliers, and by recognizing their own members for considering sustainability in the choice of their suppliers. EBMOs can also consult with their members to reduce indirect emissions, for example by optimizing employees' transportation. They can raise awareness of the benefits of public transportation, perhaps by suggesting discount strategies for employees. They can encourage carpooling strategies and more.

Finally, EBMOs can be a catalyst for change. Change begins with awareness. EBMOs can if they so choose to be instrumental in mobilizing their entire membership stakeholder base. They can become militant. They can communicate the urgency of the problem, to investors, consumers, employees, employers, and to society at large. Raising awareness creates the foundation for best practices beyond the member enterprises themselves.

4.4.2 Measures by EBMOs specific to adaptation

EBMOs can raise awareness among members as to the existential nature of climate change, and in doing so assuage concerns over the long timeframes involved. Most organisations after all are in it for the long term. EBMOs can be instrumental in closing the knowledge gap, by providing educational and future-oriented skills training programmes. They can be strong advocates for additional government funding to build resilience across their respective industry, by highlighting the societal benefits of their members' activities and the need to protect them from the inevitable ravages of climate change that are already built into the system. They can assist members in navigating the complex array of adaptation programmes already in existence. Business and employers organisations, as agents of change, can serve as a bridge to connect all stakeholders to promote a loud and resolute collective voice to influence policy, not only in mitigation, but also in adaptation.

Finally, regional EBMOs can help enterprises identify localized climate change impacts and support them by providing technical advice and guidance while building capacity to implement adaptation measures. This would especially help SMEs that do not have resources to have a "climate change" or "sustainability" operating unit and lack practical expertise to carry out an adaptation programme.

▶ 4.5 Conclusions

As discussed throughout this report, the climate discussion is fostering cultural change. This shift is crucial to generate widespread support for a net-zero economy but means that enterprises have to adapt to a changing business landscape with new demands from consumers[23] and employees alike. While SMEs may have lower capabilities to measure and tackle a changing business environment, EBMOs can coordinate or implement surveys of consumer demands and seriously address them, avoiding greenwashing. They can support and encourage participation in certification programmes.

Sustainability is increasingly part of what a suitable workplace environment should offer. Employees' preferences are increasingly valuing the environmental performance of their employers. Roughly 80% of executives in a 2020 Deloitte survey indicated their employees were very concerned about climate change. Forty-five percent of surveyed millennial employees in another study would look to change jobs if their company didn't implement sustainable business practices, and 44% would leave negative reviews

23 According to a recent European survey, more than nine in 10 citizens (94%) say that protecting the environment is important to them personally. Roughly 40% of surveyed millennials say they would start, stop, or deepen/lessen a relationship with a brand based on a company's impact on the environment, according to Deloitte's 2019 Millennial Study.

for their company if they had poor sustainable business practices. Thirty percent of US employees from large organizations (>5,000 employees) in another survey said that they had left a job because of the company's lack of a sustainability plan. EBMOs can foster adaptation to consumers' and employees' demands: as discussed in section 4.3 the adoption of ESG standards will not be equally accessible to all enterprises. EBMOs can contribute to capacity building that is tailored to sector-specific needs and demands.

One result of living in a warmer planet is the loss of jobs and productivity. The rise in global temperatures caused by climate change will also make the phenomenon of "heat stress" more common[24]. Such excess heat increases workers' occupational risks and vulnerability; it can lead to heatstroke and, ultimately, even to death. The proliferation of so-called "urban heat islands", areas of concentrated heat inside cities resulting from growing population numbers and urbanization, will further intensify the impact of heatwaves, aggravating the risks faced by workers (ILO, 2019d).

Consulting EBMOs and addressing business concerns is of the utmost importance for developing and implementing international labour standards to guide governments when designing national policies to tackle occupational safety and health hazards associated with heat stress. Agricultural and construction workers are expected to be the worst affected, accounting for 60 percent and 19 percent, respectively, of working hours lost to heat stress in 2030. A sectoral response to heat stress in agriculture and construction should include technological improvements, skills development, and awareness-raising (ILO, 2019d).

