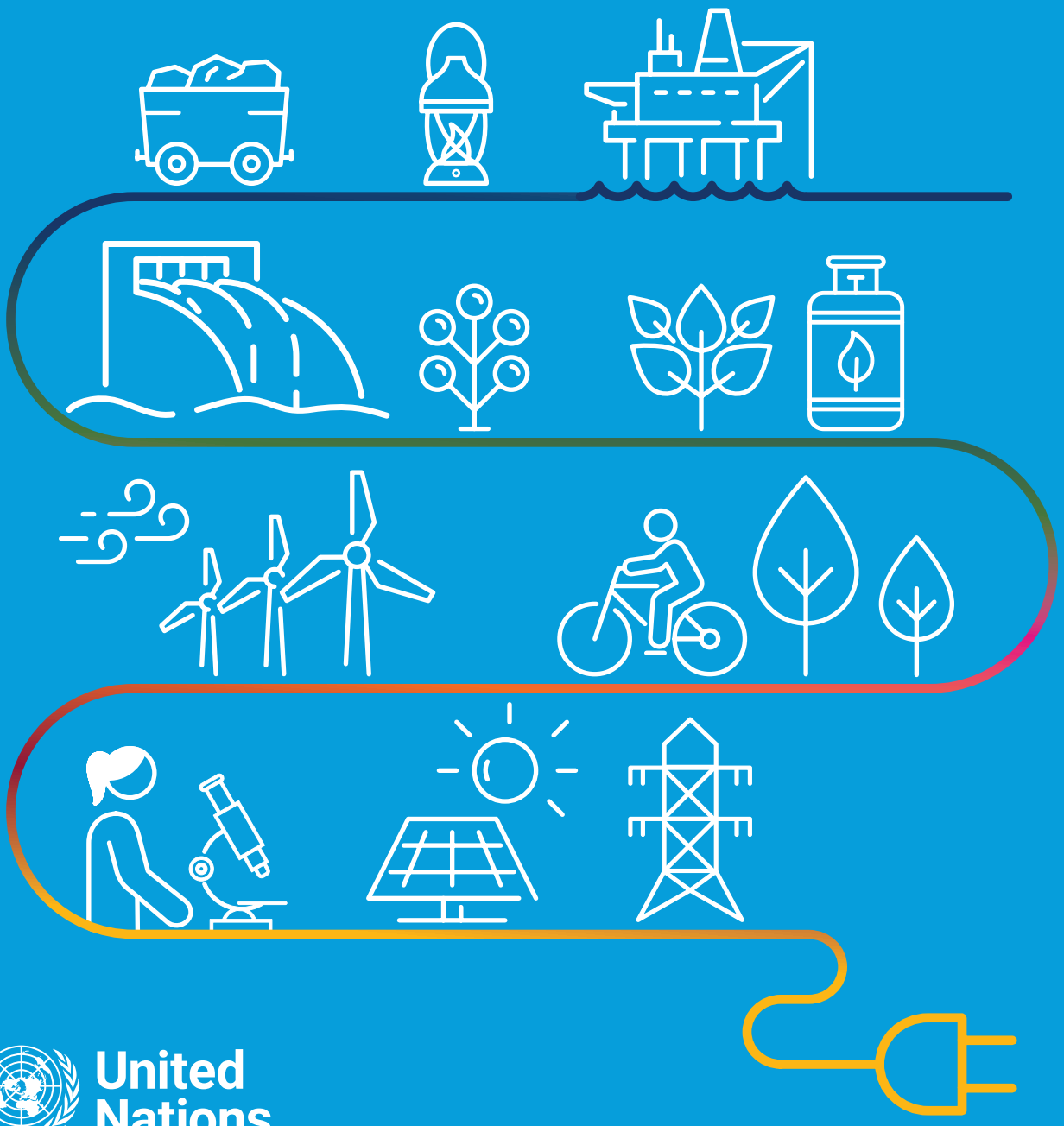
UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

COMMODITIES & DEVELOPMENT REPORT 2023

Inclusive Diversification and Energy Transition



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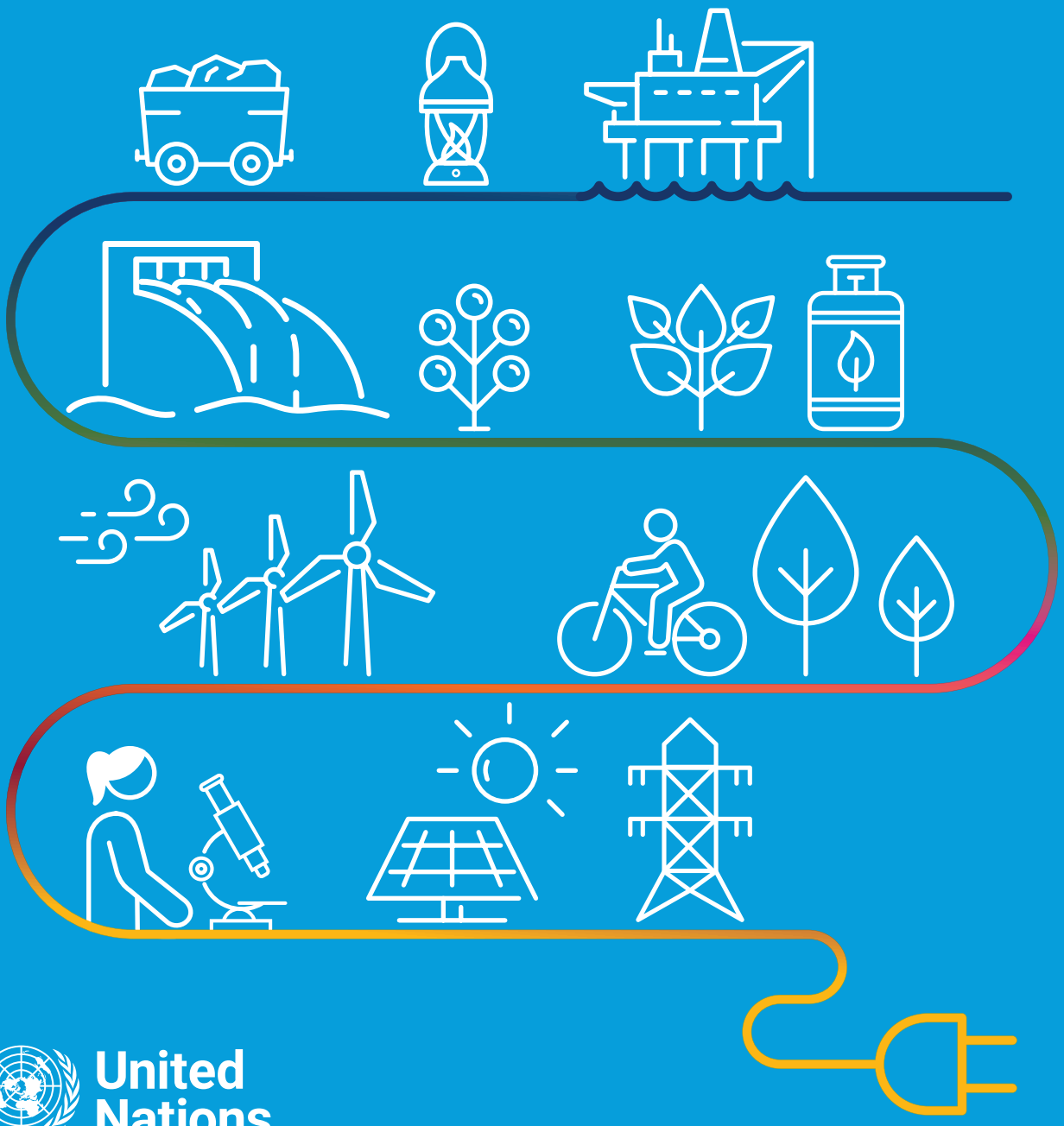

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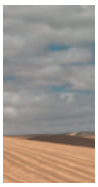
Acronyms and Abbreviations

CDDC ..... commodity-dependent developing country
CO_2 ..... carbon dioxide
COP 27 ..... Conference of the Parties
COVID-19.... coronavirus disease (of 2019)
DDC ..... diversified developing country
FAO ..... Food and Agriculture Organization of the United Nations
FDI ..... foreign direct investment
GDP ..... gross domestic product
GHG ..... greenhouse gas
GIP..... green industrial policy
HCI ..... human capital index
HDI..... human development index
IEA ..... International Energy Agency
IPCC ..... Intergovernmental Panel on Climate Change
LDC ..... least developed country
LLDC ..... landlocked developing country
LNG ..... liquefied natural gas
MNE ..... multinational enterprise
NCDDC ..... non-commodity dependent developing country
NDC ..... nationally determined contribution
NTMs ..... non-tariff measures
OECD ..... Organisation for Economic Co-operation and Development
SDG ..... Sustainable Development Goal
SIDS ..... small island developing States
SWF ..... sovereign wealth fund
tCO_2e ..... tons of carbon dioxide equivalent
UNCTAD..... United Nations Conference on Trade and Development
UN DESA .... United Nations Department of Economic and Social Affairs
UNDP..... United Nations Development Programme
UNFCCC ..... United Nations Framework Convention on Climate Change

Contents

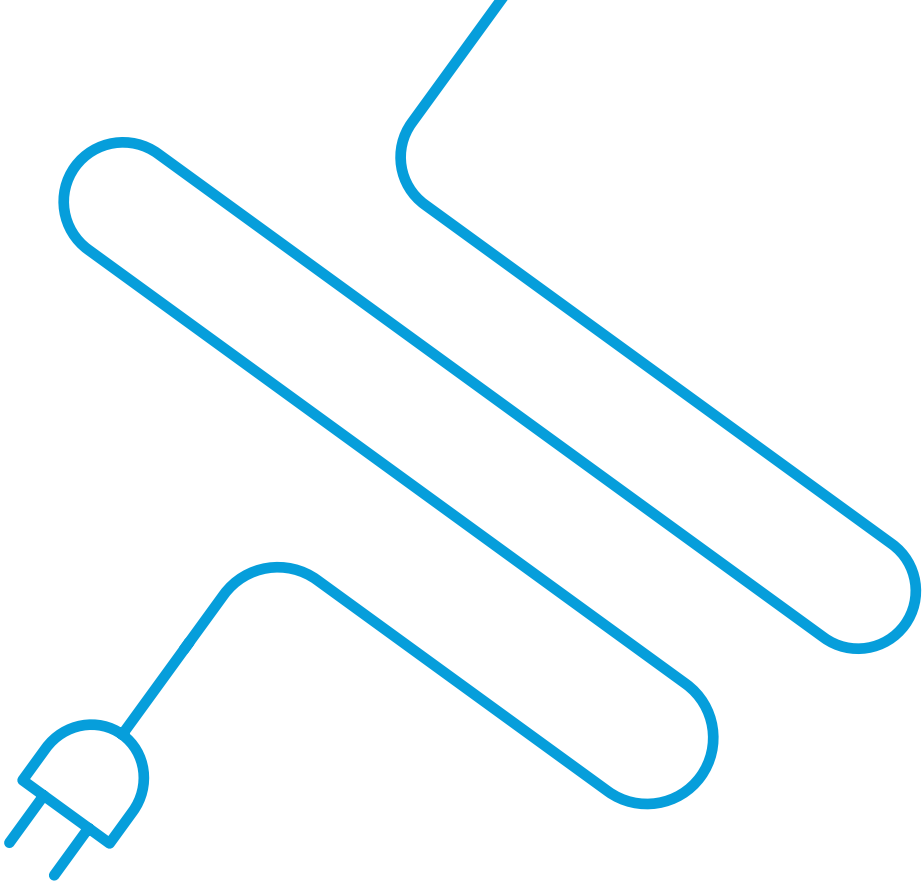


Boxes

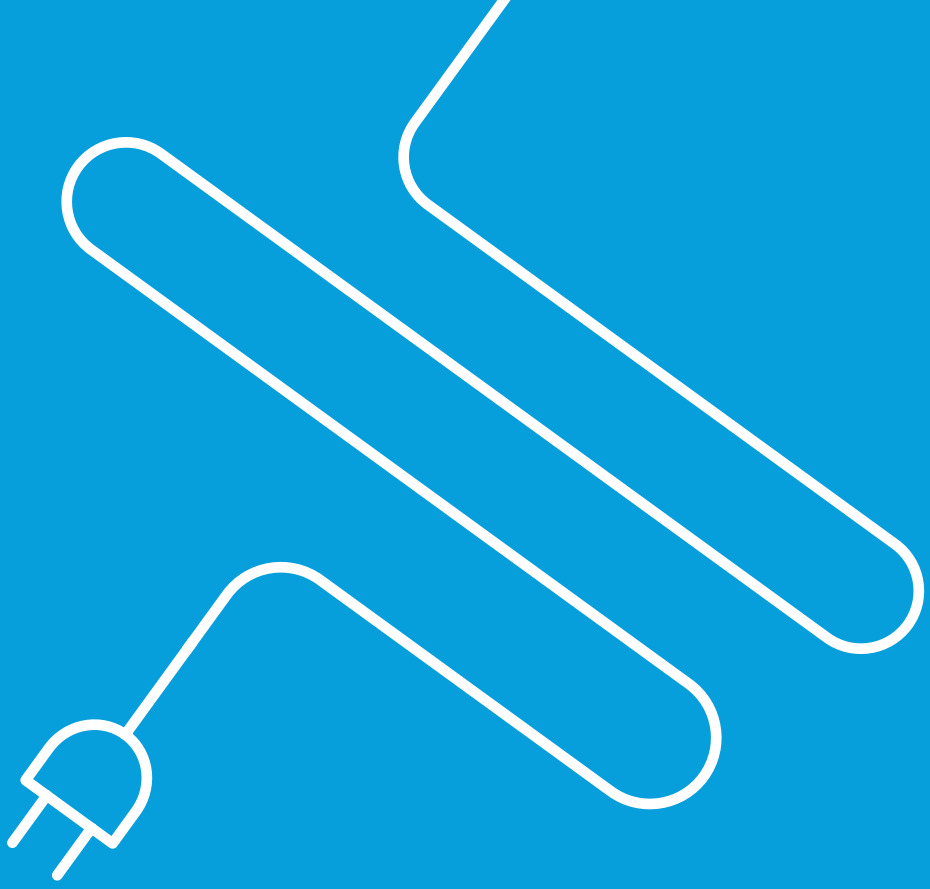
Tables

Maps

Figures



Overview



Overview

Strength through diversification

This report explores ways in which commodity-dependent developing countries can diversify their production and move up value chains to produce and export a wider variety of products – and do so in ways that are inclusive and protect the global climate.

Most economic value chains originate in commodities, such as crude oil, copper, cotton or wheat. Developing countries that depend on exporting commodities are often very vulnerable. They are, for example, exposed to fluctuations in exchange rates: a drop in commodity prices reduces export revenues in United States dollars, which tends to lower the demand for the local currency and puts downward pressure on the exchange rate. As a result of these fluctuations, commodity-dependent developing countries (CDDCs) often have volatile incomes and slow economic growth. Overconcentration of exports also affects public revenue and the potential for investing in sustainable development.

In addition, CDDCs are impacted by economic and political shocks transmitted through global commodity markets – such as those arising from the COVID-19 pandemic and the war in Ukraine – which have come on top of the climate crisis and the global energy transition. An additional challenge is that, to limit global warming to 2°C above pre-industrial levels, a significant proportion of natural resources will need to remain unused – one-third of oil reserves, half of the natural gas reserves and over 80 per cent of coal reserves.

While there are risks for commodity exporters, there are also risks for importers. Many developed and developing countries depend on imports of basic commodities such as food, fuels and fertilizers. In 2019-2021 among the 195 UNCTAD member States, 131 were net importers of basic food, 143 of fuels, and 154 of fertilizers. In highly integrated global commodity markets, supply disruptions in one region have knock-on effects around the world. For example, in 2022, reduced gas supply to Europe pushed up liquified natural gas (LNG) prices globally – with dire consequences for some Asian countries.

Diversifying exports

As the world moves to more advanced products that command higher prices in international markets, CDDCs risk falling behind. If they are to achieve the Sustainable Development Goals (SDGs) in an increasingly uncertain global economic and political environment, they will need to become more resilient – by moving along value chains and diversifying production to offer a greater variety of exports. Diversification not only insures against future market shocks, but also generates economic growth and drives structural transformation.

This diversification can take place across broadly defined economic sectors, such as an extension from agriculture to manufacturing or services, but it can also happen within sectors, such as when farmers start to produce non-traditional agricultural goods.

Diversification can thus be horizontal or vertical. Horizontal diversification typically broadens the range of production and exports. Vertical diversification can involve greater variety in a sector's value chain, such as refining crude oil to produce gasoline or petrochemicals.

Common approaches

Each CDDC will diversify according to its own priorities and capabilities, but there are common broad approaches. Successful countries have, for example, generally promoted priority sectors while making the economic environment more conducive to investment, business activity and international trade. They have also maintained stable and competitive macroeconomic conditions and built regulatory frameworks that facilitate private-sector initiatives.

Market access conditions are also a key factor in successful diversification. The challenge for CDDCs is that many trading partners impose low tariffs for commodities, but higher tariffs for goods made from those commodities, since these might compete with their own production.

A critical component of diversification is access to reliable energy services, since adding more value usually means consuming more energy. In addition, diversification requires a strong human capital base – a well-trained workforce that can seize higher-skill employment opportunities.

Diversifying imports

While reducing reliance on a few commodities for exports, developing countries also need to avoid over-reliance on imports from one or two countries – particularly for food. Some net-food-importing developing countries could increase their own agricultural output – especially those in Africa, where, in 2020, average cereal yields were less than half the global average.

To be prepared for emergencies, countries also need to build up public food stocks while strengthening safety nets and social protection. And at times of crisis, fertilizers and fuel markets must remain open – to balance food supply and demand across the globe and avoid price spikes.

Ensuring inclusiveness

Diversification brings economic benefits, but if not accompanied by inclusiveness and sustainability policies, it may have drawbacks. Producing more sophisticated products may widen inequalities if higher-skilled workers capture most of the opportunities and command higher wages. This could widen within-country disparities, which have been exacerbated by recent shocks in the economy. At the same time, diversification could create low-skilled jobs, for example, when a food-processing firm introduces a new product in the market and procures agriculture inputs from smallholder farmers.

There has been limited research on the links between diversification and inequality, and the results have been mixed. A few studies have found that rising specialization resulted in higher wages for the more skilled workers. Others have found that export diversification may expand employment opportunities to a larger share of the population.

The relationship between inequality and diversification may also be U-shaped. Initially, export diversification can widen wage gaps if it increases the demand for high-skilled labour. In the long run, however, as the benefits spread throughout the economy, there are more jobs for low-skilled workers, and inequality falls again.

This report presents an analysis of 182 countries which shows that overall export diversification is associated with greater inequality, but as diversification generates more widespread opportunities within the economy, inequality declines.

These results suggest that it may be necessary for Governments in CDDCs to consider supplementary interventions to ensure inclusive change. Governments may also need to intervene to provide public goods and increase investment in education, healthcare and skills building.

Diversifying through a climate emergency

Historically, economic development and diversification relied on the extensive use of fossil fuels. The same is true of countries that have diversified over recent decades. This report has tracked the links between greenhouse gas (GHG) emissions and gross domestic product (GDP) over the period 1980-2018. As expected, more diversified developing countries and developed countries had higher emissions than CDDCs. Emissions were lowest in sub-Saharan Africa and among low-income countries. Among CDDCs, the highest emissions were from fuel exporters. In the absence of energy transition, in general, for both CDDCs and non-commodity-dependent developing countries (NCDDCs), emissions growth seems to be increasing at the same rate as GDP, if not faster.

Developing countries aiming to emulate the traditional transition from agriculture to industry will have to achieve this under fundamentally different circumstances – notably a climate emergency. They cannot, therefore, stake their futures on fossil fuels.

They should reduce GHG emissions from economic activity by making growth less emissions-intensive without compromising their economic development. Limiting growth is not an option if developing countries are to attain the SDGs, so they need to minimize GHG emissions while taking advantage of the changing global energy landscape by reconfiguring their economic structures and energy systems.

A just transition

The Paris Agreement calls for a ‘just transition’ to a lower-carbon world that provides decent and quality jobs for the whole workforce. A just transition also requires addressing prevalent issues in energy access.

Currently, access to electricity and clean cooking fuels in developing countries is very unequal, particularly in Africa and the Asia and the Pacific region. Access to clean energy also has an important gender dimension since women are more exposed to the hazards associated with dirty energy sources.

To accelerate progress towards SDG 7, CDDCs and their development partners need to ensure universal access to affordable, reliable, sustainable, and modern energy. But this will only contribute to the green energy transition if energy sources are renewable and enable

countries to follow a new development path that avoids some of the worst by-products of industrialization, such as smog and polluted rivers.

During this transition, both CDDCs and net-commodity-importing developing countries should upgrade their value chains. For example, many CDDCs provide the raw materials for clean energy technologies – including minerals critical for energy transition, such as cobalt, lithium and copper. They should avoid getting trapped at the entry of the value chains, as has often been the case, but upgrade to higher segments of these chains.

At the same time, net-commodity-importing developing countries can diversify their sources of imports of basic commodities such as food, fuels and fertilizers – while boosting their own production, particularly of food and renewable energy, where economically viable. For this, they will need the full support of the development partners, particularly for technology transfer as well as strengthening social safety nets and emergency preparedness.

Making the transition to low-carbon energy

Efforts towards an energy transition will depend on a country's starting point, including its ability to invest, as well as existing capabilities. While technologically advanced countries may have the resources and capacities to introduce renewable technologies, low-income countries may prioritize energy access or clean cooking technologies while building capacity for developing renewable energy such as wind or solar industries. Meanwhile, fuel-exporting CDDCs may initially shift from petroleum and coal to natural gas while advancing to greener energy sources.

As diversification and economic growth boost income, countries have more resources to invest in environmental protection. Advocates of green industrialization argue that countries can minimize carbon emissions by changing production and consumption patterns, using natural resources more efficiently and minimizing pollution and environmental damage. This calls for cuts in the use of fossil fuels and huge investments in efficient and green energy. In addition to solar sources, many CDDCs have considerable potential for hydropower and wind energy and for producing and exporting green hydrogen. At the same time, countries need to protect workers and communities whose livelihoods have depended on fossil-fuel-based industries.

If a transition to a greener economy increases employment and social welfare, it is likely to be more politically and socially acceptable and thus offer a pragmatic path towards a low-GHG economy.

The energy transition may, in addition, offer a much-needed impetus for countries to address social and economic disparities. Electrification of schools, for example, allows them to use IT equipment and adopt more advanced curricula and teaching materials that enable low-income households to acquire more skills. Households would further benefit from energy access and cleaner cooking technologies, for example, freeing more women to participate in the labour force.

As a global challenge, the climate crisis requires a collective response. Given the obstacles that the CDDCs face on their path to a low-carbon future, they will need the support of development partners. This may include financial and capacity-building support, along with knowledge transfers that would allow the uptake of new low-carbon technologies.

Striking policy balances

Experience will differ from one country to another and between the types of commodities that countries depend on. Fossil-fuel-dependent economies, for example, may have more resources than agriculture-dependent economies to invest in economic transformation. The capacity to transform will also depend on the current level of emissions, the sensitivity of emissions to changes in output, and existing productive capabilities.

For lower-income CDDCs, focussing exclusively on cutting emissions may therefore constrain their development without significant emissions benefits. And since energy access is critical for human wellbeing, for these countries, it may be more realistic to concentrate on building basic capabilities and ensuring access to energy using all available sources. These countries should have priority consideration in the allocation of the current carbon budget.

If the CDDCs are to meet their development goals while decreasing emissions, they will therefore need to strike balances between traditional sources of energy and greener alternatives such as solar and wind power. Over time, the demand for green products will increase while that for traditional carbon-based products shrinks. And during this period, CDDCs should not just be buyers of green energy systems but be active participants as producers and innovators of green technologies.

Greener economies ahead

To achieve sustainable economic growth and enhance human development, CDDCs should reshape their economic structures to become more diverse, resilient, and prepared for a low-carbon future. They need to adapt their productive capabilities in the face of evolving energy and transportation systems. They should aim to develop productive capacities that foster increased productivity and prosperity while transitioning to a low-carbon economy. They should enact policies that prioritize inclusivity by creating employment opportunities and minimizing potential inequalities that may arise from that process. Green industrial policies (GIPs) are crucial in driving this transformation.

A well-designed GIP for CDDCs will:

- **Be multisectoral** – Industrial policy should extend beyond manufacturing to all sectors of the economy, including agriculture, mining and services, with a particular focus on reducing CDDCs' dependence on traditional commodities.

- **Have social goals** – Industrial policy should also be driven by societal goals, including those for climate, health, reducing poverty and inequality and creating decent jobs outside the commodity sector.

- **Collaborate with the private sector** – Instead of the traditional top-down policymaking, industrial policy should be a sustained collaboration between the public and private sectors to create the appropriate institutional environment for diversification outside of the commodity sector.

- **Guide technological change** – Industrial policy should steer technological change to non-commodity sectors that promote pro-poor, pro-environment and pro-labour activities.

CDDCs transitioning along low-emissions paths have the opportunity to start now at the beginning of the green technological revolution. If they delay, they may find themselves firmly

locked into older infrastructure and technologies, in which case the costs of greening their economies will become higher.

It is also worth emphasizing that instead of merely being consumers of green energy and relying on technology imports, CDDCs should strive to participate in the development of new technologies and productive capabilities and establish dynamic comparative advantages in green products and technologies.

Principles in practice

Instead of copying models from elsewhere, CDDCs should identify pragmatic policies suited to their levels of development and productive capabilities. These will differ from one economy to another, but could be guided by common principles.

Develop foundational capabilities – Most CDDCs will need to 'jump' from a limited set of productive capabilities into more technologically advanced production. To succeed, CDDCs will require 'foundational capabilities' that allow them to learn these new technical solutions and apply them in innovative ways. Hence, States should support research and development to build and accumulate production capabilities.

Ensure political and public support – A successful GIP needs to identify the distributional effects of structural changes and manage potential conflicts, given that reforms might have short-term costs on segments of the population. Moreover, success in such structural transformations takes years, or even decades, after the reforms have started, so they will need consistent support from the population and successive governments.

Create jobs – CDDCs typically have relatively limited high-quality employment opportunities, so the creation of such jobs should be a priority for GIP, particularly for workers in the informal sector. This could include initiatives such as providing training and support for entrepreneurship and small businesses, creating public works programmes that can develop skills, and investing in labour-intensive green technologies and related infrastructure projects.

Promote social cohesion and a just transition – Ensure GIP accounts for all segments of society and includes marginalised and under-represented groups in their design to address and prevent widening existing disparities. This should include measures targeting actors who are vulnerable to the energy transition.

Ensure gender equality – Gender equality should be an integral component of GIP design – including measures that specifically address the structural barriers faced by women in accessing the labour market, such as improving childcare, increasing access to education and training, promoting equal pay for equal work, and ensuring equal opportunities for career advancement.

Identify priority sectors and value chains

GIPs should identify priority sectors for economic diversification that offer the greatest opportunities and lowest risks. This requires an understanding of a country's current productive capabilities and sectoral opportunities. Certain sectors may offer significant export opportunities for CDDCs due to their potential for upgrading, high unit values, and favourable market conditions. The type of commodity dependence (agriculture, fuel, minerals), income level, and the export and import replacement potential of these sectors play a role in the feasibility of diversification strategies. CDDCs can also capture more value in existing value

chains. Policymakers need to consider these factors when identifying potential new sectors for economic diversification.

Seek entry points

Entry points for diversification will depend on the commodity being exported.

Fossil fuels – One option is to transfer income during boom periods into a diverse asset portfolio through commodity-based sovereign wealth funds (SWFs). However, SWFs are only effective and sustainable if they remain transparent, with strong governance and robust inflow/outflow rules.

Minerals – For important clean-technology metals such as cobalt and lithium, mining should be linked with domestic or regional value chains. The recent agreement between the Democratic Republic of the Congo and Zambia to jointly manufacture precursors to electric car batteries is an example of what CDDCs could consider doing. While developing capabilities for diversification, mineral-exporting CDDCs should promote environmental, social and governance (ESG) guidelines, and ensure equitable distribution of gains, as well as build strong institutions governing the commodity sector.

Agriculture – CDDCs that depend on agriculture can process more crops locally while shortening supply chains. This is not easy. Newcomers may need access to deep and cheap capital to compete. All countries should also seek to move to smarter agriculture – to increase efficiency and crop productivity while reducing GHG emissions.

Regional integration

Coordinated regional diversification policies can be advantageous given the small sizes of individual CDDC markets and variations in export potential across countries. By prioritizing diversification efforts in different sectors, CDDCs can expand their opportunities for linking into new supply chains and positioning themselves in the global markets. Effective policies, institutional support, and regional cooperation are crucial for creating a supportive environment that enables sustainable and inclusive economic diversification. Leveraging regional trade, particularly in Africa, where intra-regional trade is low, presents opportunities for CDDCs export diversification. For example, by utilizing regional trade agreements and partnerships, African countries can tap into the growing demand for processed products within the continent, reducing reliance on traditional commodities. Additionally, fostering regional value chains through partnerships allows CDDCs to collaborate and benefit from each other's strengths and resources, enhancing collective bargaining power and market access. Such partnerships require careful planning and management, as well as strong institutional frameworks and governance mechanisms.

International support

GIPs in most CDDCs cannot succeed without support from the international community. CDDCs and their development partners should join forces to:

Stabilize commodity markets – Introduce rules to limit speculation and implement counter-cyclical financing facilities that mitigate price shocks. To help create space for industrial policy, the international community could also consider reinstating stabilization funds to limit CDDCs' volatility of export revenues.

Combat tax evasion and illicit financial flows – In the context of ESGs, measures could include greater international collaboration to reduce tax avoidance and tax evasion while directing the global financial system towards more productive investment.

Promote technology transfer – For CDDCs to successfully transition to low-carbon development paths, they will need better access to new technologies and be able to adapt them to local contexts. There should be an international framework along the lines of the Technology Mechanism created under the United Nations Framework Convention on Climate Change (UNFCCC) to ensure the transfer of green technology to CDDCs.

Use stronger measures on trade and investment – CDDCs can stimulate transitions with targeted investments in infrastructure and research and development, and those eligible can take advantage of the special and differentiated treatment provided for in WTO rules.

Support energy transition and mitigate the consequences of stranded resources – It is unrealistic to expect CDDCs to voluntarily strand fossil-fuel resources without an alternative development path supported by the international community. International financial institutions, large multinational enterprises (MNEs), donor governments, and aid agencies could facilitate this transition.

Be supported by international funding – To implement nationally determined contributions, many countries will need international support. A regular assessment of progress and challenges could guide industrial policy and provide opportunities for mutual learning in CDDCs.

Towards a greener world

Until recently, the benefits of industrial policy and economic diversification in CDDCs were thought to be accrued primarily by these countries, offering little incentive for other economies to support this transition. Climate change has shifted that calculus: the global community stands to benefit if CDDCs succeed in transitioning along low-carbon development paths. The only way to a greener world is through mutual support and cooperation.

This report is structured as follows:

Chapter 1 – The predicament of commodity-dependent developing countries: Summarizes the status of commodity dependency, indicating the main challenges.

Chapter 2 – Strength in diversification: Commodity-dependent developing countries will need to become more resilient – by moving up value chains and offering a greater variety of exports.

Chapter 3 – Ensuring inclusiveness – Producing more sophisticated products can increase inequalities. While moving along the value chains, countries need to ensure that the benefits are widely shared.

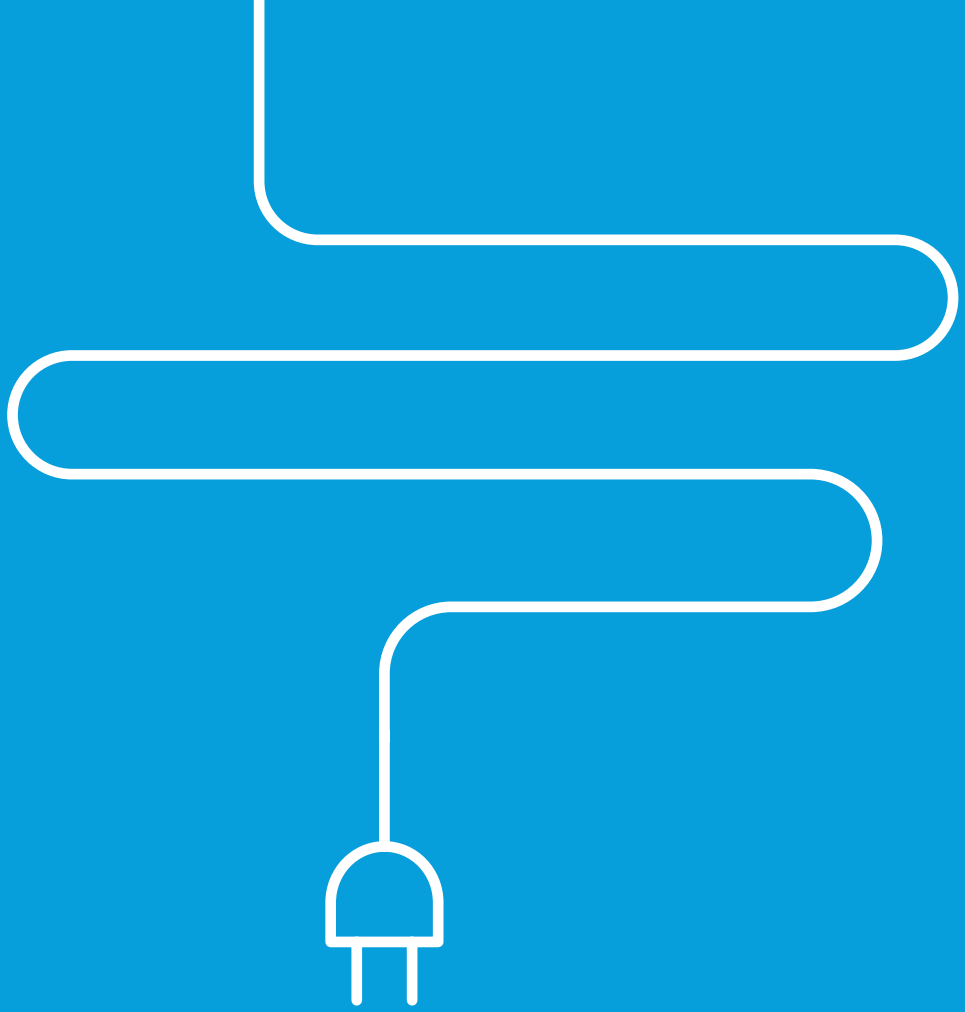
Chapter 4 – Diversifying the traditional way will have high environmental cost: CDDCs seeking 'diversification' need to carefully balance old and new sources of energy to meet the needs of current and future generations.

Chapter 5 – Greener economies ahead: This chapter considers potential future directions and argues for 'green industrial policies.'

CHAPTER

1

The predicament of commodity-dependent developing countries



1 The predicament of commodity-dependent developing countries

Commodity-dependent developing countries (CDDCs), defined as countries that derive at least 60 per cent of their total merchandise export revenues from commodity exports, have long over-relied on the extraction and export of natural resources to support their economies. While this concentration on the commodity sector has brought revenues to these countries, it has also created numerous challenges and vulnerabilities. These include macroeconomic instability, delayed industrialization or deindustrialization, the long-term declining trend of prices of exported primary commodities relative to the prices of imported manufactured goods,[1] and volatility of export revenue caused by commodity price fluctuations.[2] Many CDDCs are among the most vulnerable to the impacts of climate change, such as extreme weather events, rising sea levels, and droughts.[3] The COVID-19 pandemic and the war in Ukraine have further exposed CDDCs' vulnerabilities[4] and highlighted the urgent need for these countries to diversify their economies.

Diversification has eluded the majority of these countries for decades. In fact, most CDDCs seem to be trapped in a state of commodity dependence.[5] To make matters worse, CDDCs now have to diversify in ways never done before: through low carbon paths in the context of climate change mitigation and the energy transition.[6] This is challenging because diversification has been associated with the increasing use of fossil fuels and rising greenhouse gas (GHG) emissions.[7] Figure 1.1 illustrates this point by showing the relationship between average diversification and total GHG emissions in the past two decades. Hence, efforts to reduce global GHG emissions will undoubtedly impact CDDCs' policy space to diversify their economies and achieve the Sustainable Development Goals (SDGs). And diversifying in the context of the energy transition should be done in a way that is just and equitable rather than worsening income inequality.

If the current and emerging global context will not permit CDDCs to follow the same development model that has allowed other economies to prosper, will they be able to chart their own pathways? What will such pathways look like? And what will be the meaning of economic transformation and diversification for these economies?

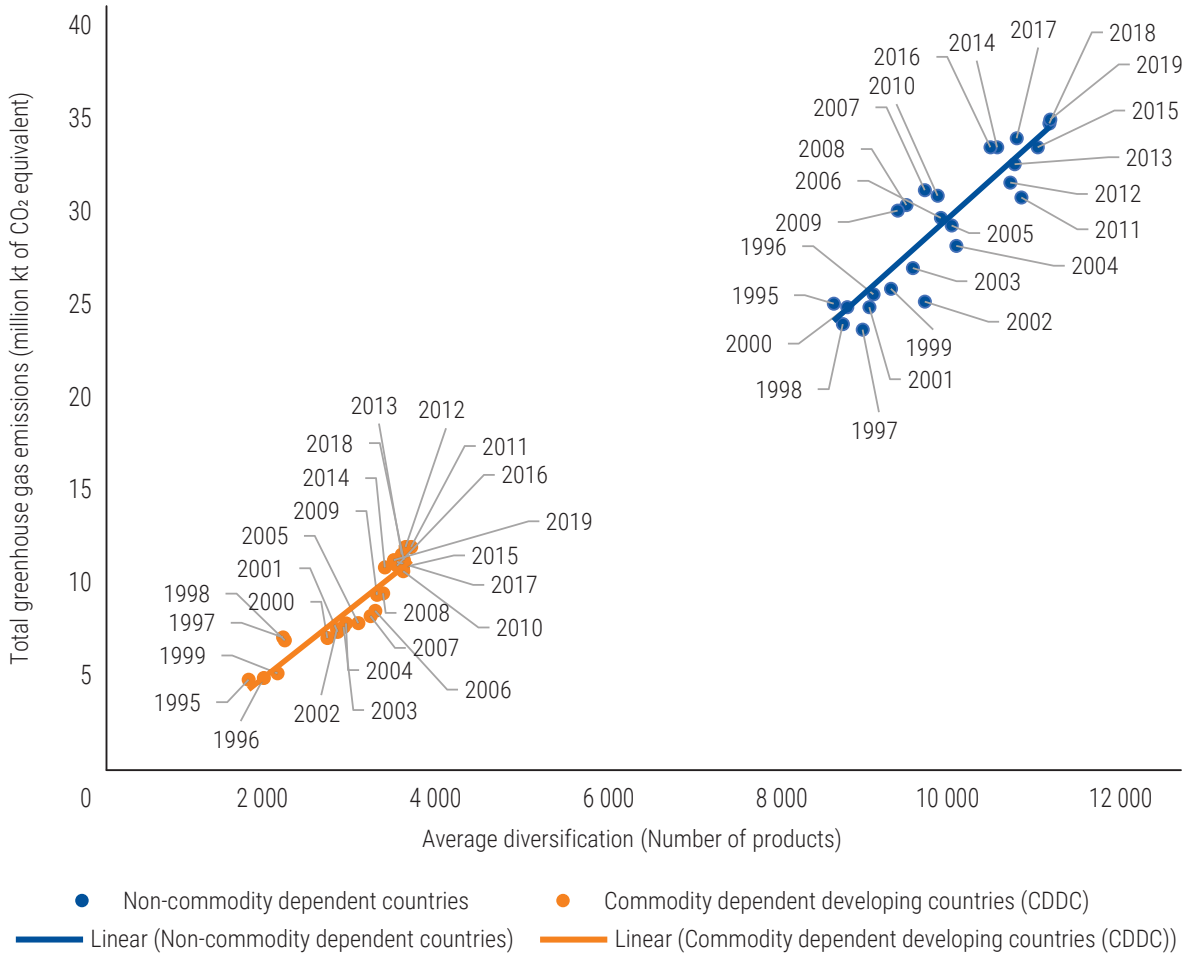
Economic and export diversification is the key to reducing commodity dependence and increasing the economic resilience of this group of countries. Diversification not only minimizes the risks associated with economic concentration but also generates faster economic growth[8] by expanding productive capacities and shifting resources from low to high-productivity sectors, and promoting economic structural transformation. Successful cases of diversification often combine various pathways, for example, by adding value to primary commodities such as producing and exporting chocolate instead of cocoa or producing a larger number of products within or outside the commodity sector. A country may also diversify by investing its financial resources into a broad set of assets to minimize risk, as is the case with Norway.[9]

To successfully diversify, CDDCs will have to deal with old and new issues that have been hampering their socioeconomic development. These include the structural barriers that have prevented them from fully realizing their potential, such as political instability, limited institutional capacity and governance, poor infrastructure, and insufficient investment in education and skills training. CDDCs will also need to embrace new technologies and business models to create more resilient and sustainable economies.[10]

While the challenges seem daunting, this might be the time, more than before, when CDDCs should focus on overcoming commodity dependence. While decarbonization and the energy transition might represent challenges, they also come with opportunities for countries that are able to harness them.

In the current paradigm, which calls for decarbonization of production and consumption, the demand for traditional high-carbon commodity exports from CDDCs, such as fossil

Figure 1.1 Diversification has been associated with higher total greenhouse gas emissions: CDDCs need to diversify through a new low carbon-path



Source: UNCTAD based on UNCTADstat database and World Bank data.

Note: Diversification shows the number of products exported based on the HS 6-digit classification, further disaggregated by unit value.

fuels, is expected to drop drastically.[11] Due to declining demand for fossil fuels in the future, such natural resources and their associated assets might become stranded. This will have a devastating effect on CDDCs dependent on fossil fuels if the global energy transition is not accompanied by inclusive diversification in these countries.

At the same time, the global shift towards renewable energy presents opportunities for countries with abundant solar, wind, and geothermal resources. Embracing a transition towards green energy sources will give distinct advantages to early adopters from the CDDC group. Green energy will be an important commodity which, if produced in large quantities, could be exported to regional and global markets. Green hydrogen could be an example.[12]

Moreover, some CDDCs with the required basic capabilities could leapfrog old technologies and develop their productive systems based on low-carbon technologies and processes. Markets will likely be moving towards consuming goods with low carbon content, and countries that can use green energy in their production systems will be well-positioned to reap the benefits of expanding markets in green products.[13] CDDCs could position their economies in such a way that they maximize the benefits derived from this new economic landscape.

While all CDDCs share challenges and opportunities, their diversification pathways will need to be tailored to country circumstances. CDDCs will need to define relevant green industrial policies (GIPs) that focus on enabling these countries to benefit from opportunities created by the global energy transition. One important element of such a policy would be its inclusivity through, for example, its capacity to create jobs that cater to the needs of different segments of the workforce.

CDDC diversification efforts are more likely to succeed if they are embraced and genuinely supported by the global community. Support can take different forms, including favourable international trade policy that provides room for developing countries' non-traditional exports, financial assistance, capacity building to acquire and use more sophisticated productive systems, and technology transfer.

Given that CDDCs' economic transformation will require an increase in energy use, often from very low bases, they will need to use all their energy resources in line with commitments under CDDCs nationally determined contributions (NDCs) in the context of the Paris Agreement, and conditional on external assistance.[14] The quicker the scaling up of this assistance, the more GHG emissions can be mitigated in these countries.

This report explores ways in which CDDCs can become more resilient by diversifying production and moving up value chains to produce and export a wider variety of products – and do so in ways that are inclusive and protect the global climate.

The commodity trap

Most economic value chains originate in commodities such as crude oil, copper, cotton or wheat. As prices fluctuate in international markets, developing countries that depend on exporting these commodities often have volatile incomes and slow productivity growth and can be politically unstable. As the world moves to more advanced products that command higher prices in international markets, CDDCs risk falling further behind.

UNCTAD considers a country to be commodity-dependent if it derives 60 per cent or more of its merchandise export revenues from primary commodities. On this basis, in 2019-2021, 95 of the 195 UNCTAD member States were CDDCs, and an additional 15 were also very exposed, with shares in the 50 to 60 per cent range.[15] Generally, CDDCs are countries at

earlier stages of development: for landlocked developing countries (LLDCs), the proportion of merchandise export revenues from primary commodities was 81 per cent; for small island developing States (SIDS), it was 61 per cent, and for the least developed countries (LDCs), it was 76 per cent (Figure 1.2).

In 38 CDDCs in 2019-2021, the dominant commodity export was agricultural goods; in 31, it was mining products; and in 30, it was energy.[16] Moreover, many CDDCs depend on a narrow range of exports or even a single commodity. For Zambia, for example, 69 per cent of merchandise exports were of copper; for Suriname, 77 per cent were of gold; and for Iraq, 91 per cent were of crude oil. Of the developed countries, however, only 13 per cent were commodity dependent.

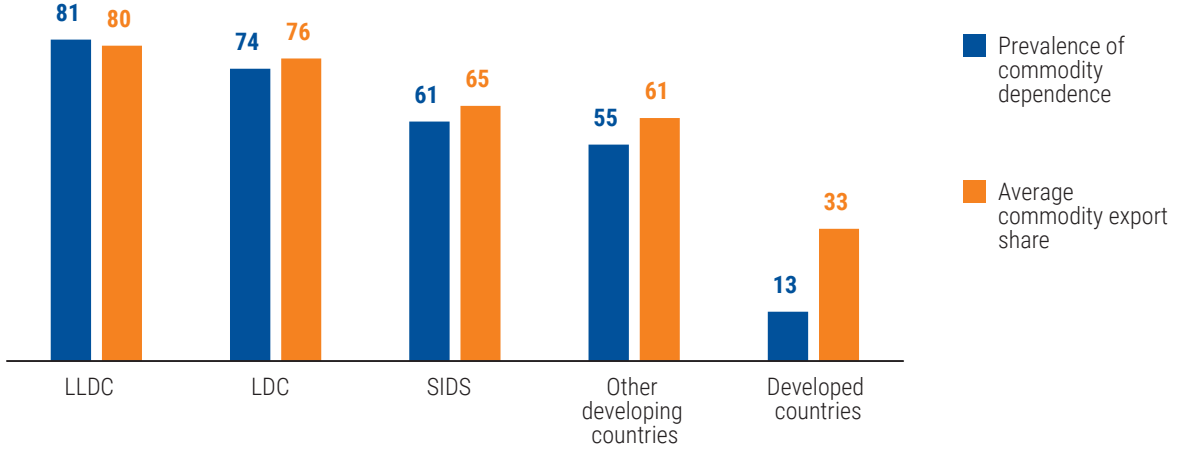
Countries dependent on commodities often experience slow productivity growth, volatile incomes, macroeconomic and political instability, and overvalued exchange rates.[17] Typically such dependence goes hand-in-hand with underdevelopment – as reflected in UNDP's human development index (HDI). For instance, in 2021, 29 of the 32 countries classified as having low human development in UNDP's human development index (HDI) were CDDCs. Low-human development countries have average commodity export shares of 82 per cent.[18]

Fluctuating revenues

Overconcentration of exports also affects public revenue and the potential for investing in sustainable development. For example, in 2020, Angola generated 51 per cent of its central government revenue from oil, a figure projected to increase in 2022 to 59 per cent. [19]

Without proper fiscal policy frameworks, this can result in volatile and unsustainable spending and fluctuations in output. One way to address this is by saving a portion of commodity revenues for future use through sovereign wealth funds (SWFs). Examples of such funds include the Norwegian Oil Fund – the largest commodity-linked SWF with over $1.1 trillion worth of assets, and the copper-based Economic and Social Stabilization Fund in Chile.[20] Such funds can also make countries more resilient by transforming wealth based on natural

Figure 1.2 Commodity dependence is more prevalent in the developing world: Commodity dependence by country group, 2019–2021
(percentage)



Source: UNCTAD based on data from the UNCTADstat database.

resources into other types of assets.

CDDCs are very exposed to fluctuations in exchange rates. A drop in commodity prices reduces export revenues in United States dollars, which tends to lower the demand for the local currency and puts downward pressure on the exchange rate. In Zambia, for instance, between July 2014 and January 2016, the price of copper per metric ton dropped from $7,113 to $4,472. Over the same period, the exchange rate of the Zambian kwacha fell from K6.14 to K11.13 per United States dollar – increasing the local currency value of external debt denominated in United States dollars.

Further recent shocks transmitted via global commodity markets have been the COVID-19 pandemic and the war in Ukraine – which have come on top of the climate crisis and the global energy transition, all of which are affecting patterns of production and consumption. These disruptions have hit hardest at vulnerable developing countries – but particularly at CDDCs, many of which rely on the export of one commodity group, such as fuels, while also being net importers of other basic commodities, including food. In 2020, according to the Notre Dame Global Adaptation Initiative, all the 25 countries most vulnerable to climate change impacts were CDDCs.[21]

Left with stranded assets

In addition, many CDDCs that depend on fossil fuel exports will suffer from a rapid decarbonization of the global economy. This could leave them with 'stranded assets' – resources that have lost their value or become liabilities, such as abandoned oil fields or equipment. CDDCs that depend on the export of crude oil, natural gas and coal fossil fuels will need to prepare for shrinking markets.

One estimate suggests that, to limit global warming to 2°C above pre-industrial levels, a significant proportion of fossil fuel reserves will need to remain unused – one-third of oil reserves, half of the natural gas reserves and over 80 per cent of coal reserves.[22] In Africa, for example, this comprises 28 billion barrels of oil, 4.4 trillion cubic metres of natural gas and 30 gigatons of coal. In Central and South America, it comprises 63 billion barrels of oil, 5 trillion cubic metres of natural gas and 11 gigatons of coal. Even more assets would need to be stranded to achieve the 1.5°C target: to have a 50 per cent probability of reaching the 1.5°C target by 2050 would leave unextracted 58 per cent of oil reserves, 56 per cent of gas reserves, and 89 per cent of coal reserves.[23, 24] These proportions would be even higher if the 1.5°C target is to be reached with a probability higher than 50 per cent.

The 1.5°C target might already be out of reach, but the global energy landscape is nevertheless undergoing a profound transformation. The latest forecasts of the International Energy Agency for the first time show that global fossil-fuel demand is peaking.[25] Under current policies, coal use would drop within the next few years, natural gas demand would plateau by the end of the 2020s, and oil demand would peak in the mid-2030s. If countries follow through on their climate pledges, fossil fuel demand would drop even faster. This is already reflected in lower investment in fossil fuels: between 2019 and 2022, investment in upstream oil and gas fell by 17 per cent to around half its 2014 level.[26]

Fossil fuels will remain part of the global energy mix in the coming decades, but the mid-to long-term trends show slackening demand.

Risks for commodity-importing countries

While there are risks for countries that depend on commodities for exports, there are also risks for commodity importers. Many developed and developing countries depend on imports of basic commodities such as food, fuels and fertilizers. In 2019–2021 among the 195 UNCTAD member States, 131 were net importers of basic food, 143 of fuels, and 154 of fertilizers.[27] And of the 95 CDDCs, 73 were net importers of basic food, 60 of fuels and 79 of fertilizers. And 42 were net importers of all three basic commodity groups.[28]

International trade helps to balance the global supply and demand of commodities and provides more diverse food. But, as demonstrated after the onset of the war in Ukraine, import dependence is also a risk. For example, in 2021, Egypt sourced 75 per cent of its wheat imports from the Russian Federation and Ukraine; Mexico sourced 98 per cent of its maize imports from the United States of America; and Nepal sourced 99 per cent of its rice imports from India.[29]

In mid-2020, as national economies started to rebound from the shock of the COVID-19 pandemic, supply chains could not keep pace, and commodity prices started to rise (Figure 1.3). Commodity production also depends on supplies of energy, so prices were also driven up by high energy prices. At the same time, there were increases in the cost of transport, notably for container freight.[30]

The broad-based upward trend in commodity prices was given a boost by the start of the war in Ukraine, which affected basic food items such as wheat and sunflower oil, as well as fertilizers and fossil fuels. In 2021, the Russian Federation and Ukraine jointly accounted for 27 per cent of global wheat exports, according to figures in UNCTADStat database. Supplies were also affected when commercial vessels were prevented from leaving Black Sea ports after the war started. Net importers of food faced not just rising prices but also increasing uncertainty in supplies, especially in countries that depended on imports coming through Black Sea ports, including many LDCs. Some countries responded by restricting exports of wheat and other grains, which further exacerbated the situation.