Nonlinear climate risks will require radical change and truly transformative adaptation. Yet enterprises' disclosures on climate risk reveal a preference for incremental or reactive adaptation strategies such as business continuity planning and energy efficiency installations. Recent research has found that more radical – but necessary- strategies such as retreating from certain areas, desalination infrastructure, disaster relief programmes, and coastal ecosystem restoration that begin to consider nonlinear change were notable for their near absence from reporting (Goldstein et al., 2019). Winn, Kirchgeorg, Griffiths, Linnenluecke, and Günther (2011) find that organizations' enduring assumption that "current economic and social conditions will continue to flourish regardless of unfavourable biophysical conditions in Earth's natural and climate systems" predispose them to a risk management approach that is inadequate in the face of the scope, scale and systemic uncertainty associated with climate change impacts. EBMOs, with their data and outreach capabilities can provide fora in which informational barriers are bridged, and radical adaptation for radical change is discussed in the business agenda.

Climate change is also a human rights issue: it impacts people's access to a clean and safe environment. Consequently, it has an impact on human rights in the workplace. Enterprises and institutions will need to be able take steps to address adverse human rights impacts on the environment. For EBMOs, "showing by doing" can help SMEs understand what their own efforts could focus on. Other relevant actions for business organizations involvement in human rights issues associated to climate change involve addressing to Government and stakeholders any concerns around rule of law failures or corruption which are undermining or preventing effective measures to address environment and human rights harm. EBMOs can speak with governments about internal policy and implementation coherence around responses to climate change. Just as in a business, governments cannot look at this in silos. A human rights harm that can be directly seen and responsibility directly identified already create several remediation challenges. EBMOs can engage in dialogues that determines what would be the standard of proof and how would responsibility and remediation requirements be attributed in future legislation (IOE & KAS, 2021).

Finally, for EBMOs to be able to support enterprises in addressing these challenges and to represent the collective voice of business to the public authorities even in difficult circumstances, they need to give due attention to **building their own resilience**. While there is no one-size-fits-all formula, resilient EBMOs tend to share common characteristics, such as: a solid governance structure; a high degree of member centricity; valuable services which address clients` most pressing needs; multi-skilled staff who can move between different roles; strong alliances with other key-actors; functional risk management systems; as well as research, leadership and communication capacity on key business environment issues (ILO, 2021a).

24 Heat stress refers to heat received in excess of what the body can tolerate without suffering physiological impairment. Heat stress is projected to reduce total working hours worldwide by 2.2 per cent and global GDP by US$2,400 billion in 2030.