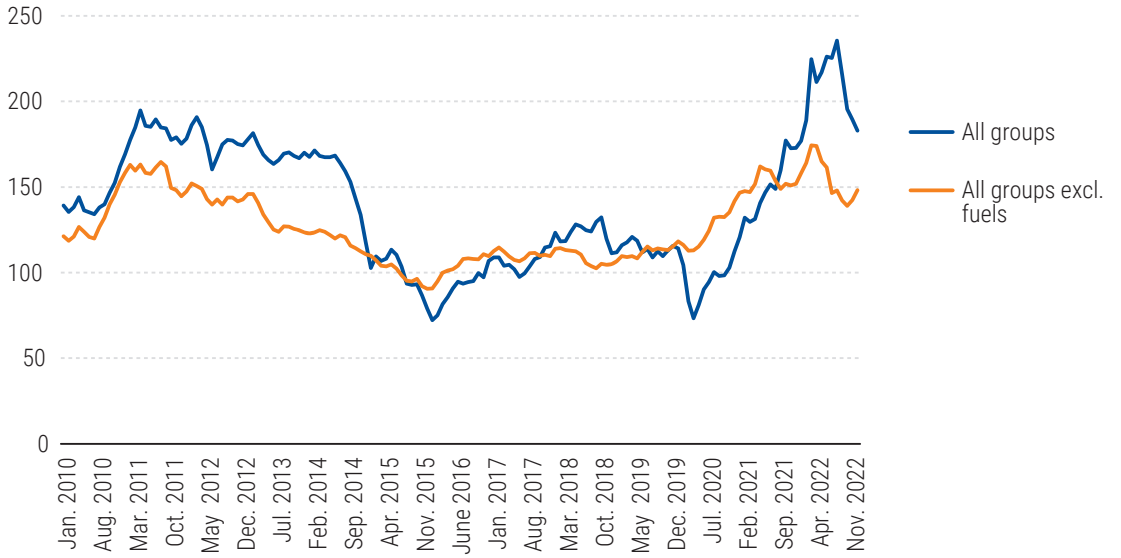
Between 2021 and March-April 2022, after the start of the war, the price of wheat rose by 56 per cent and that of sunflower oil by 65 per cent. Over the same period in Europe, prices of natural gas, for which the Russian Federation was the main supplier, increased by 131 per cent (Figure 1.4).

Prices of food started to fall after the Black Sea Grain Initiative was signed by the Russian Federation, Türkiye, Ukraine and the United Nations, which facilitated exports of food items and fertilizers from Ukraine and the Russian Federation.[31] Between 3 August 2022 and 5 March 2023, 23 million tons of grain and other food products were exported.[32]

Nevertheless, as of January 2023, many commodity prices remained higher than before the COVID-19 pandemic. Between 2019 and 2023, the price of wheat increased by 89 per cent and that of sunflower oil by 64 per cent. Also worrying for food production and supplies is the high price of fertilizers: over the same period, the average monthly price of urea increased by 81 per cent and that of potassium chloride by 120 per cent (Figure 1.5).

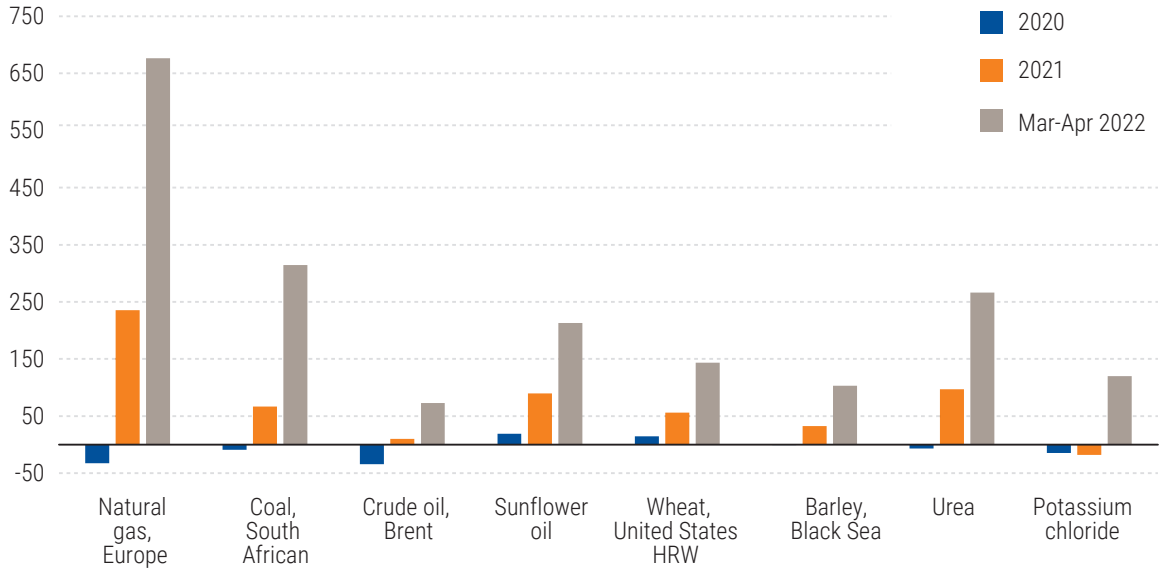
The price hikes since mid-2020 created a significant problem for net-commodity-importing developing countries – which were faced with higher import bills, inflationary pressures and rising levels of debt. This hit particularly hard at the poor, who tend to spend a higher share of their incomes on food – so that in 2022 the number of acutely food-insecure people hit a record of 349 million.[33] In 2022 and 2023, for the 48 most-affected countries, higher food and

Figure 1.3 Commodity prices rose sharply amidst the COVID-19 pandemic: UNCTAD commodity price index, excluding fuels 2010-2022
(2015=100)



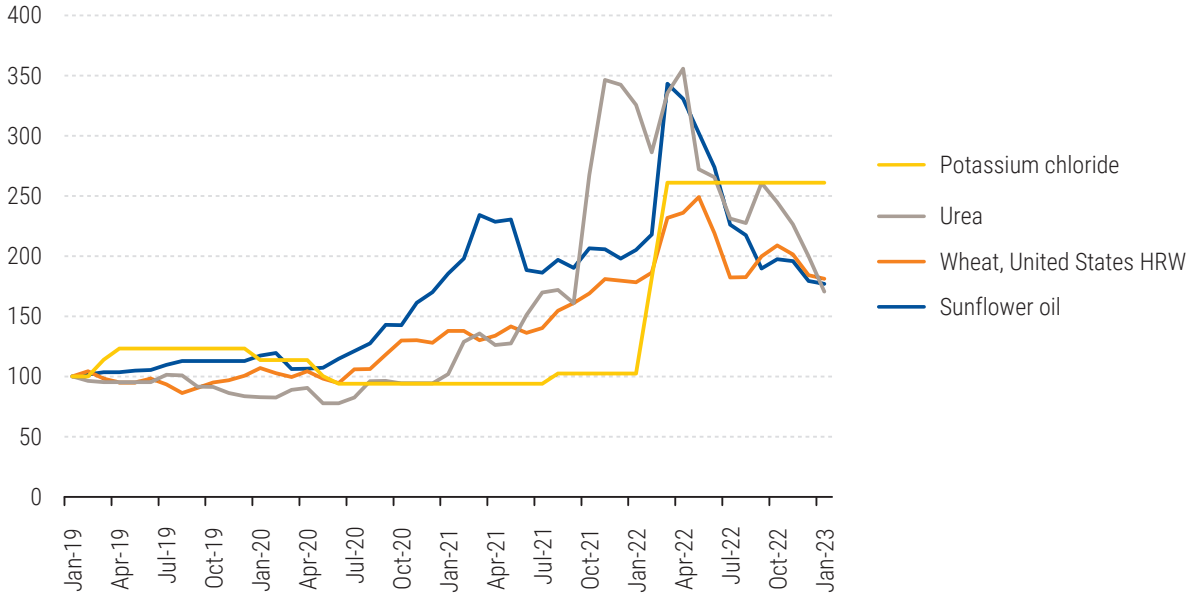
Source: UNCTAD based on data from UNCTADStat database.

Figure 1.4 The commodity price shock in early 2022 came on top of a rising price trend: Price changes from the 2019 average, selected commodities
(Percentage)



Source: UNCTAD based on data from FAO and the World Bank.

Figure 1.5 Food and fertilizer prices remain high: Food and fertilizer prices, index January 2019 – January 2023
(Average 2019 =100)



Source: UNCTAD based on data from the World Bank.

fertilizer prices raised import bills by $9 billion, and governments had to spend $5 billion–$7 billion to protect vulnerable households.[34] There is also an important gender dimension: in 2019, women were 13 per cent more likely than men to experience either moderate or severe food insecurity[35] – a gap that widened in 2020 and 2021 during the COVID-19 pandemic.[36]

In combination with rising energy prices, the world faces a cost-of-living crisis.[37] In Rwanda in January 2023, for example, year-on-year nominal food inflation was 41 per cent,[38] and in Ghana, it was 61 per cent.[39] Many net commodity-importing developing countries were also affected in 2022 by a depreciation of their currencies against the United States dollar – the main invoicing currency in international trade.[40]

In highly integrated global commodity markets, supply disruptions in one region have knock-on effects around the world. For liquified natural gas (LNG), for example, as the technology and infrastructure have been extended to more countries, the market has become more integrated. In 2022, reduced pipeline flows from the Russian Federation to Europe pushed up LNG prices globally – with dire consequences for some Asian countries. Pakistan, for instance, was forced to shut down gas-fuelled power plants, causing widespread blackouts.[41] Bangladesh had to stop purchasing LNG on the spot markets in 2022 and faced an energy crisis and power outages.[42] Higher LNG prices have also encouraged countries to turn to coal and oil – undermining global efforts to reduce GHG emissions. For example, Germany reactivated and prolonged the operation of coal-fired power plants to boost supply in 2022.[43]

Endnotes

1 Prebisch, 1950; Singer, 1950

2 UNCTAD, 2021d

3 UNCTAD, 2019a

4 Including in the form of inflation, food insecurity, and unsustainable debt levels (UNCTAD, 2022h).

5 UNCTAD, 2021d

6 The energy transition is generally understood as the process of moving away from fossil fuel sources of energy, namely coal, oil, and natural gas, towards low-carbon energy sources, including solar and wind energy sources. The increasing use of lithium-ion batteries also contributes to the energy transition.

7 See, for example, Wang et al., (2020), Iqbal et al., (2021), and UNCTAD (2023a).

8 Empirical research establishes a strong link between economic diversification and growth, particularly export-led diversification e.g., Hausmann et al., 2007; Agosin, 2009; Freund and Pierola, 2012.

9 In this report, diversification is used to mean any or all its associated concepts discussed here, depending on the context.

10 UNCTAD, 2021d

11 For example, in developing countries, international investment in fossil fuels power generation and extraction has declined by half from 2019 to 2022 (UNCTAD, 2023b).

12 UNCTAD, 2023a

13 For example, a recent report found significant price premia being paid for green upstream products such as green plastic or green steel (WEF and Boston Consulting Group, 2023).

14 UNCTAD, 2019a

15 Data are not available for Monaco, San Marino and the Holy See; trade data for Liechtenstein are reported together with data for Switzerland.

16 For two CDDCs it is not possible to identify the dominant commodity group in a consistent way, see Osakwe and Solloder (2023) for details.

17 See, for example, references in UNCTAD (2021d).

18 UNDP, 2022

19 Calculation based on data in IMF (2022).

20 See data on SWF's assets under management: https://globalswf.com/ranking (on 16 May 2023, the Norwegian Oil Fund was the largest in the world).

21 The ND-GAIN vulnerability score includes indicators on biophysical exposure, adaptive capacity and sensitivity, i.e. the extent to which a country is dependent upon a sector negatively affected to by climate hazard. Available at: https://gain.nd.edu/our-work/country-index/, accessed 1 December 2022.

22 McGlade and Ekins, 2015

23 Welsby et al., 2021

24 In Africa this would comprise 51 per cent of current oil reserves, 49 per cent of natural gas reserves and 86 per cent of coal reserves in Africa. In Central and South America, it would comprise 73 per cent of oil, 67 per cent natural gas reserves, and 84 per cent of coal reserves.

25 IEA, IRENA, UNSD, World Bank and WHO, 2022

26 Ibid

27 countries in which imports are greater than exports, in value terms.

28 Also, at global level, food security depends to a large extent on a few key staples. For example, wheat, rice and maize jointly accounted for 41 per cent of food calories in 2018-2020 according to data in FAOStat.

29 Based on data from UNCTADStat database.

30 UNCTAD, 2022g

31 UNCTAD, 2022i

32 https://unctad.org/a-trade-hope-2

33 WFP, 2022

34 Rother et al., 2022

35 FAO; IFAD; UNICEF; WFP; WHO, 2020

36 FAO; IFAD; UNICEF; WFP; WHO, 2022

37 UNCTAD, 2022h

38 National Institute of Statistics of Rwanda, 2023

39 Ghana Statistical Service, 2023

40 UNCTAD, 2022; Boz et al., 2022

41 Bloomberg, 2022

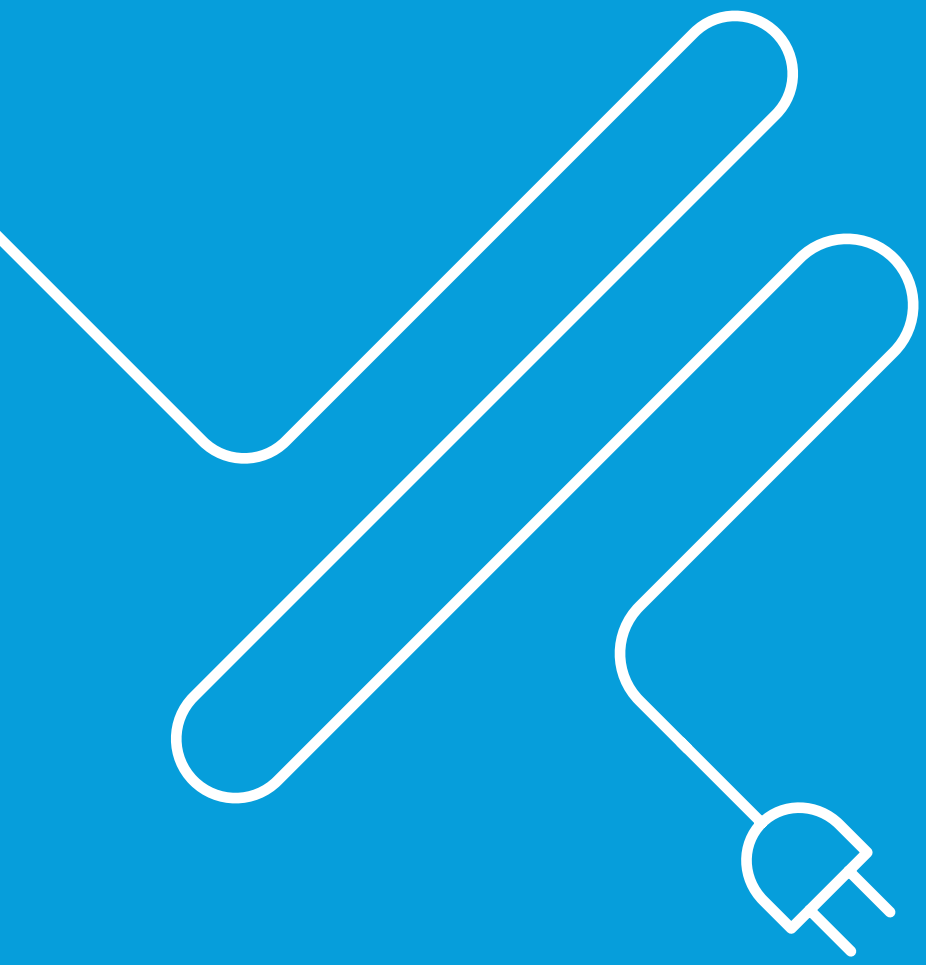
42 Reuters, 2022a

43 Reuters, 2022b

CHAPTER

2

Strength in diversification



2 Strength in diversification

This chapter delves into the crucial topic of economic diversification, specifically focusing on its significance for CDDCs. It highlights the traditional drivers of diversification, such as human capital development, competitive industries, and reliable infrastructure, including access to energy and information and communication technologies (ICTs). Despite the dynamic and ever-evolving nature of economies worldwide, these traditional drivers of economic diversification continue to be of utmost relevance for CDDCs. By analysing successful cases of diversification and addressing key challenges, the chapter offers insights into how CDDCs can navigate the complexities of diversification to foster sustainable and resilient economies.

If CDDCs are to achieve the Sustainable Development Goals in an increasingly uncertain global economic and political environment, they will need to become more resilient – by moving along value chains and diversifying production to offer a greater variety of exports. Diversification not only insures against future market shocks, but also generates economic growth and drives structural transformation.

To become more resilient, CDDCs will need to produce more varied products and exports.[1] Diversification is thus associated with structural transformation – reallocating labour and capital across sectors, industries, and firms to produce a wider assortment of goods and services. This reallocation can take place across broadly defined economic sectors, such as a shift from agriculture to manufacturing or services, but it can also happen within sectors, such as when farmers start to produce non-traditional agricultural goods.

Directions for diversification

Diversification can be horizontal or vertical. Horizontal diversification typically broadens the range of production and exports. Costa Rica, formerly a CDDC, for example, has established new industrial sectors and is exporting medical instruments and semiconductors. Or diversification can be vertical, involving greater variety in a sector's value chain, such as refining crude oil to produce gasoline or petrochemicals or using locally mined cobalt, nickel and manganese to make and export precursor materials for batteries. On a smaller scale, local companies can process raw agrifood commodities such as cocoa beans into cocoa butter. CDDCs can also diversify their markets – by increasing the range of countries to which they export.

CDDCs have significant potential for structural change through both manufacturing and services.[2] As agriculture becomes less labour-intensive, some agricultural workers can move to the manufacturing sector, which can absorb low-skilled workers and produce more tradeable goods for exports.[3] At the same time, diversification should expand the services sectors, with a focus on dynamic, high-productivity, and tradeable activities.

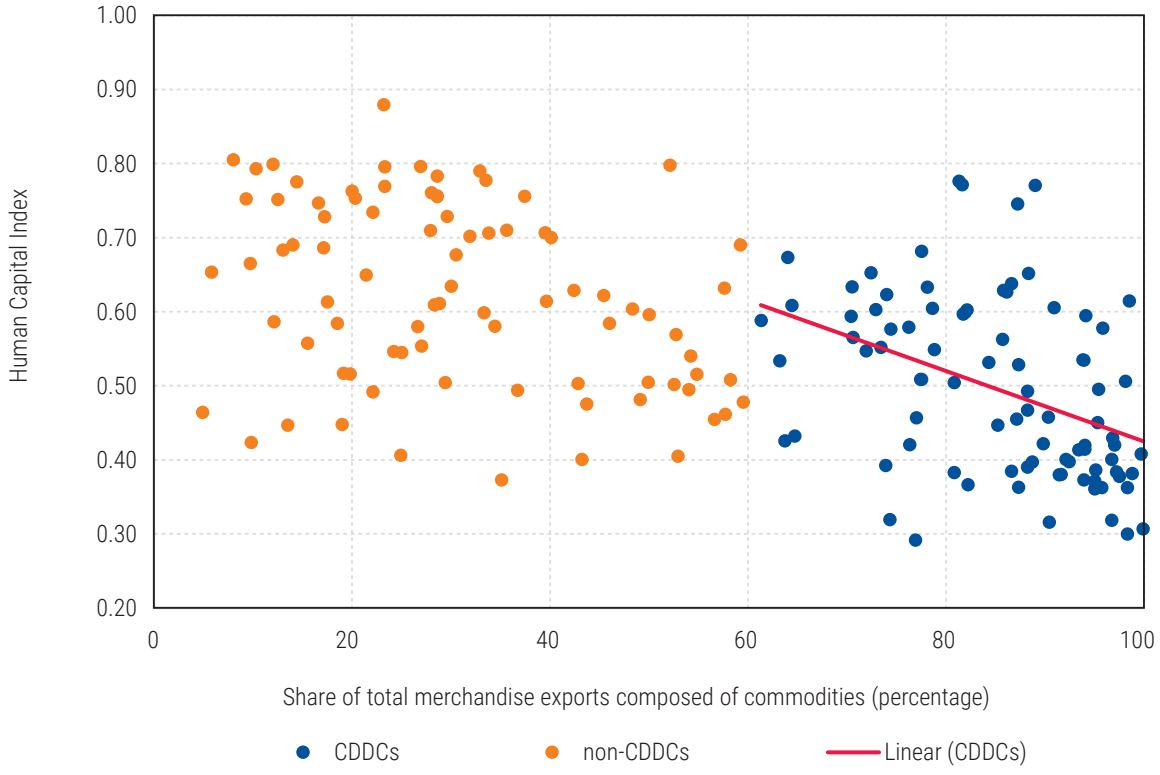
Enablers of diversification

Each CDDC will diversify according to its own needs, but there are some common broad approaches. Successful countries have, for example, first targeted priority sectors while making the economic environment more conducive to investment, business activity and international trade.[4] They have also maintained stable macroeconomic conditions and built regulatory frameworks that facilitate private-sector initiatives.

In addition, diversification requires a strong base of human capital – a well-trained workforce that can seize higher-skill employment opportunities. And there is empirical evidence of the importance of education for diversification.[5] To measure a country's strengths in this respect, the World Bank has produced a composite human capital index (HCI). Non-CDDCs have an average HCI of 0.63, while CDDCs have an average HCI of 0.48.

Figure 2.1 plots the HCI against each country's share of commodities in merchandise exports – indicating a more general negative correlation.[6] In Costa Rica, for example, an educated workforce with high technical skills has attracted high-tech companies.[7] Similarly, in Gabon, the International Multisectoral Centre for Vocational Education and Training, established in 2021, provides training in competencies such as mechanical engineering and computer maintenance.[8]

Figure 2.1 Commodity dependence and low human capital often go hand-in-hand: Commodity dependence, 2019–2021, and the quality of human capital, 2020



Source: UNCTAD based on data from the World Bank and the UNCTADstat database.

Note: The human capital index is available for 171 United Nations Member States.

Market access conditions are also a key factor in successful diversification. Many countries impose low tariffs for commodities but higher tariffs for goods based on those commodities. Such 'tariff escalation' is more common in manufacturing than in agriculture and can be found in both developed and developing countries and for imports of apparel, animal products, tanning and light manufacturing – as well as for food products.[9] Hence, tariff escalation in manufacturing could be a contributing factor to the lack of industrialization in CDDCs and poses an obstacle to export diversification. Tariff peaks that are often concentrated in agricultural goods, such as food products, can also limit the scope for export diversification in these countries. In this regard, it is important that trade liberalization under the framework of the World Trade Organization continues to address, through trade negotiations, the issue of tariff escalation and tariff peaks faced by many CDDCs. In addition, these countries should include in diversification strategies a detailed analysis of the tariff structure they face in export markets, as well as opportunities arising from existing trade preferences, such as under the Generalized System of Preferences and other schemes, given country-specificities that need to be taken into account.

Exports of goods from CDDCs can be further impeded by non-tariff measures (NTMs), which are generally more pervasive and present higher barriers.[10] NTMs include technical requirements and sanitary and phytosanitary measures. For agrifood products, NTMs can take the form of quality standards, food safety regulations, as well as requirements on labelling and traceability. Such measures raise compliance costs and further stretch limited administrative capacities of CDDCs.

To address NTMs, developing countries and their development partners need to boost product quality and safety, improve domestic infrastructure, and build national capacity to reduce the costs of trade, such as customs clearance. In addition, the trading partners of CDDCs should remove unnecessary NTMs and increase transparency by offering companies clearer information on regulations and requirements. Diversification and upgrading will often mean importing capital goods such as machinery and inputs, for which CDDCs can reduce import tariffs to zero.

Diversification and value upgrading also depend on the availability of capital goods and inputs for new and higher value-added products. In this context, a lack of competition in domestic input markets can compromise the competitiveness of exporters in international markets and needs to be addressed through an appropriate competition policy response. For example, there is evidence suggesting that, in Malawi and the United Republic of Tanzania, a lack of competition led to markups of the price of fertilizers, an essential input.[11] Key services such as transportation and telecommunications can also be subject to anticompetitive behaviour, resulting in lower quality standards and higher prices and thereby hindering the competitiveness of firms that depend on these services. A strong competition authority that effectively prosecutes collusion and other anticompetitive behaviour can help maintain efficient input markets and thereby strengthen the competitiveness of exporting firms in CDDCs.

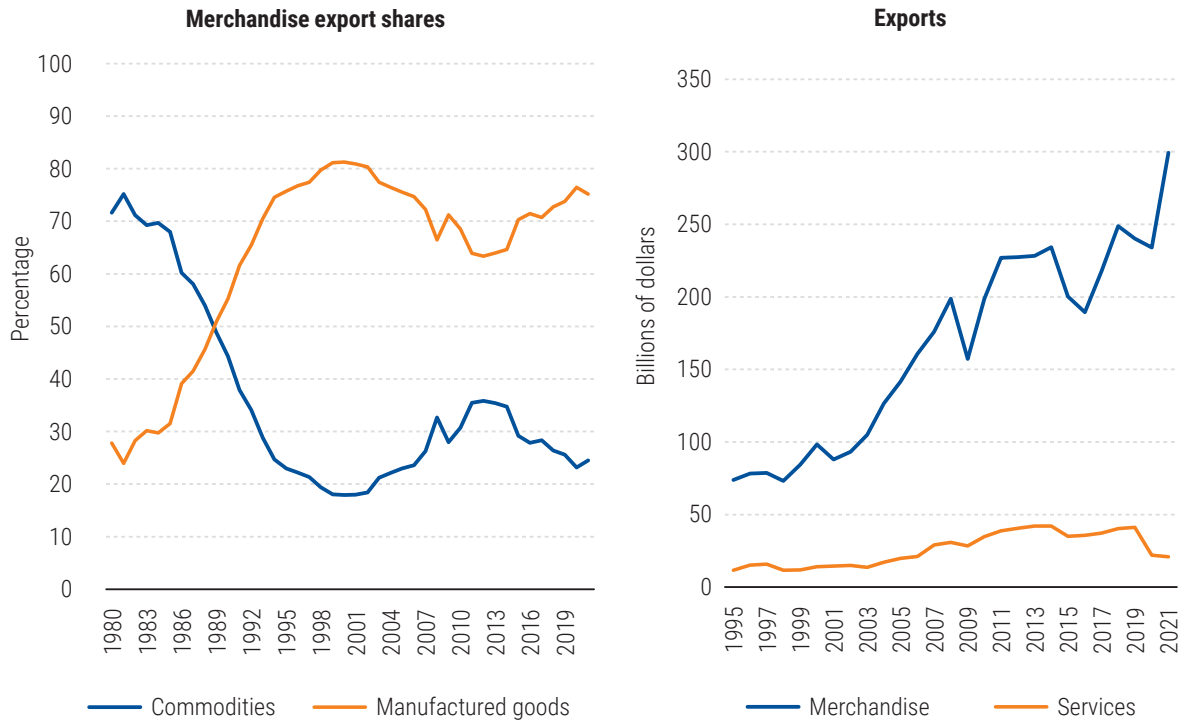
Another key requirement is good physical infrastructure, including roads, ports and airports. This is a major concern for CDDCs, particularly the landlocked developing countries (LLDCs) that must export most goods through neighbouring countries. Links with global markets can therefore be improved through regional integration – as through the implementation of the African Continental Free Trade Area.

Some countries are diversifying by creating special economic zones (SEZs) where business and trade laws are different from those in the rest of the country. In 2019, across 147 economies, there were nearly 5,400 SEZs.[12] Such zones need to be carefully designed to correspond to local conditions and international economic trends and have good electricity and telecommunications services and connections to transport routes.[13] And they need to connect well with the rest of the economy and spread knowledge and innovation beyond SEZ borders – through partnerships between governments, international institutions, and local firms. Such measures could include capacity building and training programmes and networking events where local suppliers can make links with foreign firms. In Ethiopia, for example, there has been success in linking some industrial parks with local suppliers for the garment industry.[14]

Malaysia moves on from rubber and tin

Malaysia provides a good example of manufacture-led diversification. In 1980, primary commodities accounted for 72 per cent of merchandise exports, mainly rubber and tin ores.[15] From the 1980s, the Government promoted both vertical and horizontal diversification and value upgrading – by promoting foreign direct investment (FDI), creating industrial clusters and funding research and development. The result was sustained growth in manufacturing, particularly electronics. At the same time, Malaysia stepped up the value-added for commodities such as rubber (Figure 2.2). As a result, Malaysia is now among the top global exporters of

Figure 2.2 Malaysia is a successful case of manufacture-led diversification: Malaysia, commodities in total merchandise exports, 1980–2021, and exports, 1995-2021



Source: UNCTAD based on data from the Department of Statistics Malaysia (merchandise export shares) and UNCTADstat database (Exports).

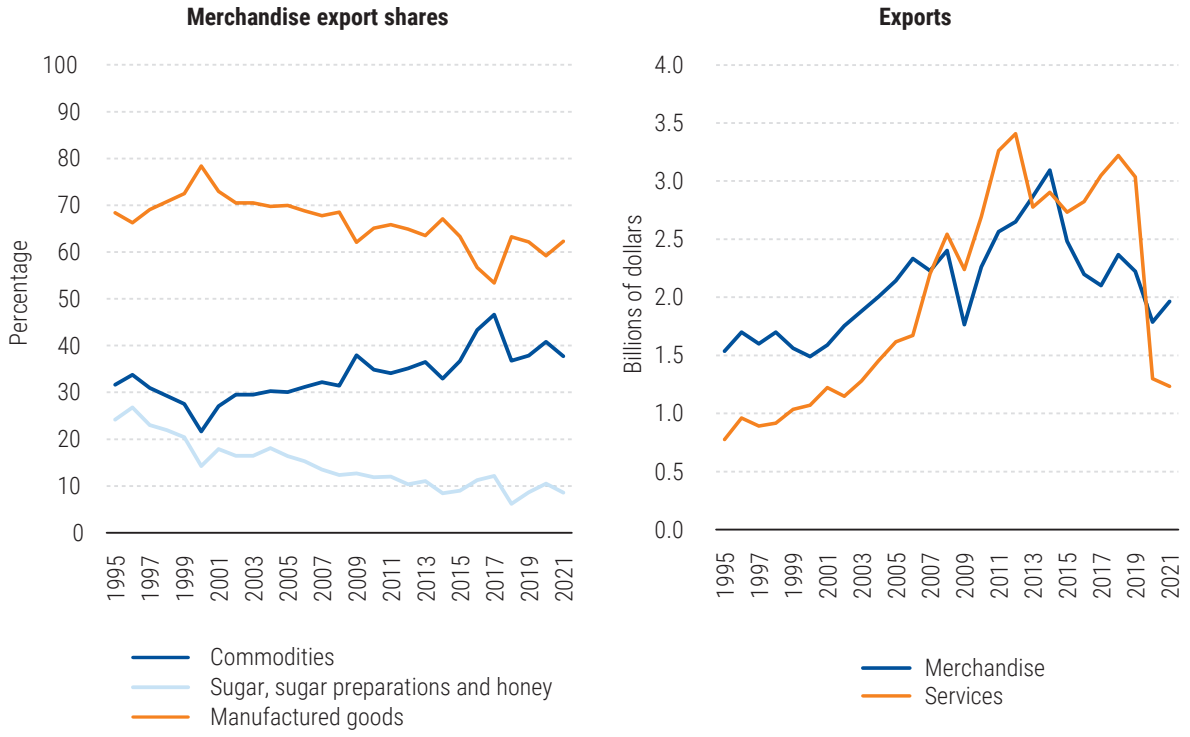
Note Commodities correspond to SITC sections 0 to 4; manufactured goods correspond to SITC sections 5 to 8.

surgical gloves, which in 2021 generated $455 million in export revenue. In addition, Malaysia had oil resources that it was able to convert into petrochemicals.[16] The overall result has been a deep structural transformation. Between 1982 and 2000, the share of employment in agriculture fell from 31 to 17 per cent, while that in manufacturing increased from 16 to 23 per cent. Commodity exports became less significant: between 1980 and 2000, their share of total merchandise exports dropped from 71 to 18 per cent.

Mauritius sees beyond sugar

Mauritius is a good example of how to upgrade and add value in both manufacturing and services. At independence in 1968, 90 per cent of merchandise export revenue was generated by raw sugar and molasses.[17] The Government realized that reliance on a single cash crop posed a significant risk and, from the early 1970s, set up export processing zones, particularly for textiles and garments. Then in the 1980s, it sought FDI for the expansion of the services sectors – notably tourism, information and communications technology, and banking and finance.[18] From 2008 to 2019, the value of services exports usually exceeded that of merchandise exports (Figure 2.3). The drop in 2020 was due to the COVID-19 pandemic, which hindered tourism and travel.

Figure 2.3 Services played a key role in the diversification process of Mauritius: Mauritius, commodities in total merchandise exports, and of services exports, 1995–2021



Source: UNCTAD based on data from UNCTADstat database.

Other countries have diversified production and exports or moved along commodity value chains.

- Costa Rica – Diversified its exports away from coffee and bananas towards the manufacture of medical instruments as well as ICT services and eco-tourism.
- Botswana – Established a diamond-processing industry, cutting and polishing raw diamonds, and has developed a tourism sector.
- Chile – In parallel with growing exports of copper, Chile diversified to non-mineral exports.
- Indonesia – Moved from exports of iron ore to become a leading exporter of stainless steel. Between 2016 and 2021, exports of iron and steel rose from $2 billion to $21 billion.[19]

Other CDDCs are at various stages on the path towards diversification and value upgrading.[20]

Reliable access to electricity

A critical component of diversification is access to reliable energy services, since adding more value usually means consuming more energy. This is a major problem in Africa. In 2020, of the 20 countries that had the lowest share of the population with access to electricity, all were African CDDCs whose average share of commodities in exports was 90 per cent (Table 2.1). Electricity in CDDCs can also be very expensive.

Households and firms in CDDCs typically experience frequent power outages and voltage fluctuations.[21] In Zambia in 2019, for instance, 86 per cent of manufacturing firms experienced electricity outages – typically for 13 hours a month.[22] Interruptions in supply hinder the adoption of new technology and modern production methods and require firms to invest in generators that add to their production costs – all of which reduce their competitiveness in international markets.

Good access to electricity is also vital for education and training. In Chad, for example, in 2021, only 4 per cent of primary schools had access to electricity.[23] Lack of electrical power also affects the health of the workforce, particularly in rural areas. In the developing world in 2020, around 2.4 billion people cooked with open fires or inefficient stoves, polluting household air and killing around 3.2 million people each year.[24] There is also an important gender dimension since women often take on time-consuming tasks such as fetching fuelwood. The productivity of women-led microenterprises is boosted by access to modern energy sources, particularly for heat-intensive food processing or for lighting for home-based work carried out in the evenings. Street lighting also contributes to women's security.

Diversifying sources of imports

While reducing reliance on a single commodity for exports, countries also need to be concerned about overreliance on one or two countries for imports – particularly for food. At times of acute crisis, development partners can offer more support and help prevent hardship in the most vulnerable countries. FAO, for example, has proposed a food-importing financial facility which would help the most vulnerable countries, including the LDCs, access critical foodstuffs.

Boosting food emergency preparedness should involve building up public stocks while strengthening safety nets and social protection.[25] Net-commodity-importing developing

Table 2.1 Many African CDDCs suffer from low access to electricity: Countries with the lowest levels of access to electricity

	Percentage of population with access to electricity, 2020	Percentage of commodities in total merchandise exports, 2019–2021
South Sudan	7	100
Chad	11	98
Burundi	12	95
Central African Republic	15	76
Malawi	15	93
Burkina Faso	19	97
Democratic Republic of the Congo	19	82
Niger	19	89
Sierra Leone	26	87
Liberia	28	74
Mozambique	31	94
Guinea-Bissau	33	98
Madagascar	34	74
United Republic of Tanzania	40	88
Benin	41	92
Uganda	42	86
Guinea	45	95
Zambia	45	89
Angola	47	98
Rwanda	47	91

Source: UNCTAD based on data from the UNCTADstat database and the World Development Indicators database of the World Bank.

countries, particularly the LDCs, may not have the financial resources to achieve these objectives. In this context, the recent worsening of indicators of fiscal sustainability of LDCs illustrates this point. Indeed, the fiscal deficit as a share of GDP in the median developing country that was a net importer of basic food in the period 2019-2021 worsened from 2.1 per cent in 2019 to 3.5 per cent in 2022.[26] Therefore, these countries will need additional financial support if they are not to cut spending on essential services such as health or education.

At times of crisis, markets for food, fertilizers and fuel must remain open – to balance supply and demand across the globe and avoid price spikes. In 2022, the WTO's 12th Ministerial Conference exempted the World Food Programme's humanitarian food purchases from export prohibitions or restrictions.[27] This is a useful contribution, but LDCs and other vulnerable countries need far-reaching commitments that ensure access to essential foodstuffs and other basic commodities. Efforts to stabilize commodity markets will benefit from greater market transparency.

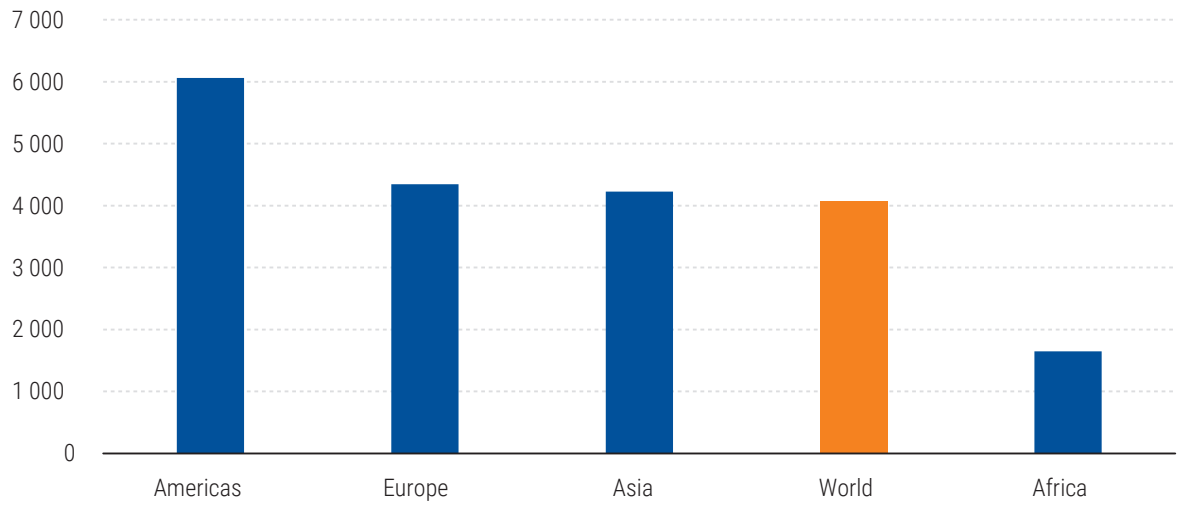
In addition, net-commodity-importing developing countries need to be more resilient to future commodity market shocks – particularly for key food staples. Some countries could increase their own agricultural output – especially those in Africa, where, in 2020, average cereals yields were less than half the global average (Figure 2.4). Yields can be increased through higher-quality inputs along with finance, capacity-building and better technology, including climate-smart agriculture, while also reducing post-harvest losses through better storage, processing and transportation. Moreover, food production can also be increased along the extensive margin where planted areas can be expanded sustainably, i.e. without contributing to deforestation or loss of biodiversity. Food security in food-deficit countries can be further bolstered by cutting food waste and distributing food more equitably across the world.

Countries can also cut energy imports by making greater use of renewable energy sources. Africa has 60 per cent of the best solar resources globally but only 1 per cent of installed photovoltaic capacity.[28] The SIDS too have substantial potential to expand renewable energy.[29] Seychelles, for example, in its updated NDC, has set a target of 15 per cent renewables in the energy mix by 2030.[30] The updated NDC of the Bahamas includes the target of at least 30 per cent renewables in the energy mix by 2030.[31] In its National Energy Policy, Barbados has set a target for 100 per cent renewable energy by 2030.[32] And in its National Development Plan, Fiji aims to generate 100 per cent of its electricity from renewable sources by 2036.[33] The Small Island Developing States Accelerated Modalities of Action (SAMOA) Pathway calls for an acceleration of renewable energy deployment with more financial resources, technology transfer and capacity building.

Diversifying through a climate emergency

Today's developed countries reached their high income and consumption levels by restructuring from agricultural to energy-intensive industrialized output. Developing countries are following a similar trajectory but under fundamentally different circumstances – notably a climate emergency. They cannot, therefore, stake their futures on fossil fuels.

Figure 2.4 Cereal yields differ significantly across regions: Cereal yields in selected regions, 2020
(kg per hectare)



Source: UNCTAD based on data from FAOStat.

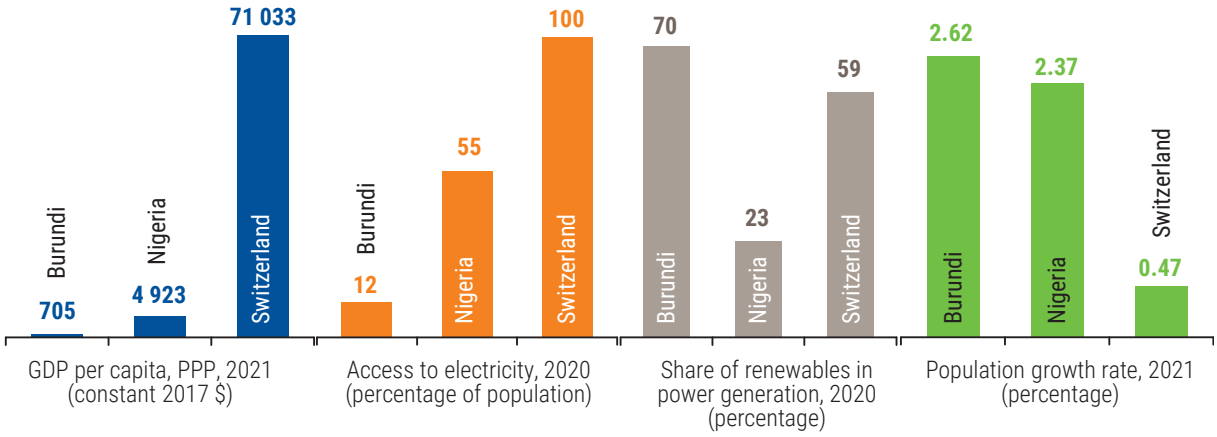
There are two ways of reducing greenhouse gas emissions from economic activity. One is to make growth less emissions-intensive; the other is to deliberately slow economic growth. In particular for developing countries, limiting growth is not an option if they are to attain the SDGs, so they need to look instead to minimize GHG emissions while taking advantage of the changing global energy landscape by reconfiguring their economic structures and energy systems.

Many CDDCs provide the raw materials essential for clean energy technologies – including battery metals such as cobalt, lithium and copper. They should not get trapped at the entry of value chains but rather move along them to add value locally. A promising example is the recent cooperation agreement signed between the Democratic Republic of the Congo and Zambia to jointly develop a battery precursor industry.[34] CDDCs that have large potential for renewable power generation can also become suppliers of green hydrogen while using this to generate electricity in remote and currently unserved areas.[35]

CDDCs have a chance to take a new development path and avoid some of the worst by-products of industrialization, such as smog and polluted rivers that cause disease and premature death. Most CDDCs have already spelt out plans for scaling up renewable energy, strengthening energy efficiency and have presented other strategies to reduce GHG emissions in their NDCs. Green industrialization and green growth will require large investments in infrastructure and energy systems. Most of the targets in their NDCs are conditional on financial, technological and capacity-building support from the international community.[36] CDDCs will therefore need to work with their development partners to mobilize the necessary finance and transfer of technologies.

Countries and regions will follow their own energy transition paths, considering their resource endowments and availability of financial and technical capacity – and the needs of their current and future populations. The different circumstances they face are illustrated in Figure 2.5. Burundi, Nigeria and Switzerland have very different endowments and population growth rates.

Figure 2.5 Countries differ in terms of their development status and natural endowments: Selected energy and socio-economic indicators



Source: UNCTAD based on data from the World Bank (GDP per capita), United Nations World Population Prospects database (population growth rate) and IRENA.

Note: These countries were selected for purely illustrative purposes to highlight the diversity of challenges of countries at different stages of development and with different natural resource endowments.

Hence, as CDDCs diversify, transform, and upgrade their economies to achieve the SDGs, they have to take these differences and inequalities into account.

From link to link

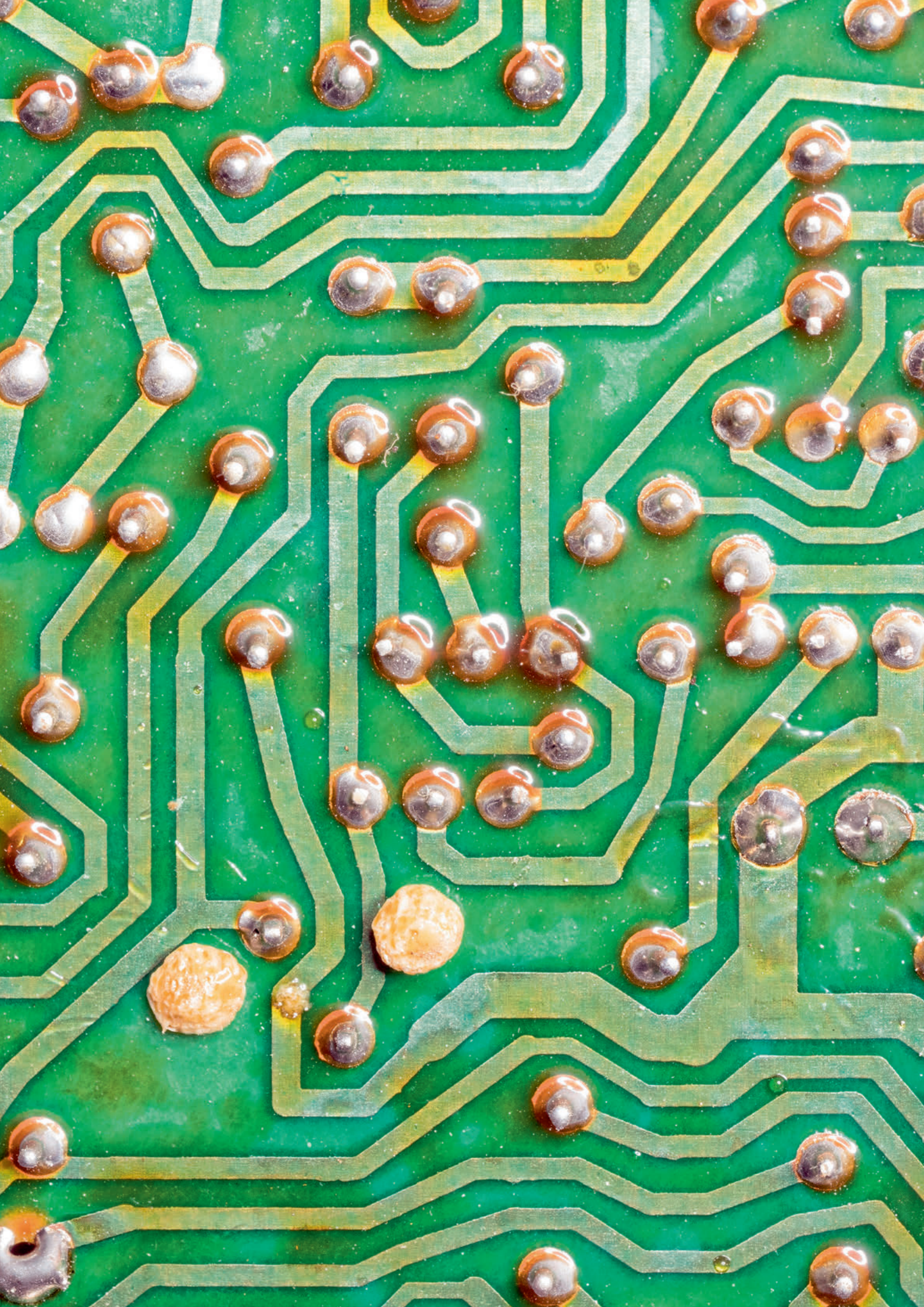
In an increasingly volatile global economic and geopolitical environment, both CDDCs and net-commodity-importing developing countries need to diversify and upgrade their value chains. A number of CDDCs have demonstrated that it is possible to move along the value chains of commodity and non-commodity sectors so as to be more resilient.

At the same time, net-commodity-importing developing countries need to diversify their sources of imports of basic commodities such as food, fuels and fertilizers – while boosting their own production, particularly of food and renewable energy. For this, they need the full support of the development partners, particularly for strengthening social safety nets and emergency preparedness.

Many of these processes do, however, carry the risk of increasing inequalities, both within and between countries, as analysed in the next chapter.

Endnotes

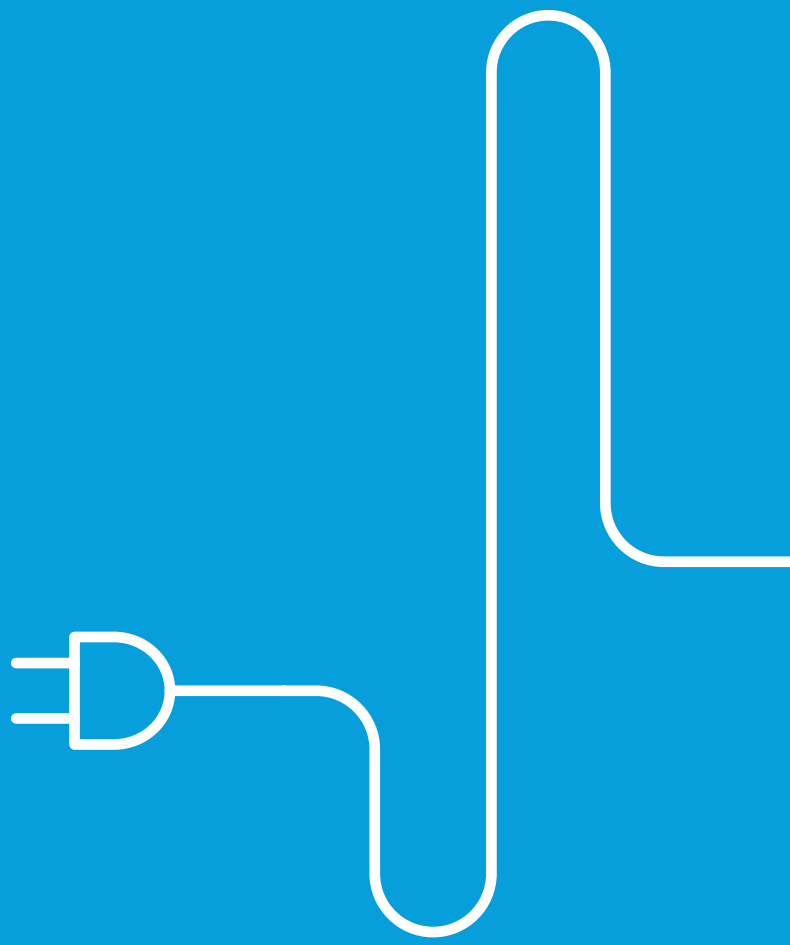
1 Independent of the structural composition of an economy, a reduction of concentration of export destinations is also a form of diversification.
2 UNCTAD, 2021d
3 Hallward-Driemeier and Gaurav, 2018
4 See e.g. UNCTAD (2015) for specific recommendations in this regard.
5 Giri et al., 2019
6 The key components of the Human Capital Index are education and health measured by survival rates, quality-adjusted years of schooling and prevalence of stunting.
7 Rodríguez-Clare, 2001
8 https://www.uneca.org/stories/gabon-launches-technical-training-hub-to-revolutionise-skills-for-economic-diversification
9 UNCTAD, 2022a
10 UNCTAD and World Bank, 2018
11 World Bank; Organisation for Economic Co-operation and Development, 2017
12 UNCTAD, 2019b
13 UNCTAD, 2021a
14 Whitfield et al., 2020
15 Based on data from the Department of Statistics Malaysia.
16 Based on data from COMTRADE.
17 Based on mirror data from COMTRADE.
18 See also UNCTAD (2001) on the role of FDI in the diversification process of Mauritius.
19 Based on Comtrade database for harmonized system code 72.
20 For example, economic diversification is included in key forward-looking policy documents of gas and oil-dependent economies of the Gulf Cooperation Council, such as in Vision 2030 of Bahrain; Vision 2035 of Kuwait; Vision 2040 of Oman; National Vision 2030 of Qatar; Vision 2030 of Saudi Arabia; and Economic Vision 2030 of Abu Dhabi, United Arab Emirates.
21 Ayaburi et al., 2020
22 According to World Bank Enterprise Survey data.
23 UNESCO Institute for Statistics, 2023
24 IEA et al., 2022
25 Gentilini, et al., 2022
26 UNCTAD calculation based on data from UNCTADStat database and Kose et al. (2022).
27 WTO, 2022
28 IEA, 2022
29 Blechinger et al., 2016
30 UNFCCC, 2021a
31 UNFCCC, 2021b
32 Ministry of Energy and Water Resources of Barbados, 2021
33 Ministry of Economy of the Republic of Fiji, 2017
34 UNECA, 2022b
35 UNCTAD, 2023c
36 UNCTAD, 2019a



CHAPTER

3

Ensuring inclusiveness



3 Ensuring inclusiveness

This chapter examines the relationship between export diversification and income inequality. While some studies suggest that diversification can lead to higher income inequality by favouring high-skilled workers, others argue that it can create employment opportunities and narrow inequalities in the long run. However, the results remain inconclusive, highlighting the need for further empirical research. The chapter presents the results of an econometric analysis exploring the relationship between inequality and export diversification. This approach provides policymakers with possible entry points to pursue inclusive diversification. The chapter also examines the impact of the energy transition on income disparities within and between countries and the role of international cooperation in supporting CDDCs. Inclusive policies and capacity-building are critical for CDDCs to achieve a just energy transition and promote sustainable growth.