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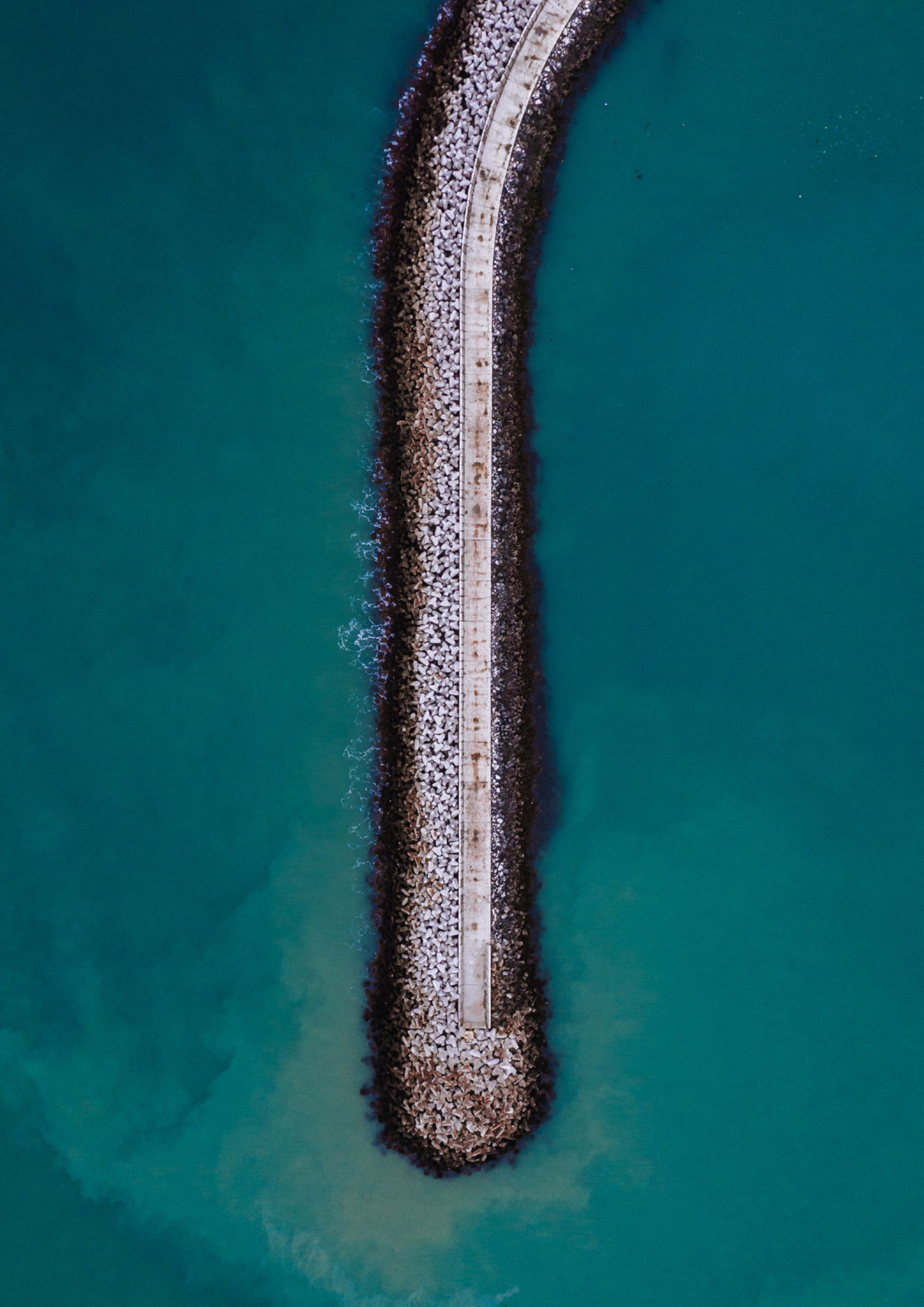

Conclusion

This report has shown that, while making substantial efforts to mitigate climate change, the world will need, to a certain degree, to adapt to the transformations that have already unravelled. The world is already 1.1°C warmer than in pre-industrial times. On the mitigation side, the Paris Agreement calls to limit warming to no more than 1.5°C, which requires an emissions reduction of 45% by 2030 and reaching net-zero by 2050. The risks of failing to do so are already translating into increasing costs for enterprises: analysts from all sectors point out that global infrastructure, supply chains, food systems, asset prices, land, and labour productivity, are already facing disruptions, damages, and risks due to extreme weather events. This report has studied what these two broad action points -adaptation and mitigation- will mean for enterprises, with a particular emphasis on SMEs. It analysed existing and potential policies and institutions to channel the green transition and what EBMOs can do to support them.

The global institutional architecture toward the net-zero economy was analysed in Chapter 1. Such global governance should create a level playing field at all levels, considering the unique challenges SMEs face in low- and middle-income economies. Policies that address existing imbalances in access to resources and know-how are the centrepiece of a supportive business environment. The global architecture of environmental policy has encountered multiple obstacles in its development since the first international environmental agreement emerged. The uncertainty about the magnitude and timing of climate impacts, as well as the uneven geographical distribution of expected damages, have proven a significant obstacle to developing a comprehensive and fair set of guidelines.

The assessment models that predict climate damage have evolved and clarified the urgency of climate action. The notion of environmental justice has developed as a core desired value of the policy at regional and international levels. At the same time, other barriers have emerged and endured. A persistent barrier is the presence of significant disparities in the potential for developing clean technologies and raising capital for green investments across countries. A related barrier is the proper regulatory and international framework to mobilize resources to achieve the abatement goals to stay within 1.5. EBMOs are uniquely positioned to bridge the gap between enterprises and policymakers, advocating for meaningful policy changes and mobilization of the resources needed to achieve them. EBMOs will also need to increase their knowledge base and be more flexible in their approach to be successful advocates for their market sectors. They will have to pay attention to the evolving science, new research, and innovations to keep their members up to date.