Rapid economic development has often resulted in increasing inequality, as the benefits are unequally shared between capital and labour and within the workforce. Economic inequality can be broadly considered in terms of both outcomes and opportunities.[1] Inequality of outcomes concerns differences in income, material wealth or living standards. Inequality of opportunities focuses on disparities in access to energy, education, employment, or health services. Nevertheless, these two dimensions are interrelated and may be difficult to disentangle.

A further cross-cutting aspect of inequality is gender. Women and men do not always have the same access to education, health, credit or economic opportunities.[2] Moreover, women typically have lower wages and economic participation rates, resulting in lower incomes.[3]

Measuring inequality

The most common indicator of inequality is the Gini coefficient which measures the extent to which the income distribution among individuals or households within an economy deviates from a perfectly equal distribution. The Gini coefficient takes a value between 0 and 100, where 0 represents perfect equality, and 100 represents perfect inequality, that is, a situation where a single entity controls all resources.[4] The Gini coefficient is independent of the size of the economy and the population, making it appropriate for cross-country comparisons.[5] Nonetheless, it also has limitations. It is, for example, more responsive to changes in the middle of the distribution than at the opposite tails, which include the most extreme disparities.[6] It also depends on what is measured, for example, income inequality pre- or post-tax, or consumption inequality pre- or post-housing costs.[7] For cross-country comparisons, therefore, it is vital to use the same source or unit of measurement. Other indices include Theil's L index and the Palma ratio, though these are more complex.[8]

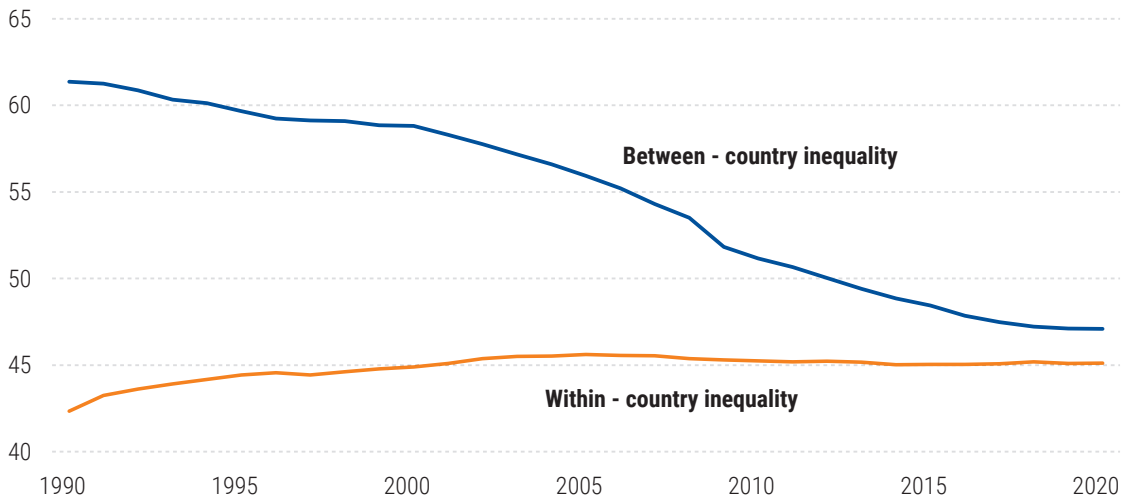
Despite shortcomings, the Gini coefficient is easy to interpret and provides a general overview of income inequality, both within and among countries. Within-country inequality describes the distribution of income between households in a single economy. Between-country inequality describes the income distribution across countries, that is, the average income differences between countries.[9, 10] SDG 10 aims to reduce both components of income inequality, which are important to differentiate as they can follow different trends (Figure 3.1).

Figure 3.1 shows the Gini coefficients within and between countries from 1990 to 2020. It indicates two different trajectories. Inequality between countries has been declining. Between 1990 and 2020, the Gini-coefficient fell from 61 to 47. This means that the gap between the average incomes of the wealthiest and poorest countries has declined, as a result of decelerating growth in wealthier countries, particularly after the 2008 financial crisis, while emerging economies had stronger growth.[11]

On the other hand, inequality within countries showed a small increase, from 42 to 45 – reflecting widening inequality between the rich and the poor within countries. While this represents a small increment in absolute terms, within-country inequality threatens socioeconomic development and hampers the achievement of SDGs. In addition, within-country inequality is more notorious at the national level due to the significant differences in wealth within the same population.

Recent shocks have reversed some of the progress in reducing among-country inequality and further widened within-country disparities. The COVID-19 pandemic, along with uneven vaccine access, has hit low-income households the hardest.[12] Indeed, the United Nations 2022 Sustainable Development Goals Report estimates that over the period 2017 to 2021, between-country inequality, measured by the Theil's L index, has increased by 1.2 percentage point, a stark difference from the pre-COVID-19 estimate of -2.6 percentage points.[13] Currently, inequalities could widen further as a result of rising inflation and the cost of debt servicing, which can hinder countries' ability to protect their most vulnerable people.

Figure 3.1 Inequality within and between countries, Gini coefficients, 1990-2020



Source: UNCTAD based on data from the UNU-WIDER WIID Companion database.

Diversification and income inequality

In the process of economic development, how income is distributed determines the extent to which wealth creation benefits most or a portion of the population. This is a crucial issue debated among academics and policymakers. While there is abundant research on the inequality-growth nexus, studies remain inconclusive as to whether inequality affects growth or if the relationship runs in the opposite direction. Existing literature highlights that studies have reported positive, negative, or inconclusive associations.[14]

One school of thought suggests positive distributional effects, which is in line with the Kuznets curve hypothesis, which posits that economic growth and income inequality have an inverted U-shaped relationship.[15] According to this hypothesis, as economies shift from rural to urban areas and industrialize, income inequality tends to increase initially due to higher per capita income and productivity in urban settings. However, over the long term, inequality is expected to decline as more workers migrate and a smaller portion of the population remains in agriculture. Critics argue that external shocks and data limitations may confound the Kuznets curve's findings.[16] While Kuznets acknowledges that more data is required to prove this hypothesis, later studies[17] support the existence of the curve, indicating positive distributional effects in the long run.

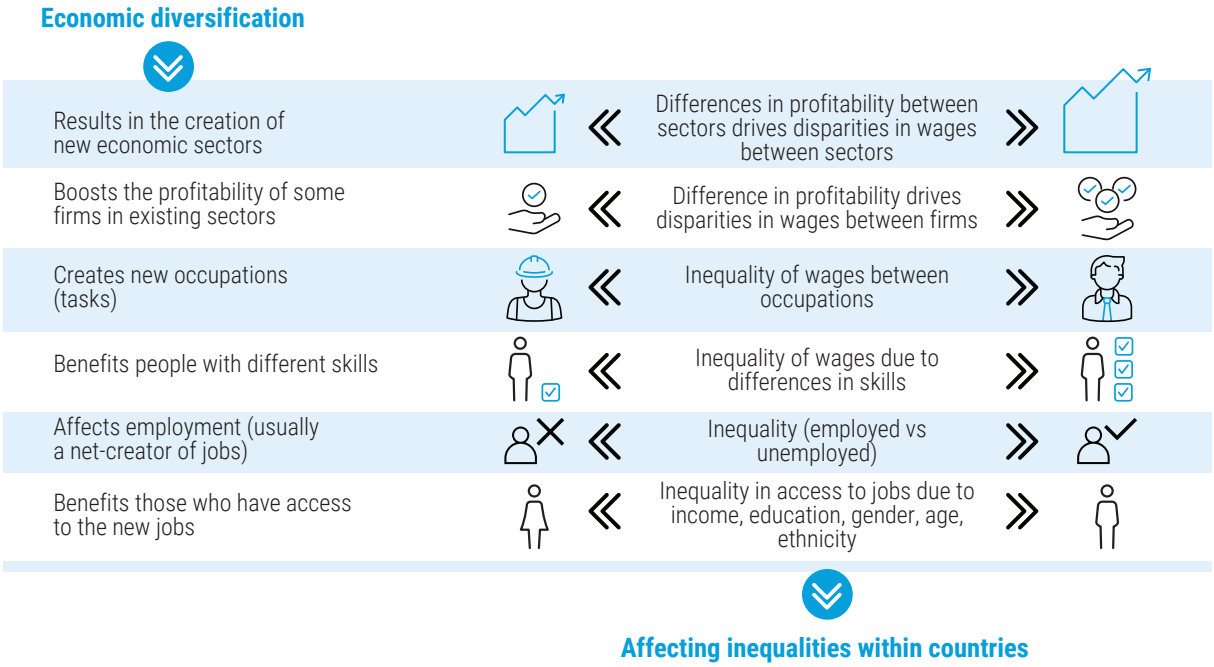
A few studies have similarly concluded that as countries diversify or 'deconcentrate' their exports, their per capita incomes increase.[18] Initially, low-income countries can have frequent episodes of product 'discoveries' and diversify.[19] But beyond a certain level of income, such events become less frequent – and exports start to concentrate again, as companies can take advantage of economies of scale, and they start to specialize in different export products.[20, 21] This new phase of concentration in trading activities tends to reduce employment, labour force participation, and wages.[22]

Closely interlinked is the accumulation of human capital, which increases workers' mobility and ability to absorb new technology. Human capital has the potential to reduce the skill and income gap by facilitating knowledge diffusion and employment.[23] However, this may depend on the extent to which opportunities to build capital are equally distributed in the population, for example, through the location of training institutions in a country. If such opportunities are unequally distributed, the income gap between highly-skilled and low-skilled workers may widen.

In theory, economic diversification changes the economy's structure and can impact inequality through various channels, including disparities between sectors, firms, occupation levels, and skills. These different factors influence the resulting income inequality between individuals (Figure 3.2).

Economic diversification creates new sectors (goods and services) in the economy. The varying productivity levels of these sectors may contribute to inequality between sectors within a country;[24] those that are more productive can claim higher average profits and pay higher average wages. Diversification can also boost firms' profitability within existing sectors, affecting inequalities across firms.[25] Firms that embrace innovation and diversify their production can achieve higher profits and offer higher average wages.

Figure 3.2 Transmission channels from economic diversification to the potential impact on inequalities



Source: UNCTAD.

Inequalities can also arise from wage differences resulting from diversification. Some emerging occupations could be more productive and be rewarded with higher wages. Similarly, increased demand for specific or scarcer skills can also command higher wages. These disparities result from differences in occupations within a firm[26] and skills at the same occupation level.[27]

Economic diversification usually creates jobs, thereby impacting inequalities between the employed (receiving a labour income) and the unemployed. Moreover, diversification in some sectors can influence individuals' access to skills and their choice of occupation, firm and sector to work in. Consequently, this affects individuals' work opportunities and income levels. For instance, gender disparities in education can limit girls' access to skills and opportunities in certain family and social contexts and are likely to constrain skills development. Similarly, social perceptions may discourage women from working in some sectors, such as construction and mining, limiting their options for employment.

Diversification (or lack thereof) can determine people's choices regarding which skillset to develop or which industry to work in. For instance, in CDDCs, the absence of industries such as light manufacturing, automotive, electronics, and digital products such as online gaming restricts employment opportunities in these sectors for their population.

While there has been extensive literature on the association between export diversification and income, there has been less attention to the links between diversification and inequality. And similar to the research on income and inequality, the results have been mixed, probably because of differing samples, methodologies and underlying assumptions. Few studies indicate a monotonic relationship, where rising specialization leads to a greater distinction

between low and high-skilled workers, translating to higher wages for the more skilled workers and increasing income inequality.[28, 29, 30]

On the other hand, export diversification may also expand employment opportunities and learning to a larger share of the population, which would result in narrowing inequalities. There is a third proposition in the literature, that of an inverted-U-shaped relationship: initially, export diversification increases the demand for high-skilled labour as firms pursue productivity and efficiency.[31] In the long run, however, as the benefits spread throughout the economy, more diverse production creates more jobs for high and low-skilled workers, and inequality falls.[32] Nonetheless, changes in the demand for high-skill labour are likely to depend on the diversification avenue an economy pursues; if the country, for example, increases domestic backward linkages, lower-skilled labour may be preferred.

It should also be noted that inequality may be high in developing countries that depend on a narrow export basket. Countries with large natural resource endowments, such as minerals, may have very concentrated ownership and capital-intensive production, which results in high-income inequality.[33] While these studies provide valuable insight into the potential channels through which diversification may affect inequality, results remain inconclusive.

Commodity dependence and inequality

For this report, UNCTAD has examined the relationship between diversification and inequality for 182 countries,[34] using three-year averages and covering the period 1998 to 2018, based on data from UNU-WIDER and UNCTAD.[35] The sample comprises 1,109 observations across different income levels, as classified by the World Bank (Table 3.1).[36] About 56 per cent of the sampled countries are considered CDDCs.

The main measure of income inequality used is the Gini coefficient, supplemented with three other indicators: the Palma ratio, Theil's L index and the inter-decile ratio, which tend to be more responsive to changes in the distribution tails.[37, 38] The measure of export diversification is the share of commodities in total merchandise export values; a low share implies greater diversification. This is supplemented with an export concentration index[39] and a second diversification measure, defined as the number of country exports classified using the Harmonized System (HS) at the 6-digit level and further disaggregated by unit value. Other factors taken into account in this analysis are per capita GDP, population, the extent of trade openness, and endowments of human capital (Appendix A).

Table 3.1 Country classifications and number of observations

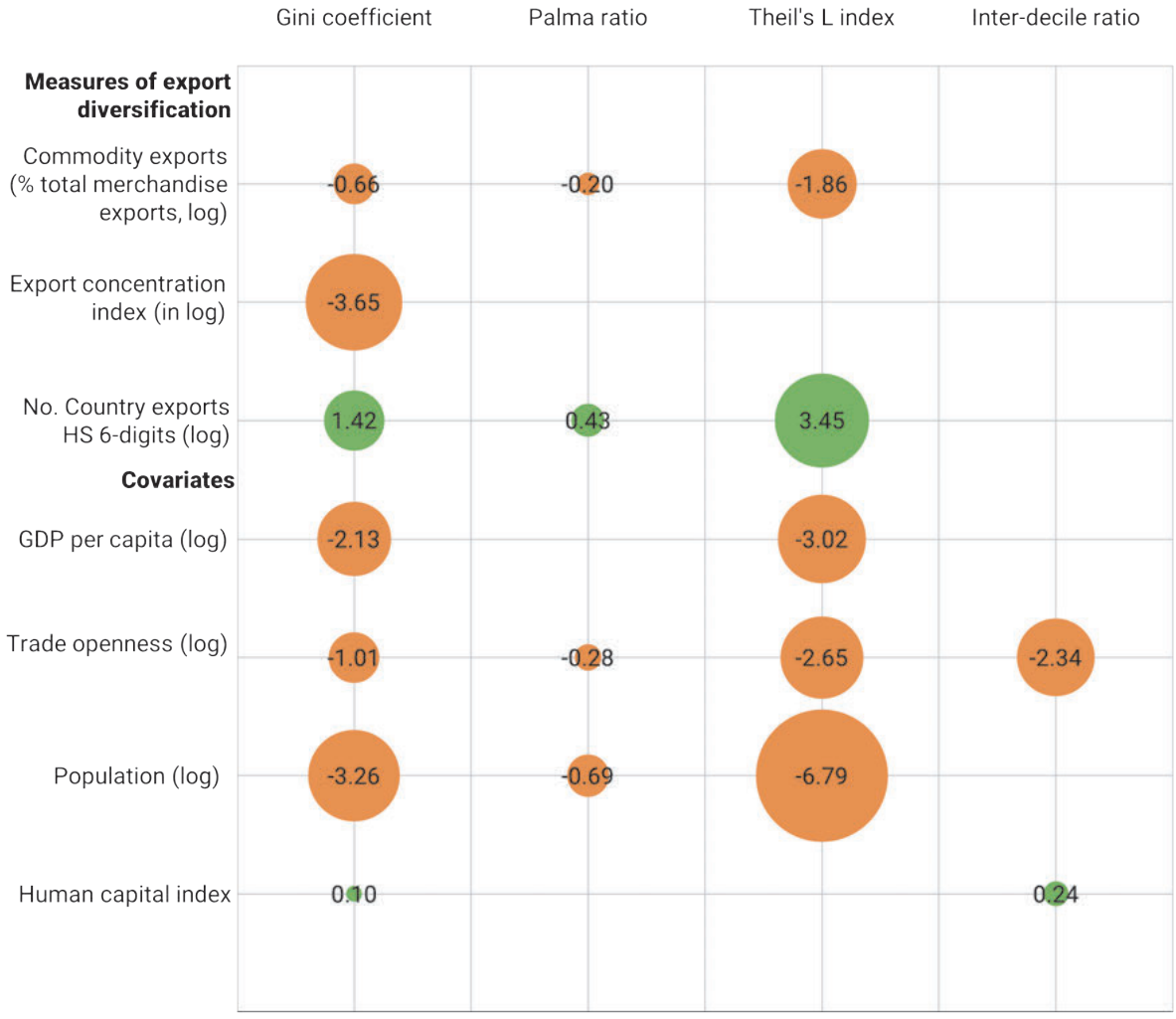
Group	Income level	Number of observations
Low-income	< $1,045	224
Lower-middle income	$1,046-4,095	354
Upper-middle income	$4,096-12,695	272
High- income	> $12,695	259

Source: UNCTAD based on World Bank, 2021.

Note: The use of the World Bank income classification was used due to the relevance of income differentiation across groups. The thresholds are based on 2021 prices in United States dollars.

The results are summarized in Figure 3.3. The matrix presents the coefficients of the fixed effects regressions between export diversification measures and various income inequality indicators. The colour of the circles represents how factors affect inequalities (green – positively, red – negatively), and their sizes represent the strength of the relationship. Note that the covariate results correspond to models using the primary measure of export diversification, i.e., the share of commodities in total merchandise export values. Non-statistically significant coefficients are excluded.

Figure 3.3 Factors interacting with income inequality



Source: UNCTAD.

Note: This figure presents the coefficients of the fixed effects regressions between export diversification measures and various income inequality indicators. All coefficients presented are statistically significant at a maximum of 10 per cent.

The results indicate that export diversification is associated with greater inequality – a relationship that remains statistically significant across most different measures of income inequality.[40] This suggests that diversification has adverse distributional effects on the population, which may be attributed to a more differentiated occupational structure and wage differentials that arise with a more diversified economy.

Inequality is negatively associated with income per capita, which can proxy for economic development and implies that change in income by itself has a beneficial impact on inequality even after controlling for export diversification. Trade openness is also negatively associated with income inequality, which implies that as trade increases, more people may be able to take advantage of different opportunities that arise.

A less-intuitive outcome from this analysis is that as human capital increases, so does income inequality. As a composite variable that captures a population's education, skills and health conditions, this may be the result of imbalances in education or healthcare access which limit the potential and prospects of lower-income earners.

Another significant factor is population size. When accounting for other factors, it seems that income disparities tend to be smaller in countries with larger populations, perhaps because larger economies can afford the transfers needed to even out imbalances in income.

From a wider perspective, the analysis considers the experience of country income groups. While there are no statistically significant differences when considering the Gini coefficient, differences emerge when using two other measures – the Palma ratio and the inter-decile ratio, which are more sensitive to changes at the opposite ends of the income distribution. They indicate that export diversification negatively affects inequality in low- and lower-middle-income countries, which also suggests there is more of a skilled-wage premium in the economies belonging to these income groups. On the other hand, these countries are also more likely to see inequality fall as they become more open to trade.[41] For high-income countries, the only variable that appears to be statistically significant is population size.

Similar results are observed for CDDCs, where only a small segment of the population benefits from diversification. However, this could be because diversification is relatively limited in these economies and perhaps not extensive enough to create possible opportunities in all segments of the population. The results suggest that it may be necessary for governments in low- and lower-middle-income economies and CDDCs to consider interventions to ensure inclusive change. This is an important aspect to consider when designing a diversification strategy, which should ideally provide opportunities to all groups from an early stage. Resource rents may also be captured by a small elite, so governments may need to intervene to provide public goods and increase investment in education, healthcare and skill building.

UNU-WIDER data provides the most comprehensive set of inequality statistics up to date, though some data within UNU-WIDER has been synthetically constructed using complex methods due to missing figures. Appropriate and consistent primary data collection at the country level is imperative to examine the factors influencing inequality more precisely. This is particularly important for countries. In addition, further research may be needed using a dynamic panel setting to better understand inequality dynamics. Finally, other studies, including microeconomic analyses, are encouraged to better understand the mechanisms through which diversification affects inequality in a given context.

An inclusive diversification and energy transition

Similar to diversification, the energy transition entails an economic transformation and is likely to lead to the creation of various jobs in greener markets. For CDDCs, this process is closely intertwined with economic and export diversification as they shift towards new sectors.

The empirical results discussed above suggest that export diversification may lead to higher income inequality, particularly in CDDCs. This implies that governments should design complementary inclusive labour policies to mitigate the impacts that diversification and the energy transition may have on income inequality.

Local capacity building is essential for the population to be able to participate and benefit from new employment opportunities. In this regard, governments can identify vulnerable sectors, firms and workers that require technical capacity-building or financial assistance to retrain or upgrade skills necessary for the evolving labour market.

As an example, the Philippines Green Jobs Act of 2016 focuses on job creation and skills development in emerging green sectors. It involves identifying skill needs and implementing training programmes and certification schemes for workers in related industries to support the transition.[42] The Act also includes financial incentives such as tax deductions for skills training, research and development, and tax-free imports of capital equipment for green job promotion.[43]

A similar initiative was launched in Spain to support the automotive industry's transition to modern, lower-emission vehicles. Titled "Plan to boost the value chain of the automotive industry towards sustainable and connected mobility," this includes retraining and updating workers' qualifications to adapt to new labour demands.[44] In addition to professional accreditations, the initiative also offers training plans for managerial and technical roles for a modernized automotive industry.[45]

Such schemes can be geared toward providing opportunities for under-represented groups, including women, youth, and minority groups. In Canada, the Youth Employment and Skills Strategy was implemented to promote youth training across natural resource sectors.[46] This strategy included targeting immigrant youth, youth with disabilities and youth from among Indigenous populations underrepresented in such sectors, to narrow existing gaps.

Coordinated industrial and education policies are also needed to support an evolving economic and labour landscape. Such measures would avoid skills mismatches and, assuming they include all social groups, can help ensure that the benefits from export diversification extend beyond those who were previously in higher-skill positions.

The decarbonization efforts of Chile, for example, have been complemented with measures to spread the gains more evenly among the population. The country, which is heavily dependent on copper mining, has vast potential for renewable energy and has been exploring avenues to gradually discontinue the use of fossil fuels in favour of solar and wind energy. Chile also has ambitions to become an exporter of green hydrogen. To support these goals, the country's National Energy Plan envisages inclusive capacity building and training schemes for existing and new workers and, in coordination with research institutions, is working on the training and certification of 27,000 people by 2030.[47]

Given the positive correlation between human capital and income inequality in the analysis above, governments should additionally revise their public education and health schemes to ensure equal access to education and other services. This would entail improving infrastructure and expanding educational and health facilities, particularly in rural and remote areas.

Governments may also provide technical and financial support to firms to explore avenues for diversification in low-carbon sectors. These may include financial incentives or direct investments in cleaner technologies and energy efficiency. Another policy option is to open opportunities for SMEs and encourage links with multinational enterprises (MNEs) to allow for knowledge spillovers that would enrich the human capital and productive capacity of the host country. Added knowledge and absorptive capacity may facilitate the uptake of new technologies and mobility needed for the energy transition.

In Costa Rica, for example, knowledge spillovers played an important role in the country's diversification strategy due to labour mobility.[48] These knowledge and technology transfers resulted from lateral flows between subsidiaries and the parent MNEs and from backward linkages with domestic suppliers.[49, 50] An important enabling factor was the country's strong human capital and its educated population, which attracted foreign investment and allowed for the absorption of new technologies and knowledge brought by MNEs.[51] In addition, such spillovers can increase gender equality: in Costa Rica, labour mobility and imitating new competitors allowed workers to apply new gender practices and skills to local firms and increase female participation.[52]

While this example does not directly relate to the energy transition, this approach would notably benefit CDDCs seeking vertical diversification, for example, in the manufacturing process of batteries, which requires technology, high skills, and forward linkages in production chains.

Social dialogue and inclusive decision-making can foster trust and better inform policymaking.[53] Engagement with stakeholders can aid target-setting and anticipate policies for minimizing the impact of the transition on exposed sectors and firms. This may also alleviate tensions between governments and industries affected by the transition.

For example, in Germany, social dialogue played a crucial role in the transition of the Ruhr Valley from a coal and steel-dependent region to a knowledge and service-based economy.[54] The government, coal sector, trade unions, environmental groups, industry, and academia actively engaged in discussions to develop policies that facilitated a smooth coal phase-out while minimizing labour market disruptions.[55] These measures included monthly stipends and early retirement for miners with over 25 years of employment, as well as guaranteed alternative employment opportunities for younger workers.[56]

Governments may also benefit from the ILO's Climate Action for Jobs Initiative. Established in 2019, this multi-stakeholder partnership aims to help countries generate decent jobs while delivering climate goals through policy and planning instruments. These include skill matching, enterprise development and investment measures, and inclusive social protection for vulnerable workers.[57] Such mechanisms can enable CDDCs and other developing countries to sustain social cohesion and inclusion at times of structural change. In a similar vein, countries implementing new green industrial policies can exchange best practices for target-setting and policymaking.

Energy disparities and the just transition

The Paris Agreement calls for a 'just transition' to a lower-carbon world that provides decent and quality jobs for the whole workforce (Box 3.1). A rapid shift towards low-carbon technologies and decarbonization should also be inclusive and minimize any welfare losses, addressing existing disparities and leaving no one behind. A just transition requires addressing current gaps and prevalent issues in energy access, which constitutes a dimension of economic inequality and can impact income disparities. Low household income limits the affordability of energy. At the same time, a lack of access to energy constrains households' human capital accumulation and may widen the income gap.

Disparities in energy access mirror existing income inequalities. While access to electricity and clean fuels, and technologies for cooking have been on the rise between 2000 and 2020 (Figure 3.4), there are substantial regional differences in access. For instance, in North America, the average energy consumption per capita in 2021 was more than 15 times higher than in Africa.[58] Moreover, within countries, access to energy tends to be higher in urban areas than in rural areas: in 2020, around 80 per cent of the world's population without electricity lived in rural areas.[59]

Map 3.1 and Map 3.2 illustrate the percentage of the population with access to electricity and access to clean fuels and technologies for cooking, respectively. In both maps, the darker the colour, the greater the access. Dark blue indicates that a greater percentage of the population enjoys energy access. The lighter the colour, the more limited the access among

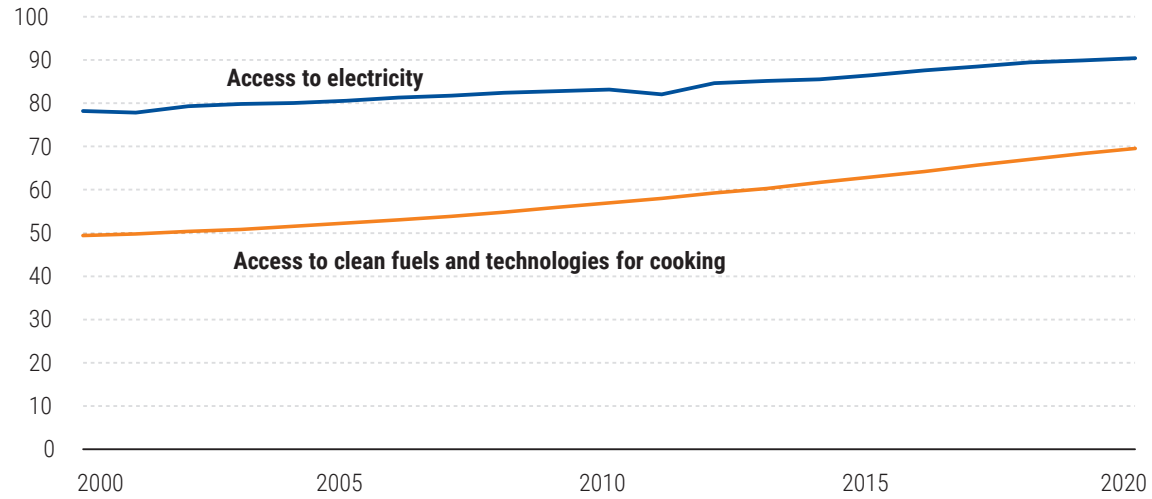
Box 3.1 The elements of a just transition

The precise definition of a just transition varies by source, but the latest IPCC Global Assessment Report identifies common elements:

- Investments in low-emission and labour-intensive technologies and sectors.
- esearch and early assessment of the social and employment impacts of climate policies.
- Social dialogue and democratic consultation of social partners and stakeholders.
- Creation of decent jobs, active labour market policies, and rights at work.
- Fairness in energy access and use.
- Economic diversification is based on low-carbon investments.
- Realistic training/retraining programmes that lead to decent work.
- Gender-specific politics that promote equitable outcomes.
- Fostering international cooperation and coordinated multilateral actions.
- Redressing past harms and perceived injustices.
- Consideration of inter-generational justice concerns, such as the impacts of policy decisions on future generations.

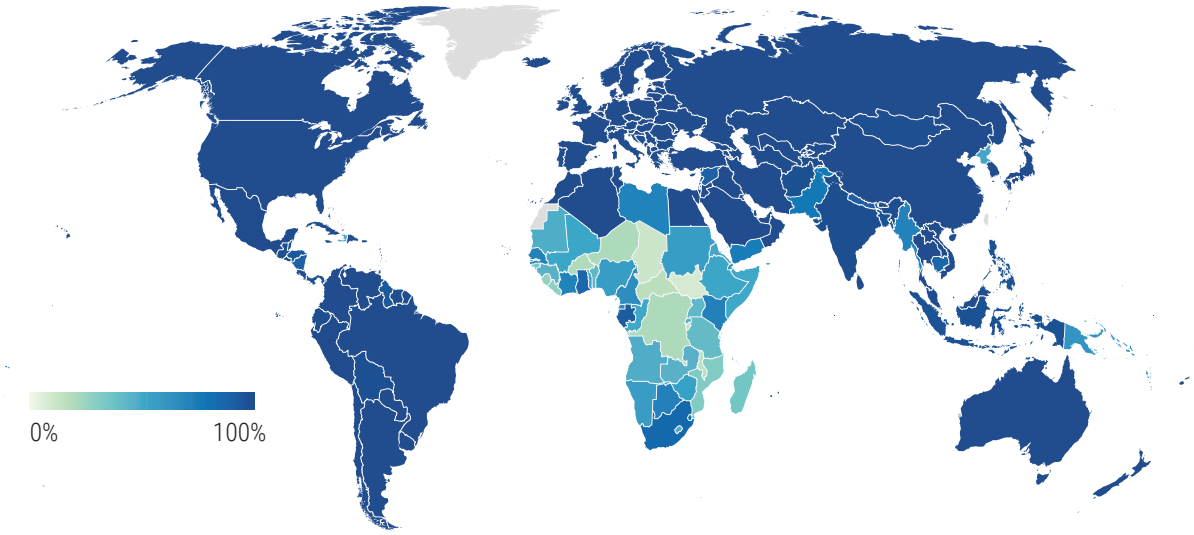
Source: UNCTAD based on IPCC, 2022. Sixth Assessment Report, Climate Change 2022: Mitigation of Climate Change (Working Group III).

Figure 3.4 Access to energy has been on the rise between 2000 and 2020
(Percentage of people with access)



Source: UNCTAD based on data from the World Bank.

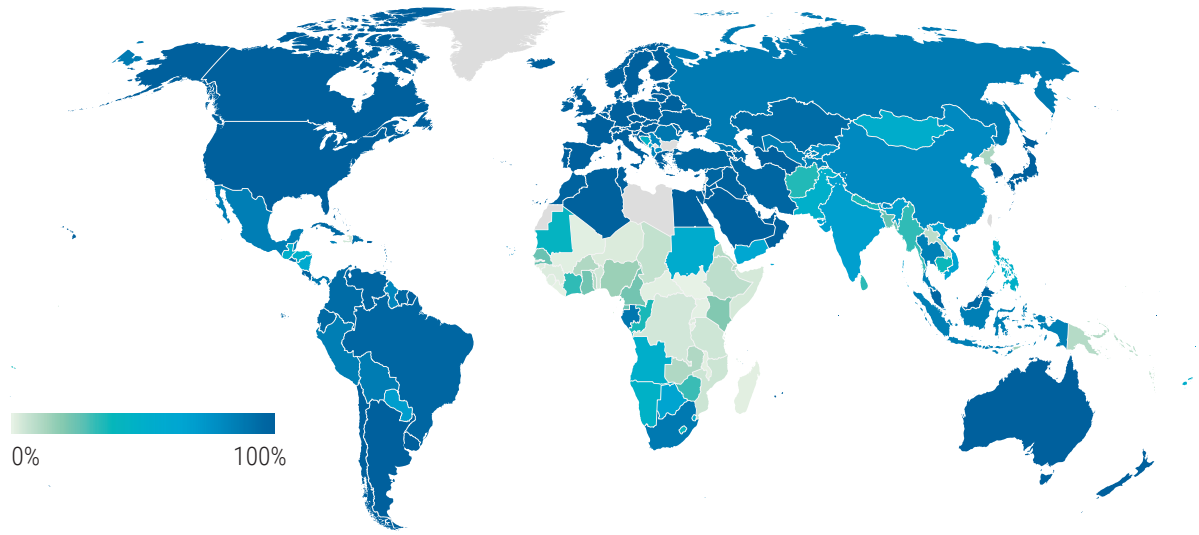
Map 3.1 Access to electricity in 2020
(percentage of population with access)



The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Source: UNCTAD based on data from the World Bank (2020).

Map 3.2 **Access to clean fuels and technologies for cooking in 2020**
(Percentage of population with access)



The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Source: UNCTAD based on data from the World Bank (2020).

the population. From these figures, it can be observed that access to electricity and clean cooking fuels is highly unequal and remains a developmental challenge among developing countries, particularly in Africa and Asia and the Pacific.

CDDCs and their development partners should therefore accelerate progress towards SDG 7 by ensuring universal access to affordable, reliable, sustainable, and modern energy. Nonetheless, this will only contribute to the green energy transition if they do so using renewable energy rather than fossil fuels.

For this purpose, however, CDDCs with low fiscal capacity start at a disadvantage.[60] Faced with many competing priorities, their governments may struggle to invest in just decarbonization, particularly given the impacts of COVID-19 and the war in Ukraine.

A just transition will require significant investment. The total financing requirement globally to meet SDG 7 is estimated at $1.3 trillion to $1.4 trillion annually until 2030.[61] For the poorest countries, much of this needs to come from development partners. However, aid flows to developing countries for clean energy have been declining.[62] Between 2017 and 2020, international public financial flows to developing countries in support of clean energy fell from $24.7 billion to $10.9 billion – making it more difficult for low-income countries to ensure a just transition that meets decarbonization targets.[63]

Reducing fossil fuel subsidies can help level the playing field for clean energy, allowing more resources to be invested in expanding sustainable energy access and improving energy services. Fossil fuel subsidies have been shown to be costly, inequitable and harmful.[64, 65]

In developing countries, 43 per cent of the benefits from such subsidies have gone to the wealthiest 20 per cent of households, while the poorest 20 per cent of the population get only 7 per cent.[66] Nonetheless, in practice, removing or even reducing fuel subsidies is politically sensitive and requires careful planning, with targeted social programmes to mitigate potential negative impacts for poor households.

Endnotes

1 UN DESA, 2015a

2 IMF, 2015

3 Ibid

4 UN DESA, 2015b

5 Trapeznikova, 2019

6 UN DESA, 2015b; Trapeznikova, 2019

7 Trapeznikova, 2019

8 General entropy measures are a series of indicators based on ratios of incomes to the mean. A parameter alpha is used to compute these measures, which assigns a weight to distances between incomes in different parts of the distribution. The most popular is the Theil's L index, also known as the mean log deviation, for which alpha is equal to 0, meaning that it is more sensitive to changes in the lower tail of the distribution. The Theil's L index equates to 0 in the case of perfect equality and increases as incomes become more unequally distributed. The Palma and the inter-decile ratio are part of a wider group of percentile and share ratios that focus on specific differences in the distribution. The Palma ratio measures the income gap between the richest 10 per cent and the poorest 40 per cent of the distribution. The higher the Palma ratio, the higher the income inequality. Lastly, the inter-decile ratio measures the income gap between the ninth decile, i.e., the 10 per cent of people with the highest income, and the first decile, representing the bottom 10 per cent of the distribution. The higher the inter-decile ratio, the higher the income inequality. These ratios are typically more sensitive to changes at the opposite ends of the distribution.

9 Chancel et al., 2022

10 This chapter's analysis of inequality is based on the United Nations University World Institute for Development Economics Research dataset – which uses household survey data, complemented by synthetic data. For more on the methodology used by WIID to compute the presented inequality statistics, refer to UNU-WIDER, 2022.

11 World Bank, 2016; Chancel et al., 2022

12 UN DESA, 2022

13 Ibid

14 Mdingi and Ho, 2021

15 Kuznets, 1955

16 Lyubimov, 2017

17 Barro, 2000; Thornton, 2010

18 Imbs and Wacziarg, 2003; Giri et al., 2019

19 Al-Marhubi, 2000; Hausmann et al., 2007; Cavalcanti et al., 2014

20 Imbs and Wacziarg, 2003; Giri et al., 2019

21 Klinger and Lederman, 2006

22 Autor et al., 2013

23 Asteriou et al., 2014

24 Hartmann et al., 2017

25 Mueller et al., 2017

26 Barth et al., 2016

27 Juhn et al., 1993

28 Linear models such as Blancheton and Chhorn (2019) and Gupta et al. (2002) would only provide a partial understanding of the overall effect if the relationship between export diversification and inequality is found to be non-linear. Differences in samples may also play a role. For example, Blancheton and Chhorn (2019) find that diversification positively affects income inequality in the overall sample. However, when examining the effect across subsamples, results hold only for higher-income countries, and the authors find no significant impacts in low-income countries. Gupta et al. (2002) find a negative correlation when examining the overall sample. Nonetheless, data availability at the time means that, at most, 38 countries were included in the study.

29 Autor et al., 2013

30 Blancheton and Chhorn, 2019; Lee et al., 2022

31 Le et al., 2020

32 This is based on the results of Le et al. (2020), which find an inverse U-shaped relationship between income inequality and export diversification in a global sample of 90 countries.

33 Gupta et al., 2002

34 This is based on research conducted by UNCTAD for this report. A list of the countries included in the analysis can be found in Appendix A.

35 Note that due to the sparseness of inequality statistics, especially the Gini data, 3-year period average values are used.

36 World Bank, 2021

37 The Palma and the inter-decile ratios focus on the difference between the two opposite ends of the distribution, whereas the Theil's L index is particularly sensitive to changes in the lower tail of the distribution.

38 Inequality data was drawn from the UNU-WIDER WIID Companion (UNU-WIDER : World Income Inequality Database - WIID, 2022), which covers 201 economies from 1960 to 2021. Data covering 1998 to 2018 was considered based on the availability of export diversification and covariates data from UNCTAD.

39 This is a modified version of the Finger-Kreinin measure of similarity in trade. For more information on this measure, see Finger and Kreinin (1979).

40 Palma ratio, Theil's L index and the inter-decile ratio

41 This is consistent with the Stolper-Samuelson (1941) theorem, where an increase in trade in countries with relatively abundant low-skill factors leads to lower inequality (Furceri and Ostry, 2019).

42 International Energy Agency, 2022

43 ILO, 2019

[44] International Energy Agency, 2022
[45] Ibid
[46] Youth Employment Strategy, 2017
[47] Government of Chile, Ministry of Energy, 2022; Bartlett, 2022
[48] Monge-González et al., 2021
[49] Giuliani, 2008
[50] Monge-González et al., 2021
[51] Giuliani, 2008
[52] Monge-González et al., 2021
[53] Mercier, 2020
[54] Ibid
[55] Arora and Schroeder, 2022
[56] Ibid
[57] ILO, 2019
[58] British Petroleum, 2022
[59] IEA et al., 2022
[60] UNCTAD, 2019a
[61] IEA et al., 2019
[62] As defined by IEA et al. (2022), international public financial flows include official development assistance and other official flows that are transferred internationally to developing countries for renewable energy. For more information on the methodology used to measure this variable, see IEA et al. (2022).
[63] IEA et al., 2022
[64] OECD and IEA, 2021
[65] UNDP, 2021
[66] IMF, 2010

CHAPTER

4

Diversifying the traditional way will have high environmental costs

4 Diversifying the traditional way will have high environmental costs

This chapter highlights the historical perspective of successful economic diversification and its implications for energy use, emphasizing the need for CDDCs to transition to a low-carbon economy. It explores the relationship between economic diversification, growth, and energy intensity, using emissions-output elasticity estimates in an UNCTAD study.[1] Even though the elasticity estimates need to be interpreted with caution, they provide information that emphasizes the challenge of balancing development goals with reducing GHG emissions. They also illustrate the complexity of the relationship between output and GHG emissions. It depends on the income level of a country, the type of commodity a country depends on, and the timeframe considered. The chapter suggests that CDDCs would need to put in place a green industrial policy framework that could help them to develop an alternative diversification pathway that is compatible with the energy transition imperative. The policy framework is the subject of chapter 5.

Countries broaden their production and export bases by diversifying their economies. Diversification can change the structure of the economy when it creates more complex and sophisticated value chains in existing sectors or when it introduces new products and services. A number of countries have diversified and become more economically resilient.[2] In most cases, however, this has involved greater use of fossil fuels and emitting more greenhouse gases. In the current context of decarbonization, this is not a viable long-term option. CDDCs seeking just transitions will therefore need to carefully balance their sources of energy to meet the needs of current and future generations.

As the experiences of East Asia and Latin America have shown, economic diversification increases the number and value of exported goods, boosting sustainable economic growth. In turn, export diversification increases the stock of foreign currency needed to finance foreign inputs and develop infrastructure, and allows for more stable revenue that increases the capital available for investment, which in turn sustains economic growth, creating virtuous loops.[3, 4]

In addition, economic growth widens the tax base – boosting fiscal revenues that increase government capacity to invest in infrastructure, human capital, and skills. Governments can also offer local firms targeted subsidies for acquiring technologies and discovering new comparative advantages, opening up a wider range of possibilities.[5] For example, frontier technologies such as blockchain can improve traceability and transparency in commodity value chains. The use of robotics can also make operations more efficient, positively affecting firm profitability. CDDCs that are well-positioned to exploit these opportunities will reap valuable benefits.[6]

Most CDDCs need to transition from agrarian economies and low bases of industrialization, so at first they are likely to use more energy.[7,8] In countries that have recently achieved a high level of diversification, there was an increase in GHG emissions resulting from a high energy intensity of the production process. In China, for example, strong growth of the export

sector and infrastructure development between 1997 and 2007 became the two main drivers of increasing energy intensity.[9] But this pattern need not continue indefinitely. As economic growth boosts income, countries have more resources to invest in environmental protection, so the environmental impact first grows with GDP and then falls – along an inverted 'Kuznets curve'.[10] However, the empirical evidence has been inconclusive, as different countries seem to follow different paths. For example, by adopting the right environmental policies, some CDDCs could leapfrog the worst phases of environmental degradation.[11]

In the process of diversification, CDDCs will continue to produce, and even increase, their current GHG emissions if they adopt the traditional energy systems and technologies that allowed developed countries to diversify. Indeed, there seems to be a trade-off between growth and environmental degradation, as suggested by the so-called 'Kaya Identity' that expresses GHG emissions as the product of population, per capita GDP, energy-intensity of GDP, and carbon-intensity of energy consumed.[12] However, adopting diversification strategies associated with a lower energy intensity of GDP or carbon intensity of GDP would generate lower GHG emissions while delivering the same level of GDP. Advocates of green industrialization argue that all countries can minimize carbon emissions by changing production and consumption patterns to achieve 'green growth,' which uses natural resources more efficiently and minimizes pollution and environmental damage.[13, 14] This calls for cuts in the use of fossil fuels and huge investments in efficient and green energy – while also protecting workers and communities whose livelihoods have depended on fossil-fuel-based industries.[15]

Because green growth ultimately increases employment and social welfare, it is likely to be more politically and socially acceptable and thus offers a pragmatic path towards a low-GHG economy. But whether CDDCs in their earlier stages of development will be able to follow this path remains an open question.

Tracking the links between GHG emissions and output

The link between GHG emissions and economic growth has been analysed using estimates of emissions-output elasticities. These elasticities provide measures of the number of units of GHG emissions associated with one unit of output. These measures provide a general view of this relationship but should be used with caution as the quality of the results depends on the quality of the data used. This report uses the most widely used data on GHG emissions, as in previous UNCTAD analyses (e.g., UNCTAD, 2019). Moreover, elasticities relating to groups of countries might hide country-specificities.[16] Nevertheless, empirical results on the links between GHG emissions and output provide a rich view of the complexity of this relationship, as discussed below.

The methodology used to estimate emissions-output elasticities is outlined in Appendix B. This methodology has been mostly used in advanced economies. The few studies focusing on developing countries found that as incomes grew, so did emissions.[17] However, in the longer term, 15 of the 43 countries covered in one of the studies, for example, managed to reduce their emissions intensity of GDP.[18] Nevertheless, the result that long-run emissions-output elasticities were positive for all but six countries suggests that the majority of countries in the sample still needed to do more to decouple long-run income growth from GHG emissions.

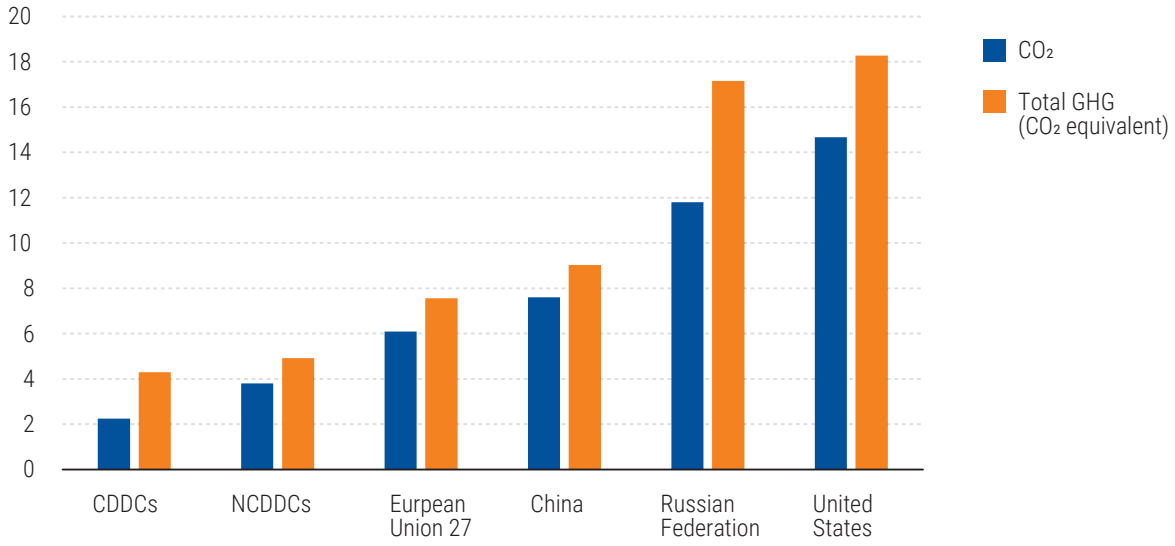
Subsequent studies broke down growth in emissions and real GDP into their trend and cyclical components and estimated cyclical and trend elasticities (see Appendix B). Cyclical elasticities capture the fact that changes in emissions may be associated with the booms or downturns in business cycles. Trend elasticities capture structural or long-term effects that make the economy more or less emissions-dependent. Applying this method, previous

studies found that trend emissions-output elasticities decline with per capita income. Hence, advanced countries have been able to decouple more rapidly in recent years.[19, 20] Another study of 46 commodity-exporting countries over the period from 1990 to 2014 found further evidence of decoupling, and that these changes were not cyclical but structural.[21]

To offer a wider perspective, this report uses material from an UNCTAD study that uses a larger data set, covering 186 countries classified as CDDCs, non-commodity dependent developing countries (NCDDCs), or developed countries over the period 1980-2018 (see Appendix B).[22] As indicated by descriptive statistics in Table 4.1, in 2018, CDDCs had the lowest average GDPs and had lower emissions than NCDDCs and developed countries. Emissions were lowest in sub-Saharan Africa and among low-income countries and highest in North America. Among CDDCs, fuel exporters had the highest emissions, though these were still substantially below those from North America. Emissions in NCDDCs and upper-middle-income countries were higher than those of high-income countries.

As indicated in Table 4.1, most of the emissions were of CO_2, which is why this report and other publications use carbon dioxide interchangeably with GHGs.[23] In fact, the concept of decarbonization, often used to refer to the reduction of GHG emissions, reflects the dominance of carbon dioxide among GHGs. Moreover, the analysis uses total rather than per capita emissions – though both measures convey a similar message – to account for the fact that what matters most is the total amount of CO_2 that a country emits into the atmosphere. Using per capita emissions in the analysis may convey an incorrect message that a small, sparsely populated country contributes more to GHG emissions than a larger, highly populated country. Irrespective of the measure used, CDDCs often have the lowest CO_2 emissions (Figure 4.1 and Table 4.2). Using data in Table 4.1, emissions in low-income countries are only about 10 per cent of those in high-income countries and 7 per cent of those of upper-middle-income countries – which are catching up with the developed countries and increasing GHG emissions per unit of output.

Figure 4.1 GHG emissions, metric tons per capita, 2019



Source: UNCTAD based on data from UNCTADstat database and World Development Indicators.

Note: Values for country groups represent population-weighted averages.

Table 4.1 Summary statistics for income and emissions, different country groups, 2018

Group	Average GDP (millions of dollars, 2015)	Average CO_2 emissions (ktons)	Average Greenhouse Gas emissions (ktons)
Commodity Dependence Status			
CDDC	99 530	90 625	92 149
NCDDC	479 519	436 640	440 073
Developed Countries	1 257 598	332 916	334 622
Commodity Type			
Agricultural CDDC	91 161	65 652	67 046
Fuel CDDC	178 541	186 131	188 777
Mineral CDDC	32 638	26 396	26 981
CDDCs by region			
East Asia and the Pacific	836 531	604 464	608 522
Europe and Central Asia	455 144	159 639	160 860
Latin America and the Caribbean	163 974	91 145	92 748
Middle East and North Africa	172 692	138 912	140 765
North America	10 605 611	3 159 749	3 175 320
South Asia	412 374	544 153	550 193
Sub-Saharan Africa	38 703	47 106	48 029
Income			
High	921 397	264 144	265 685
Low	17 510	27 449	28 161
Lower-middle	151 437	175 408	177 784
Upper-middle	436 648	383 338	386 605

Source: UNCTAD based on data from World Bank's World Development Indicators and Emissions Database for Global Atmospheric Research (EDGAR).

Note: Data on real output (in 2010 millions of United States dollars) are from the World Bank's World Development Indicators. Data on greenhouse gas emissions come from the EDGAR, which contains data sets covering the three direct greenhouse gases – carbon dioxide, nitrous oxide and methane aggregated by country and sector, using the IPCC 2006 sector designations.[24] For the historical analysis focusing on the five major industrialized economies, data for real GDP is from the Maddison Project, and data for historical carbon dioxide emissions are from the Carbon Dioxide Information and Analysis Center (CDIAC).[25] Total CO_2 emissions is the sum of fossil fuel emissions for solid, liquid, and gas fuels, as well as gas flaring and cement production. Combined GDP and CO_2 emissions data for each country is available as follows: United States (1800 - 2017), United Kingdom of Great Britain and Northern Ireland (1751 – 2017), Germany (1850 – 2017), France (1820 – 2017), and Japan (1870 – 2017).

Table 4.2 Top emitters (all values reported for 2018)

Country	GDP (millions of dollars, 2010)	Total CO_2 emissions (ktons)	Total GHG emissions (ktons)
CDDCs			
Brazil	1 797 739	1 201 539	1 224 978
Islamic Republic of Iran	425 620	666 693	675 341
Nigeria	492 075	591 952	600 732
Saudi Arabia	676 340	593 815	598 190
DDCs			
China	13 493 418	11 852 621	11 919 523
India	2 590 899	3 642 851	3 674 494
Indonesia	999 1789	991 355	1 006 355
Republic of Korea	1 601 904	696 868	698 605
Mexico	1 255 065	581 186	588 185
Developed countries			
United States	19 551 981	5 651 108	5 677 674
Russian Federation	1 430 115	1 823 398	1 840 037
Japan	4 578 914	1 225 865	1 228 035
Germany	3 561 302	853 765	856 454
Canada	1 659 241	668 390	672 966
Australia	1 463 016	478 238	482 964
Agricultural CDDCs			
Brazil	1 797 739	1 201 539	1 224 978
Argentina	583 430	276 514	281 884
Ethiopia	82 721	188 687	192 593
Myanmar	72 422	108 173	111 848
Uganda	37 239	72 737	73 944
Fuel CDDCs			
Islamic Republic of Iran	425 621	666 693	675 341
Nigeria	492 075	591 952	600 732
Saudi Arabia	676 340	593 815	598 190
Kazakhstan	202 016	284 797	287 526
Mineral CDDCs			
Chile	260 355	129 783	130 713
Democratic Republic of the Congo	42 619	95 172	96 705
Uzbekistan	95 650	93 780	96 502
Peru	210 308	73 978	75 189
United Republic of Tanzania	57 012	72 986	74 863

Source: UNCTAD.