Climate change could cut global income by $23 trillion in 2050, accounting for 14 percent of global income. As discussed in Chapter 2, while some of these costs directly impact enterprises from changes in the physical climate, others are related to structural changes and creative destruction fostered by policies implemented to combat global warming. Moreover, the barriers to business adaptation to climate change and climate policy across regions and sectors were overviewed in Chapter 2. The analysis highlighted that across all areas, managers of large and small enterprises alike depend on satisfying the needs of a wide variety of stakeholders, including customers, suppliers, and employees. For this reason, EBMOs can help enterprises to use a collaborative approach through their multiple levels of relationships at the local level.

Concerning the challenges MSMEs face, our findings suggest that informational/lack of awareness, financial, low productivity, institutional, or even socio-cultural, are among the most relevant obstacles to building resilience. These barriers are inherent to the structure of MSMEs themselves: inadequate management practices, resource inefficiency, information barriers about opportunities of the relevant green practices, their costs and benefits, risk-aversion driven by the small scale of the enterprise, and limited access to finance. Another challenge affecting all regions is the lack of effective means to measure and evaluate adaptation measures. Some of these barriers tend to be predominant in low- and middle-income economies, where the knowledge gap is wider and adaptation initiatives are less mainstream. Hence, low- and middle-income countries need to continue building adaptive capacity. Policy mainstreaming seeks to embed adaptation measures firmly into institutional frameworks. To this

end, technical information should be made available to support planning and policy decisions, including quantitative information suitable for forecasting returns on investment and building a robust economic case for adaptation.

A comprehensive analysis of existing and potential policies and institutions to decarbonize the economy while fostering business adaptation was conducted in Chapter 3. In this respect, the International Labour Organization contends that managed well, transitions to sustainable economies can become a strong driver of net job creation and upgrading. A low carbon economy has a net cost (at 1–2% of GDP) that is small when seen as a means of reducing climate impacts. When evaluating climate policies, policymakers need to consider climate change mitigation's social and economic co-benefits. Moreover, governments can and should act from all fronts using a holistic approach and implementing a combination of carbon pricing measures, adequate regulation, public support for clean R&D, and policies to foster sustainable enterprise development. Cohesive and coordinated policy design is critical, as there are substantial complementarities to exploit. Governments should foster the development of green finance to close the massive financing gap that separates the current path of the global economy from the net-zero scenario, which will guarantee the viability of green business models.

Specialised support is necessary for MSMEs. They represent over 90% of the business population, 60-70% of employment, and 55% of GDP in high-income countries, with a potentially more significant share in less developed countries. Tailored actions include establishing one-window agencies that support SMEs in becoming greener and developing capacity building strategies to help them adopt energy-efficient practices. Government can also strengthen monitoring and evaluation of the implementation of incentives and support schemes targeting SMEs. Finally, quite intuitively, environmental regulation should differentiate between SMEs and larger enterprises.

This report presents substantial evidence of an exciting way forward to embark on the private sector, particularly MSMEs, in the green transition. It also offers an overview of the perils of not doing so. All this evidence warrants the increasing awareness of EBMOs that it is in their best interest to move on these two fronts -adaptation and mitigation- in parallel. In Chapter 4, implications, and action points, for EBMOs to support sustainable development towards a net-zero economy were reviewed. Employers and business membership organizations can advocate for changes in climate policy by getting involved in the design of new climate-based legislation, providing guidance for science-based GHG reduction target setting, and promoting the achievement of such targets. At micro level, EBMOs can promote and encourage their members to disclose and report regularly on their carbon footprints. Moreover, EBMOs can advocate for concerted action to press governments to act on climate change and support their members in greening their productive activities. We provided case studies of the successful engagement of EBMOs in climate action worldwide. On the adaptation front, EBMOs can raise awareness among members as to the existential nature of climate change and, in doing so, assuage concerns over the long timeframes involved. EBMOs can be instrumental in closing the knowledge gap by providing educational and future-oriented skills training programmes.

In sum, EBMOs are a source of support and knowledge in fostering business resilience and innovation. The required comprehensive strategies to promote green jobs and create resilient economies can only succeed with the full involvement and participation of workers and enterprises under the leadership of EBMOs.

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