Analysis of the data on the cyclical patterns of output and GHG emissions (Figure 4.2) suggests that in developed countries, GHG emissions seem to generally fluctuate with business cycles. This is an indication that GHG emissions in those countries vary with changes in economic activity. Another finding, from the relationship between emissions and GDP growth by type of commodity dependence, namely agriculture; minerals, ores and metals; and fuels; suggests that the cyclical relationship is stronger in agricultural and mineral CDDCs than in fuel-dependent CDDCs. This finding confirms that movements in fuels markets are less correlated with the business cycle than are markets for the other two types of commodities. Indeed, it is well known that fuel markets are highly volatile, responding to market as well as non-market signals that may not be associated with business cycles. For example, political events in major oil-producing countries generally have an immediate effect on prices, irrespective of the business cycle.

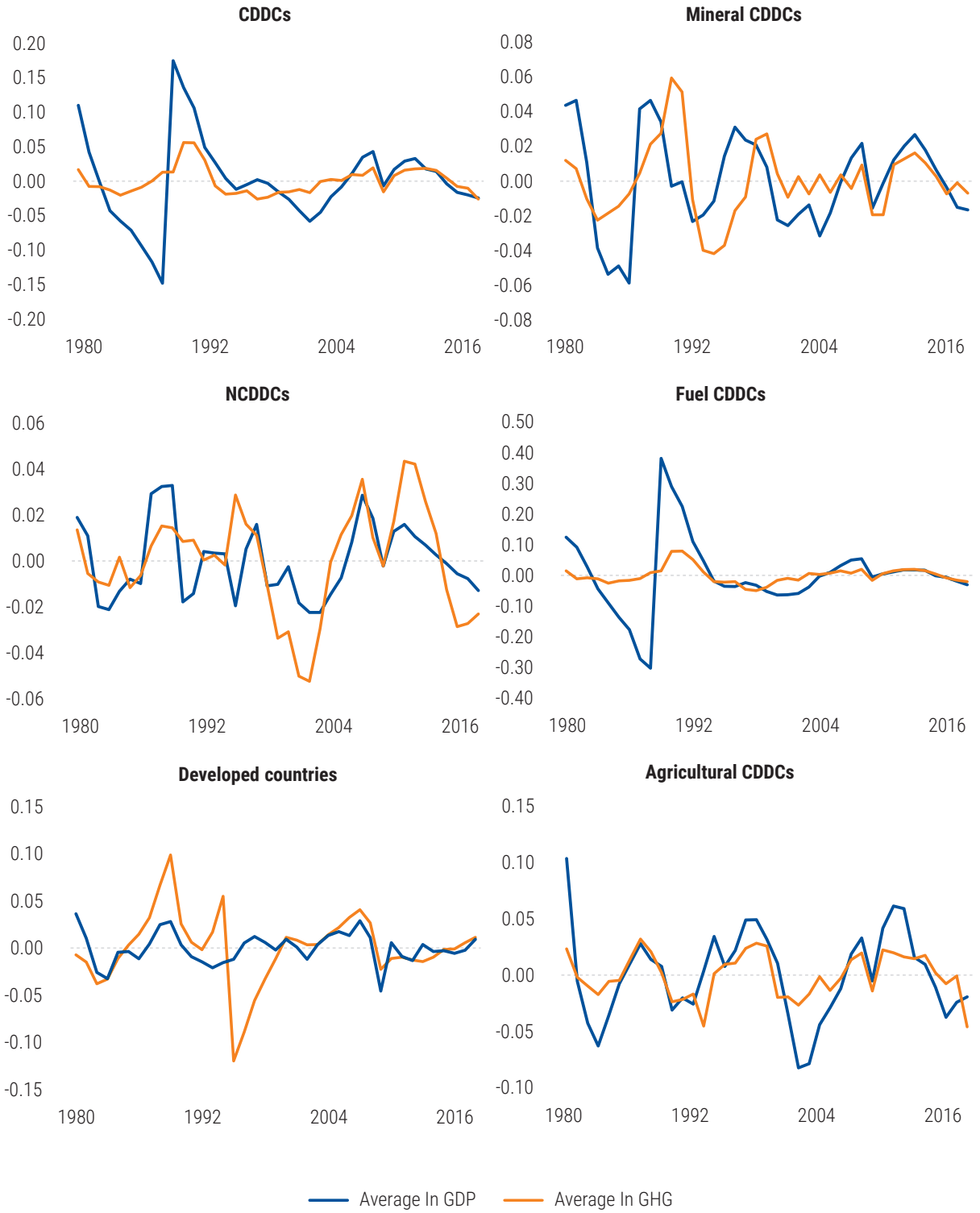
The trend relationship suggests that over time emissions rise with GDP growth in CDDCs and NCDDCs (Figure 4.3). Indeed, in developing countries, for both CDDCs and NCDDCs, changes in emissions are more likely to reflect long-term structural trends, as emissions gradually rise with GDP. Trend emissions in CDDCs have increased at least as fast as, or faster than, GDP, although starting from very low bases. This feature suggests that over time, as CDDCs diversify, they should pursue opportunities that help to restructure their economies in ways that decouple production from GHG emissions.

Moving on to the discussion of the estimates of cycle and trend emissions-output elasticities (Figure 4.4), it is worth highlighting, once more, a few findings that confirm the complexity of the relationship between output and GHG emissions. First, while developed countries have lower trend elasticities but higher cycle elasticities than CDDCs and NCDDCs, there are differences within the group of CDDCs. Trend elasticities are higher for CDDCs that depend on agricultural and fuel exports than those that are dependent on mineral exports, implying that efforts towards decarbonization of these economies as they diversify will need to be group or even country-specific.

The second finding relevant to the discussion of decarbonization and diversification in CDDCs is that high-income CDDCs have an average trend output-elasticity of GHG emissions that is almost double that of low-income and middle-income CDDCs. This result indicates that diversification strategies in high-income CDDCs would not necessarily be the same as those in lower-income CDDCs; there are specificities that will need to be accounted for.

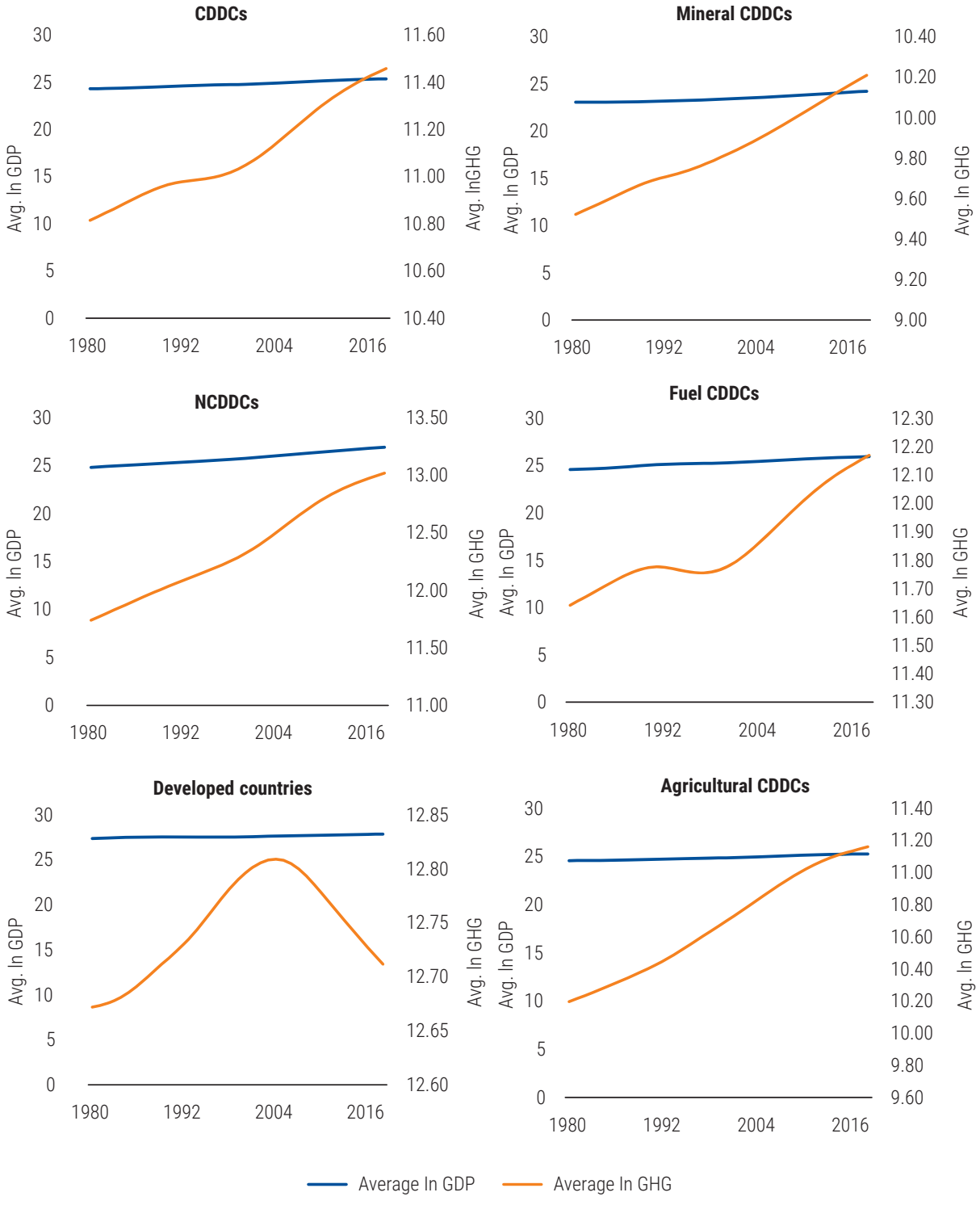
The third finding given in Figure 4.4 is that there are remarkable regional differences in terms of elasticity sizes. Elasticity estimates are highest in the Middle East and North Africa, a region that is highly dependent on hydrocarbons. A possible policy implication of this result is that this group of countries might consider diversification strategies that are oriented towards non-energy sectors with lower elasticities. But this will be contingent on each country's current and potential production possibilities in those sectors. A pairwise comparison of means reveals that compared with Europe and Central Asia, long-run elasticities are statistically higher in the Middle East and North Africa, sub-Saharan Africa, and Latin America and the Caribbean. Emissions are also the least pro-cyclical in sub-Saharan Africa and more procyclical in Latin America and the Caribbean. These regional differences are probably due to differences in types of commodity dependence and production processes across regions. It is also worth noting that within each region, there is considerable heterogeneity among countries.[26]

Figure 4.2 Cyclical GHG and GDP per commodity dependence status and commodity type
(in logarithm)



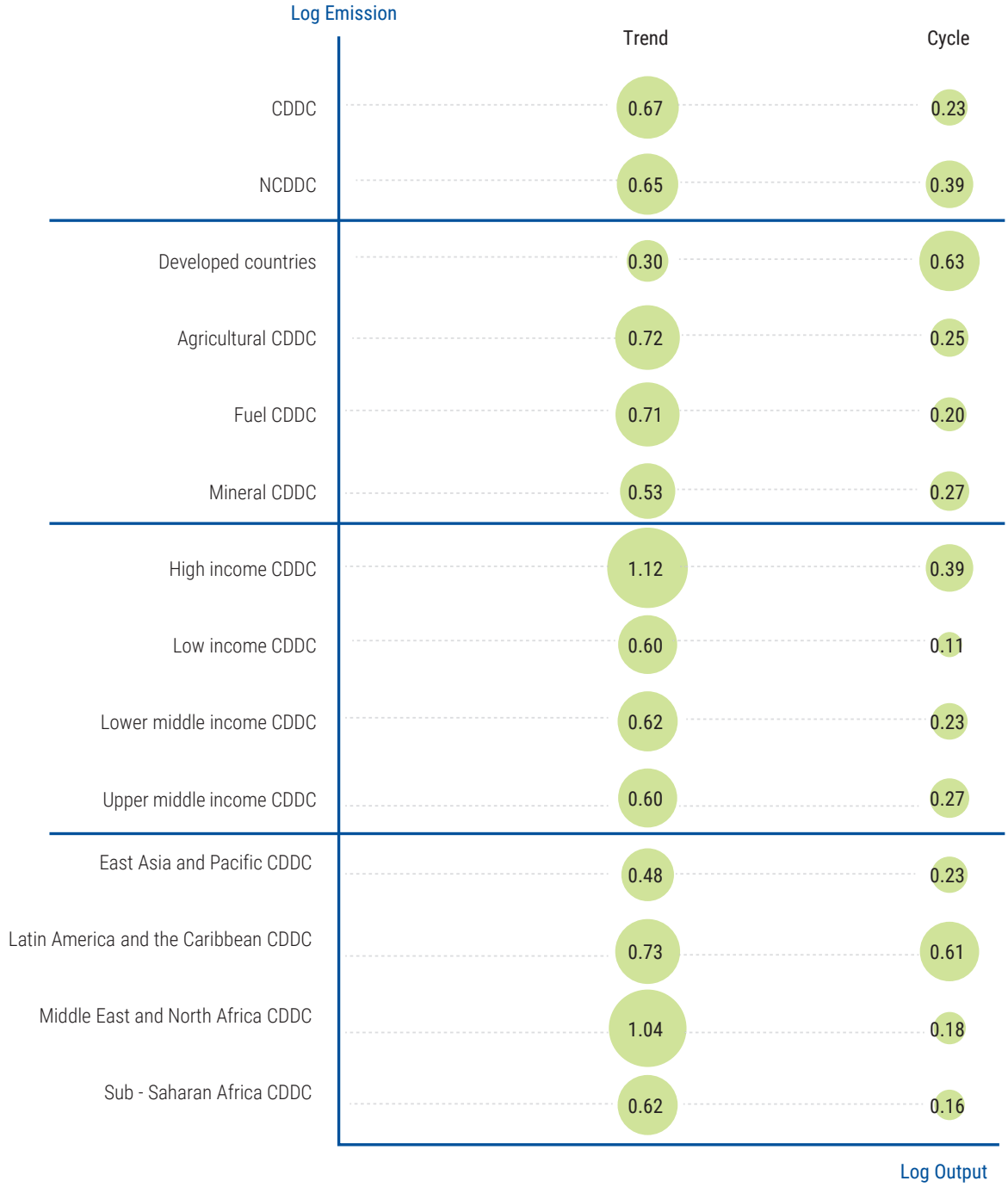
Source: UNCTAD.

Figure 4.3 Trend GHG and GDP per commodity dependence status and commodity type (in logarithm)



Source: UNCTAD.

Figure 4.4 Estimates of trend and cycle elasticities for different country groups



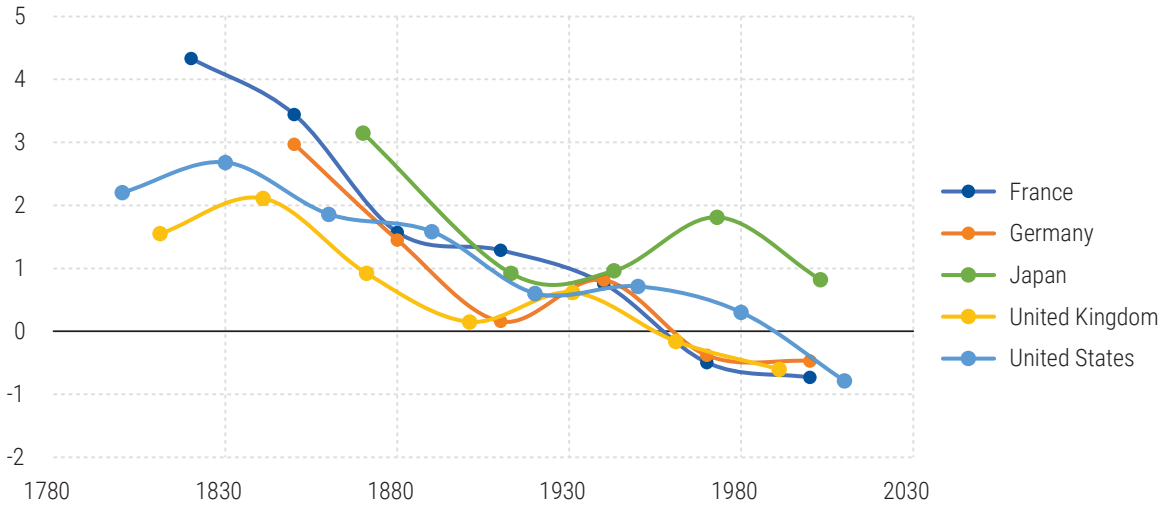
Source: UNCTAD.

A longer-term view: Decoupling is possible

Historical analysis using estimates of output and carbon emissions spanning more than two centuries provides insights into the process of decoupling as experienced by major industrialized economies. Two important messages may be derived from the elasticities captured in Figure 4.5. The first is that decoupling is possible, even though it took industrialized countries a relatively long time for their economies to experience a pattern of growth decoupled from emissions. As shown in Figure 4.5, output growth in the early periods of industrialization of major economies led to more than proportionate increases in emissions, with trend elasticities greater than 2 in the mid to late 19th century for all the countries. Over time, elasticities declined, hovering around zero in the most recent period, with experiences varying across countries.

For example, the United Kingdom had the lowest elasticity in its early industrialization, and it seems to have experienced a decoupling trend before 1880 when other countries had elasticities greater than one. Japan seems to have undergone a decoupling phase before 1930 but then increased its elasticity before showing another phase of decoupling by the end of the sample period in 2017. France had the highest elasticity at the beginning of the sample period in 1800 but continuously reduced its carbon emissions per unit of output until the end of the observation period in 2017. The lesson from these results is that decoupling experiences in industrialized countries were different, inviting some caution when referring to them. This might imply that CDDCs will also follow different pathways, with some countries decoupling faster than others. The difference between now and a century ago is that, on the one hand, the climate imperative is more acute now, and on the other hand, there are technologies that can help countries to follow a less carbon-intensive economic model.

Figure 4.5 Decoupling in industrialized countries followed a long period of industrialization: Trend emissions-output elasticities



Source: UNCTAD.

Note: The full-time series of the five countries are split up into 30-year periods. The trend elasticity equations are estimated on each of these 30-year subperiods.

The second message is that even though the only tested model for successful industrialization is the one followed by developed countries such as the ones depicted in Figure 4.5, CDDCs that would like to diversify today should aim for a different model; the traditional trajectory will not be compatible with the current and future efforts towards decarbonization. For those countries, embracing clean energies as early as possible should be considered as a part of their economic and environmental priorities.

Currently, developing countries – both CDDCs and NCDDCs – have emissions-output elasticities comparable to (and in several cases, less than) those of early industrializers when the latter were mostly well past a century of industrialization. The elasticities of several developing countries are at about the levels that the early industrializers reached in the mid-20th century.[27]

Experience will differ from one country to another and between the types of commodities countries depend on. Fossil-fuel-dependent economies, for example, may have more resources than agriculture-dependent economies to invest in economic transformation. The capacity to transform will also depend on the current level of emissions, the sensitivity of emissions to changes in output, and existing productive capabilities.

For low-income CDDCs, focusing exclusively on cutting emissions may therefore constrain their development without significant emissions benefits. And since energy access is critical for human wellbeing, for these countries, it may be more realistic to concentrate on building basic capabilities and ensuring access to energy using all available sources, including fossil fuels. A just energy transition implies that CDDCs, in general, and low-income CDDCs, in particular, might require relatively more of the remaining carbon budget. Moreover, these countries' development needs and their marginal responsibility in the climate crisis, as well as the principle of common but differentiated responsibilities, should justify more financial and technical support from developed partners in order to ensure that the process of decarbonization does not leave them behind.[28] Indeed, CDDCs should not stay at the margins of the decarbonization process. On the other hand, continuing to depend on carbon-intensive resources, as fossil fuels are being phased out elsewhere, may expose fossil fuel-dependent countries to significant losses as the natural resources and associated assets they have depended on are stranded.

Lowering GHG emissions will require efforts that should be commensurate with each stakeholder's capabilities. Some argue that given the strong association between economic growth and carbon emissions, more advanced economies should now forego economic growth while allowing "ecological space to permit development-through-growth to proceed for a short time in the Global South."[29]

However, allocating the burden solely to developed countries does not seem to be realistic.

Moreover, even if that were feasible, it would not slow the pace of climate change sufficiently. Contracting global GDP by 10 per cent between 2015 and 2030 might reduce emissions to 30 billion tons, but to achieve global climate mitigation targets, CO_2 emissions would need to fall to 20 billion tons by 2035.[30] In other words, that would require a reduction in global GDP four times larger than during the 2007-2009 recession.[31] The growth reduction necessary to bring about sufficient reductions in global CO_2 emissions would reduce living standards with little impact on overall emissions – and would probably widen inequality in wealth and income between and within countries.[32]

If the CDDCs are to meet their development goals while decreasing emissions, they will therefore need to strike a balance between traditional sources of energy and greener alternatives such

as solar and wind power. This will require time and patience. They cannot base their current industrialization solely on green energy, which is not yet sufficiently widespread or efficient. Rather, they should use the most available and reliable sources of energy, while establishing the infrastructure that will enable them to switch seamlessly to greener sources. Over time, the demand for green products will increase, while that for traditional carbon-based products shrinks. And during this period CDDCs should not just be buyers of green energy systems but active participants as producers and innovators of green technologies.

The following chapter shows how they can do so in a comprehensive way through 'green industrial policy.'

Endnotes

1 Pickbourn et al., 2022

2 Including highly vulnerable economies, particularly CDDCs, dependent on the export of a single commodity (e.g., sugar in Mauritius until the 1970s) or a limited number of commodity exports (e.g., coffee and bananas in Costa Rica until the 1980s).

3 UNCTAD and FAO, 2017

4 Agosin, 2009

5 Ibid

6 UNCTAD, 2021d

7 Agosin, 2009

8 Panayotou et al., 2000

9 Zeng et al., 2014; Lin and Chen, 2019

10 Pickbourn et al., 2022

11 Padilla, 2017

12 Kaya and Yokobori, 1997

13 Anzolin and Lebdioui, 2021

14 World Bank, 2012

15 Pollin, 2015: 109, 111

16 Please refer to Pickbourn et al. (2022) for the country level results.

17 Narayan and Narayan, 2010

18 More specifically, the authors find that for 15 out of the 43 countries in their sample, the long-run elasticity of emissions with respect to income is lower than the short-run elasticity, suggesting that in these countries, increases in income are associated with lower carbon dioxide emissions. However, the long-run income elasticity of carbon dioxide emissions was positive for all but six countries (the Congo, Iraq, Kenya, Nigeria, the United Arab Emirates and Yemen) indicating that the majority of countries in the sample still need to do more to decouple long-run income growth from carbon dioxide emissions.

19 Gough, 2017; Jalles and Ge, 2020

20 Cohen et al., 2018

21 Jalles and Ge, 2020

22 Pickbourn et al., 2022. These country categories were used in previous reports, including in UNCTAD (2019a) and UNCTAD (2021d). CDDCs are developing countries (using UNCTAD classification) that derive at least 60 per cent of their merchandise export revenue from commodities, as defined earlier. NCDDCs are developing countries that are not commodity-dependent. Developed countries are as defined by UNCTAD classification.

23 see also UNCTAD, (2019a).

24 The IPCC sectors are defined as follows: energy industries comprises emissions from fuels combusted by the fuel extraction or energy-producing industries; manufacturing industries are emissions from combustion of fuels in industry, and includes combustion for the generation of electricity and heat for own use in these industries; transportation sector refers to emissions from the combustion and evaporation of fuel for all transport activity excluding military transport; manufacturing non-energy covers emissions from industrial processes and product use, excluding those related to energy combustion. See the IPCC guidelines for further details.

25 This dataset provides country-level time-series estimates of carbon dioxide CO_2 emissions from fossil fuel combustion and cement manufacture going back to 1751, and include emissions from solid fuel consumption, liquid fuel consumption, gas fuel consumption, cement production, and gas flaring https://data.ess-dive.lbl.gov/view/doi:10.15485/1712447

26 Detailed information can be found in Pickbourn et al. (2022).

27 Pickbourn et al., 2022

28 UNCTAD, 2022b

29 Gough, 2017: 171

30 Pollin, 2015

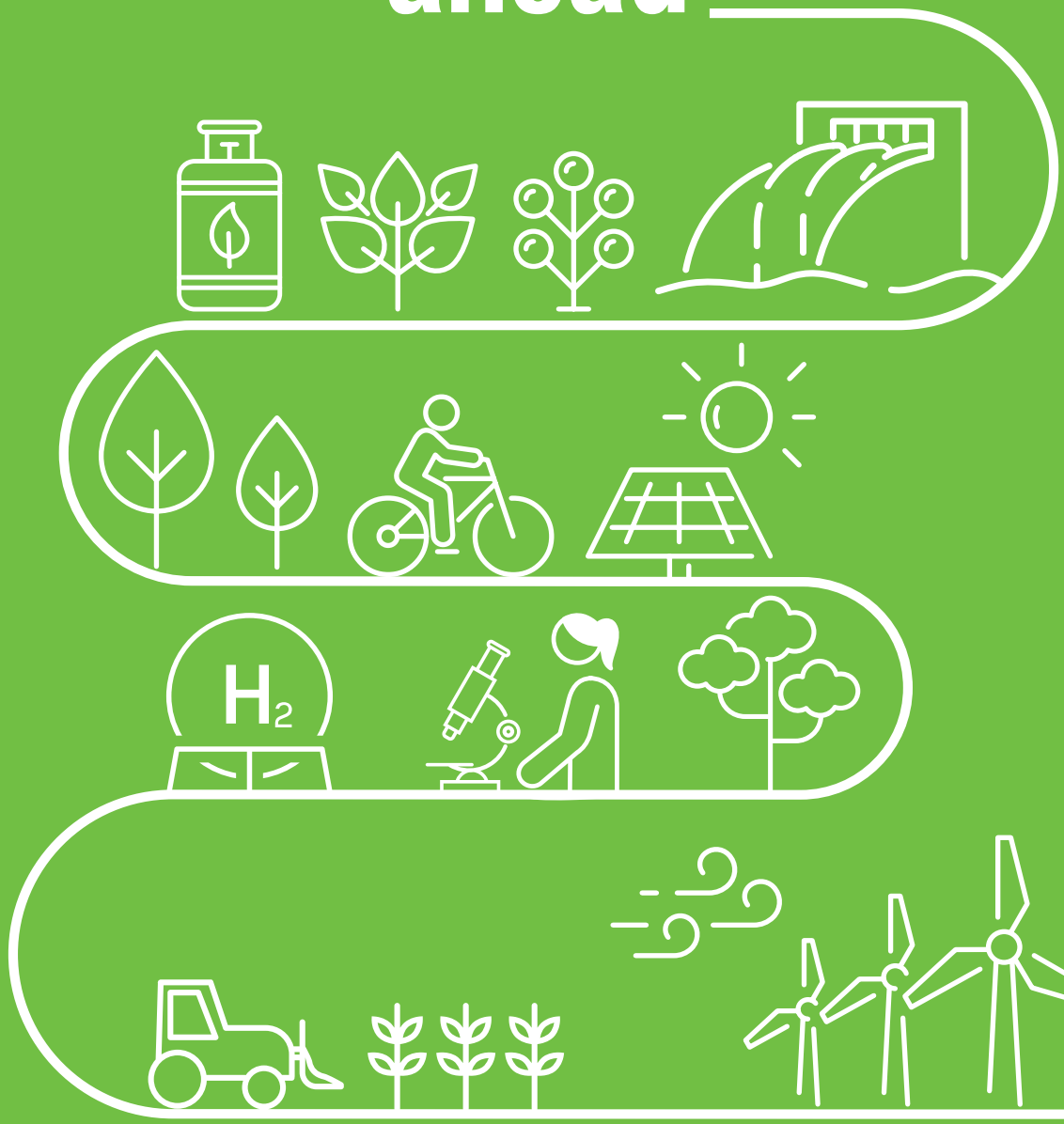
31 Pollin, 2015: 108

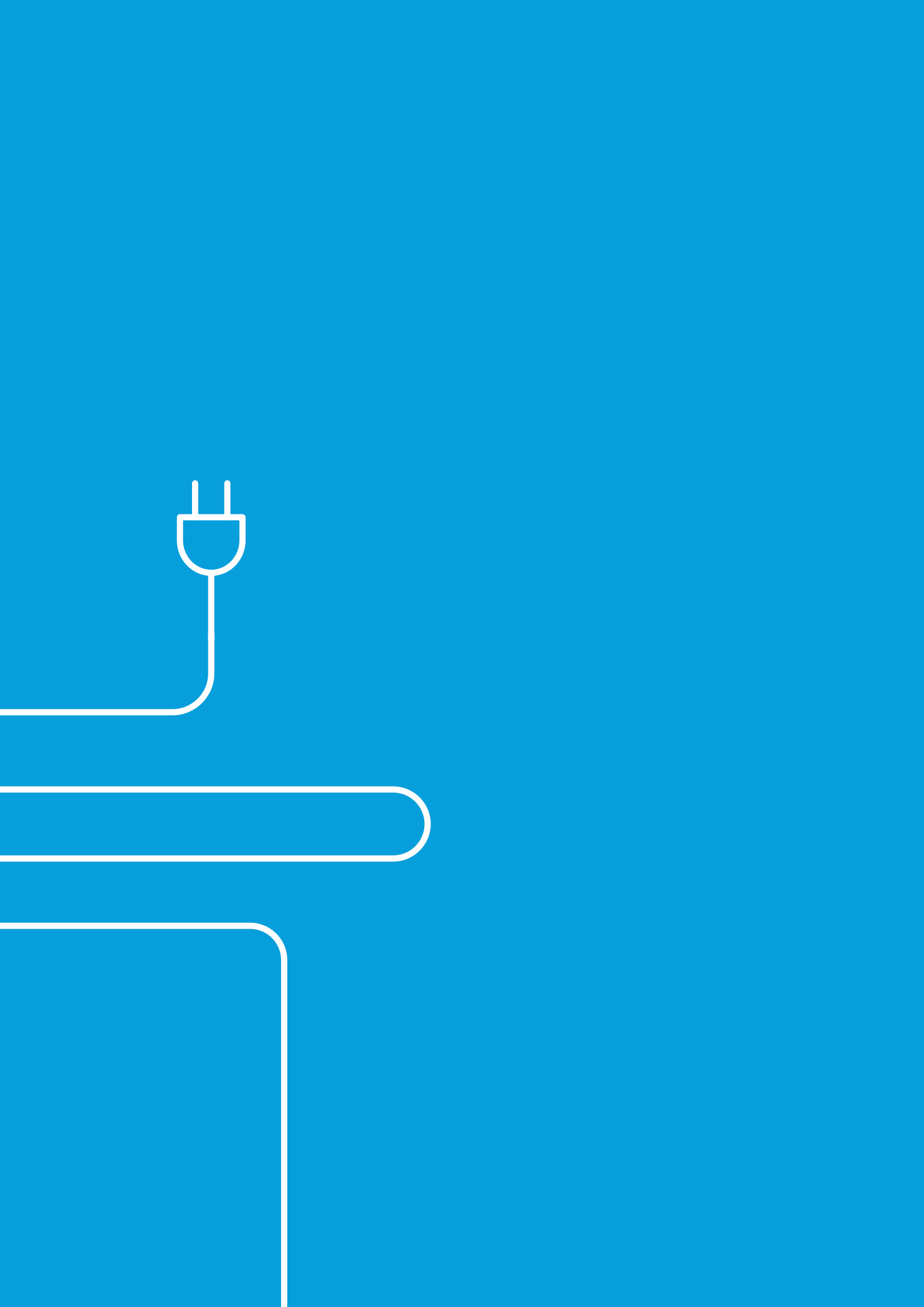
32 Gough, 2017

CHAPTER

5

Greener economy ahead





5 Greener economy ahead

To achieve sustainable economic growth and accelerate human development, CDDCs need to transform their economic structures to make them more diverse and resilient, while anticipating a low-carbon future. This chapter outlines potential directions and actions and argues for 'green industrial policies.'

CDDCs face the challenge of diversifying their economies while aligning with global efforts to reduce GHG emissions and address the climate crisis. This requires transforming their productive capabilities amidst changes in energy and transportation systems. To tackle this challenge, CDDCs should utilize all available resources. The efficient use of traditional energy sources and the expansion of renewables are both essential in their pursuit of economic diversification. They need to develop productive capacities that promote increased productivity and prosperity while transitioning to a low-carbon economy. These policies should also prioritize inclusivity by creating employment opportunities and minimizing potential negative income distribution effects within countries.[1] Green industrial policies (GIPs) play a vital role in this transformation.

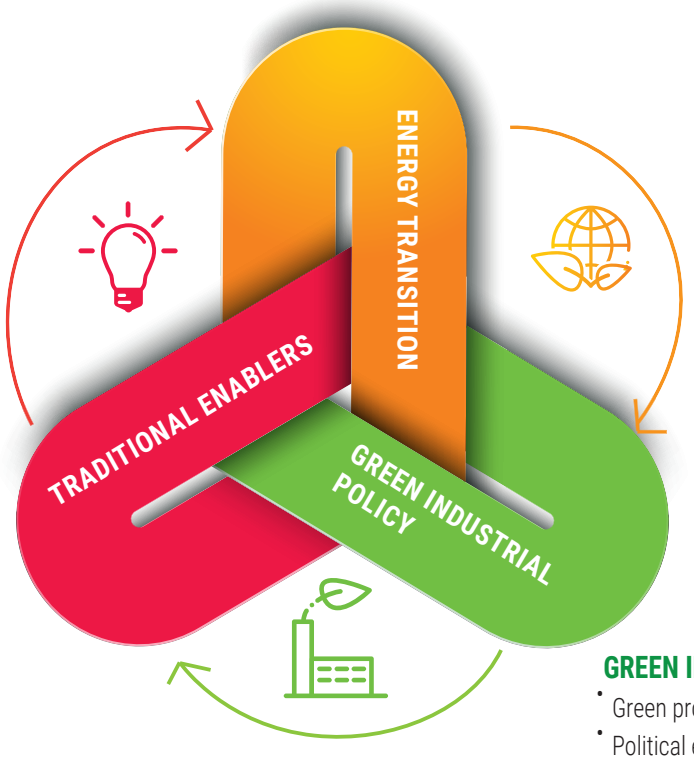
Figure 5.1 represents the types of policies required to support CDDCs in diversifying their economies while contributing to climate change mitigation efforts. This chapter begins by highlighting the conventional factors that have historically driven economic transformation, which remain relevant in green structural transformation. It then explores specific drivers for diversification within the low-carbon economy. Finally, it emphasizes the importance of implementing a green industrial policy in CDDCs for leveraging diversification opportunities arising from the global energy transition.

Traditional enablers of economic diversification

Most countries that have successfully diversified their economies have relied on a policy mix that addresses country- and sector-specific challenges and market failures, which have also generally improved the business and investment climate in the country (see chapter 2).

Human capital – A well-designed GIP framework should align the skills of the labour force with the needs of the labour market and enable workers to adapt to new and emerging industries. Governments should work with the private sector on vocational education and on-the-job training – and extend this to workers in the informal sector to make them more productive, and offer paths to formal employment. When they have learned new skills, workers in traditional energy production can be redeployed in clean energy sectors. In India, for example, the Skill Council for Green Jobs identifies and builds skills for green industries. Support can also come through international development cooperation and South-South cooperation – as with the establishment in 2014 of the Brazil-Sao Tome and Principe Professional Training Centre.[2]

Figure 5.1 Links between policies for export diversification



TRADITIONAL ENABLERS
- Human capital
- Market access (export and import)
- Infrastructure: Export Processing Zones (EPZs)
- Economic and political stability

ENERGY TRANSITION
- Boost access to energy
- Consider right energy mix
- Harness green growth opportunities
- Account for initial conditions
- Decent jobs and just transitions
- Benefit from international cooperation and agreements

GREEN INDUSTRIAL POLICY
- Green productive capabilities
- Political economy and inclusiveness: job creation, gender, SMEs
- Country specificity
- Adjust rules governing trade, finance, investment, technology
- Make the switch in CDDCs to low-carbon economy compatible with incentives

Source: UNCTAD.

Skills development should also be gender inclusive. In Ghana, for instance, the Women in the Driving Seat tractor operation aims to break down barriers for women in agricultural mechanization by providing exclusive tractor training and certification for women, to enhance the skills and expertise of women operators, mechanics, and technicians, leading to long-term growth in their involvement and leadership in agricultural machinery operation.[3]

Market access – In countries where the domestic capital market is underdeveloped, governments need to prioritize financial sector development and can consider designing targeted financing instruments through specialized funds or development banks that improve access to finance. In this regard, SMEs need particular attention as they represent most businesses and employment worldwide but face significant unmet financing needs.[4] For instance, blended concessional finance can help expand access for underfinanced enterprises by offsetting some risks. Also, instruments tailored to women-owned and women-led businesses can help to address the gender finance gap.[5] International financial institutions

can also strengthen their support for private sector access to finance in CDDCs in line with government priorities and thus promote diversification and value upgrading. Moreover, an appropriate trade policy framework can contribute to diversification and value upgrading by facilitating access of domestic firms to key inputs. In this regard, there is evidence that tariffs on imported capital and intermediate goods can limit productivity and growth in developing countries.[6]

Infrastructure – Infrastructure plays a crucial role in enabling economic diversification by providing not only the necessary physical and logistical support for the development of diverse industries and sectors, but also facilitating the development of other enablers of diversification. Access to affordable and reliable energy, for example, is not just a precondition for diversified industrial development; it is also essential for improving education and health standards. Modern transport and telecommunication services only thrive with reliable energy services and functioning digital infrastructure.[7] Special industrial zones can only fulfil their potential if they have strong links with their domestic economies. While such linkages pose a challenge in terms of policy coordination, they also provide opportunities for creating a mutually reinforcing policy approach.

Economic and political stability – All these components should coalesce into a whole-of-government strategy based on strong leadership with coordination at the highest levels of government – to build a national consensus that extends beyond immediate political cycles.[8] Costa Rica, for instance, initiated measures in the early 1980s that did not bear fruit until the 1990s and 2000s; these included exchange-rate reforms, export tax reduction, government subsidies, and regulatory frameworks to help "non–traditional" exporters concerning export contracts, the establishment of maquiladora firms in the apparel sector, and the promotion of new exports via free trade zones.[9]

Economic diversification in a low-carbon economy

The energy transition offers countries the potential for economic diversification through low-carbon activities, opening doors to positive socioeconomic outcomes such as improved energy access and green growth opportunities. At the same time, countries must be mindful of the potential impact of diversification and the transition on income inequality. Each country's prospects will depend on its unique characteristics, including natural resources, productive capacities and existing disparities. This means that progress towards a low-carbon world may be uneven and slower in developing countries compared to advanced economies. This section outlines key aspects of an inclusive energy transition.

Boost access to energy – The energy transition and expansion of renewable energy markets may offer a much-needed impetus for countries to address energy disparities. Decentralized renewable energy systems can boost rural electrification in areas with large distances to the grid. Electrification of schools, for example, allows them to use IT equipment and adopt more advanced curricula and teaching materials that enable low-income households to build higher levels of skill. Households would also benefit from energy access and cleaner cooking technologies, freeing more women to participate in the labour force.[10] This is particularly important for rural areas and could reduce the urban-rural divide. There has been some progress in this regard. For example, between 2014 and 2019, the number of people with access to solar home systems in Africa increased from 1.6 million to 12.6 million.[11]

Consider the right energy mix – As discussed in chapter 2, natural endowments and renewable energy potentials vary from country to country. These differences mean that

governments must consider their natural endowments to strategically develop renewable markets that align with their resource abundance. Morocco, for example, has focused on solar energy due to the high rates of solar irradiation it possesses.[12] By contrast, Albania has concentrated efforts on hydropower due to its river systems.[13]

Harness green growth opportunities – New opportunities may arise in various low-carbon sectors – ranging from the production of renewable energy and the operation and maintenance of equipment to nature-based solutions, expanding the circular economy, and climate change adaptation. In addition to solar energy, many CDDCs also have considerable potential for wind energy and for producing and exporting green hydrogen.[14] Indeed, in the new global markets for green energy and related products, developing countries, particularly in Africa, can have a comparative advantage and exploit new employment opportunities. Other CDDCs may also have opportunities in biodiversity-based products (Box 5.1).

Account for initial conditions – Much of the effort towards a low-carbon energy transition will depend on a country's starting point, including its ability to invest and existing disparities. Higher-income countries will be better able to introduce renewable technologies.[15] Many lower-income economies, on the other hand, may prioritize rural energy access or the use of clean cooking technologies and have fewer resources for developing wind or solar. Meanwhile, fuel-exporting CDDCs may initially shift from petroleum and coal to natural gas before advancing to greener energy sources at a later stage.

Fuel-exporting countries should be particularly cognizant of the challenges the transition implies, as it represents an immense reconfiguration of economic activity and may have important distributional implications. It is important for governments to find a balance so that they do not lag behind decarbonization efforts while also minimising the disruptions net-zero would bring to the economy. That said, the transition is likely to be achieved through gradual interventions rather than bringing an abrupt halt to carbon-intensive activities.[16]

Decent jobs and just transition – About 1.2 billion jobs around the world rely directly on a healthy, sustainability-based environment, particularly jobs in agriculture, forestry, and related sectors that depend on functioning ecosystems. A green transition could lead to a net gain of

Box 5.1 Biodiversity-based products

Agricultural CDDCs that are rich in biodiversity can benefit from products derived from biological resources, such as coffee, cotton or natural oils and fats. An example is marula oil in Namibia. Marula is an indigenous plant that is used in various cosmetics for personal and skincare. A cooperative that is processing and commercializing marula oil has generated employment opportunities for 2,500 women in rural communities in the country.

The cooperative's factory produces up to 12 tons of processed oil each year, which is either traded locally or sold in international markets. This is a small-scale initiative, but it has improved the access of women in rural communities to the labour market and constitutes a value upgrade along the marula commodity chain. Similar initiatives in other agricultural CDDCs can take advantage of opportunities that may arise from the energy transition and increased green consumption based on pre-existing productive capacities and resources. Large-scale efforts may also contribute to a country's export diversification.

Source: UNCTAD. 2021a. Women in rural Namibia profit from biodiversity-friendly trade. UNCTAD. Available at: https://unctad.org/news/women-rural-namibia-profit-biodiversity-friendly-trade

18 million jobs by 2030.[17] This is an opportunity for countries to diversify into greener activities and to increase participation from previously excluded groups.

To this end, governments will need national plans to ensure that the benefits of the transition are not concentrated in a single group. This would entail pursuing inclusive labour policies, including social protection, retraining and upskilling schemes and social dialogue, as detailed in chapter 3. In addition, governments should ensure equal access to energy, education and healthcare.

Benefit from international cooperation and agreements – Governments would benefit from regional and international cooperation and existing climate-related mechanisms such as ILO's Climate Action for Jobs Initiative to ensure inclusive policies that support a just transition by creating decent jobs and measures to safeguard vulnerable workers.

An encouraging outcome following the 2022 Climate Change Conference (Conference of the Parties of the UNFCCC – COP 27) in Sharm el-Sheikh, Egypt, was the decision to establish new funding arrangements and a dedicated 'loss and damage' fund to assist developing countries disproportionally impacted by climate change,[18] which may help contribute to the funding of a green transition in vulnerable countries.

As CDDCs may be affected by external policies, advanced economies need to be cognizant of the potential distributional effects of their own policies, such as the Carbon Border Adjustment Mechanism (CBAM) in the European Union, which aims to put a fair price on the carbon emitted during the production of carbon-intensive goods that are entering the European Union. A recent carbon pricing analysis by UNCTAD[19] estimates that the CBAM would decrease global real income by $3.4 billion, with developed countries' incomes rising by $2.5 billion and developing countries' incomes declining by $5.9 billion.[20] Although the CBAM is likely to exempt SIDS and LDCs, it is expected to further widen the gap between developing and developed countries.[21]

Green industrial policies in CDDCs

Industrial policy plays a crucial role in economic development by stimulating dynamic market forces and driving structural change and growth,[22] and the state plays a pivotal role in promoting development-oriented industrial policies.[23] Industrial policies have been instrumental in supporting the catch-up process in East Asia by addressing information and coordination challenges in capital formation and enabling private firms to unleash their creative potential and translate production experience into productivity gains.[24]

A well-designed industrial policy is essential for nurturing the learning process of companies, especially in new products and markets. It encompasses mechanisms that encourage innovation, promote research and development activities, simplify patent access, and provide fiscal and financial incentives for new production.[25] Effective industrial policies also include strategies such as information dissemination, favourable FDI policies, and government procurement, which enhance integration into global production chains.[26] Aligning industrial policy with trade policy objectives allows countries to strive for international competitiveness in increasingly sophisticated products,[27] while a strategic trade policy that complements the industrial policy further enhances its impact.[28]

Recognizing the urgency of addressing climate change, industrial policies can serve as a starting point for sustainable development strategies. Some developing countries can

leverage their natural comparative advantages in the production of low-carbon energy (e.g., solar and wind energy) by using industrial policy to develop dynamic comparative advantages in this area.[29] Also, by providing the right incentives, domestic producers can participate in producing climate-friendly goods and tailor products to local needs.[30]

Such inclusive diversification and a green transition require an appropriate policy framework – a green industrial policy.[31] A GIP incorporates "any government measure aimed to accelerate the structural transformation towards a low-carbon, resource-efficient economy in ways that also enable productivity enhancements."[32] There are some similarities with traditional notions of industrial policy but also some important differences such as: identifying environmental externalities as important market failures; promoting technologies and patterns of consumer behaviour that are desirable because of their environmental impacts; achieving structural change in a short timeframe; and stimulating positive spillovers that extend beyond the boundaries of the domestic economy.[33]

History has shown that left on their own, markets have their limits, not just for achieving greener development but also for generating employment and promoting human development in the face of globalization, disruptive technological change, and financial crises.[34]

A well-designed GIP will respond to the shortcomings of traditional industrial policy. It will:

- **Be multisectoral** – Industrial policy should be more inclusive, extending beyond manufacturing to all sectors of the economy, including agriculture, mining and services, with a particular focus on reducing CDDCs' dependence on traditional commodities.[35]
- **Have social goals** – Industrial policy should be driven by societal goals, including those for climate, health, reducing poverty and inequality and creating decent jobs outside the commodity sector.[36]
- **Collaborate with the private sector** – Instead of the traditional top-down policymaking, industrial policy should be a sustained collaboration between the public and private sectors to create the appropriate institutional environment for diversification outside of the commodity sector.[37]
- **Guide technological change** – Industrial policy should steer technological change to non-commodity sectors that promote pro-poor, pro-environment and pro-labour activities.[38]

These policies can help to create new markets for green products and services, stimulate economic growth, and create jobs in the green economy. By supporting green innovation, countries can also enhance their resilience to climate change impacts and reduce their vulnerability to environmental risks. Overall, green innovation policies are a key component of efforts to transition towards a more sustainable and low-carbon future.[39]

A GIP is, therefore, highly suited to the needs of CDDCs. Diversifying away from commodities without further increasing emissions can only be achieved with large, coordinated investments in energy systems, infrastructure, and technological innovation.[40] In the short term, these investments can reduce emissions associated with expansions in the use of fossil fuel-based energy. For example, the Optimization of Power Generation and Energy Efficiency Programme in Ecuador succeeded in reducing the flaring of gas and the use of diesel for electricity generation, making it possible to lower emissions by 848,500 tCO_2e between 2009 and 2015.[41]

Furthermore, a GIP can also mitigate the risk of stranded assets. Decarbonization in China, the United States and the European Union involves revaluing carbon assets downwards and, by implication, depreciating the underlying natural resources.[42] CDDCs can avoid creating

more stranded assets by depending less on commodities and transitioning to low-carbon economies. The Government of Namibia, for example, is aiming to be a global leader in alternative energy markets through the production of green hydrogen.

CDDCs transitioning to a low-emissions development path should start this transition now, at the start of the new green technological revolution.[43] At the beginning of a new technological wave, every country is more or less in the same position, but early adopters move ahead quicker and create advantages that make others struggle to catch up. Access to technologies and know-how is not enough – timing is especially crucial. If they postpone the changes to a later stage, when they are more firmly locked into older infrastructure and technologies, the costs of greening their economies may be very high.[44]

It is also worth emphasizing that instead of merely being consumers of green energy, relying on technology imports, CDDCs implementing GIPs can actively participate in the development of new technologies and productive capabilities and establish dynamic comparative advantages in green products and technologies.[45]

Designing GIPs for CDDCs

Instead of copying models from elsewhere, CDDCs should identify pragmatic policies suited to their levels of development and productive capabilities. These will differ from one economy to another, but in general, they should be guided by common principles, identify priority sectors, take advantage of commodity-related entry points, build on regional integration opportunities and be strongly supported by the international community.

Principles

Develop foundational capabilities – Most CDDCs will need to 'jump' from a limited set of productive capabilities into more technologically advanced production.[46] To succeed in acquiring the productive capabilities specific to a particular technology, developing countries need 'foundational capabilities' that allow them to learn these new technical solutions and apply them in innovative ways.[47] Hence, States should support research and development while attracting long-term capital to build and accumulate production capabilities. Promoting learning in production is essential, i.e., developing and accumulating productive capabilities in an environment where firms can stay in business and expand and improve their production processes.[48]

Ensure political and public support – A successful GIP needs to identify the distributional effects of structural reforms and manage potential conflicts, given that reforms might have short-term costs on segments of the population.[49] Managing potential conflicts between different groups is essential to the success of a GIP. This involves carefully fine-tuning the reform measures while implementing compensatory measures or social safety nets. It is important to foster long-term support for these reforms, as their true benefits may only be realized after several years or even decades. Consistent backing from the population and a sustained commitment across successive governments are key factors for success.[50] An example is Costa Rica and their journey towards diversification, which relied on steady support from politicians, who understood that the political benefits of the reforms would materialize several years down the line, even if they personally wouldn't directly benefit from them.[51]

Create jobs – CDDCs typically have relatively limited high-quality employment opportunities, so the creation of such jobs should be a priority for GIP, particularly for workers in the informal sector. Creating jobs for this critical segment of the labour force would help address the

income inequalities often associated with diversification. This could include initiatives such as providing training and support for entrepreneurship and small businesses, creating public works programmes that can develop skills, and investing in labour-intensive green technologies and related infrastructure projects.

Promote social cohesion and a just transition – Ensure GIP accounts for all segments of society and includes marginalized and underrepresented groups in their design. This is important to address existing disparities and prevent widening income and opportunity gaps in the population. As outlined in the previous chapters, this should include measures targeting actors who are vulnerable to the energy transition.

Ensure gender equality – A GIP should increase women's access to employment opportunities. Gender equality should not be a by-product of industrial policy or be sacrificed for environmental sustainability or green growth.[52] Gender equality should be an integral component of GIP design. It should include measures that specifically address the structural barriers faced by women in accessing the labour market, such as improving childcare, increasing access to education and training, promoting equal pay for equal work, and ensuring equal opportunities for career advancement. The GIP should also monitor gender disparities in the workforce and introduce corrective measures as necessary.

Priority sectors

Diversification towards complex,[53] greener, and more socially inclusive sectors is crucial to achieving more inclusive and sustainable economic growth. Therefore, GIPs should identify potential new sectors that meet these criteria in view of the opportunities and risks in individual economies.

Identifying potential new sectors for economic diversification – This requires an understanding of a country's current productive capabilities. Certain sectors offer significant export opportunities for CDDCs due to their potential for upgrading, high unit values, and favourable market conditions. For example, UNCTAD analysis suggests that for CDDCs, these sectors include articles of machinery and mechanical appliances, plastics and plastic articles, electrical and electronic equipment, iron and steel, organic chemicals, and optical, photo, technical, and medical apparatus.[54] However, the type of commodity dependence (agriculture, fuel, minerals) and income level of CDDCs play a role in the feasibility and potential impact of diversifying towards these sectors. Also, the export potential of these sectors varies by region, with some sectors showing greater potential in certain areas than others. Policymakers should carefully consider these factors when identifying potential new sectors for economic diversification.

Capturing more value in existing value chains – GIPs should also promote the capture of more value along the commodity value chains. In response to the COVID-19 pandemic and the war in Ukraine, businesses are likely to revisit the just-in-time business model of global value chains (GVCs) to reduce supply uncertainties. This might mean less reliance on imports from long distances, potentially changing the nature of CDDCs involvement in GVCs. This may encourage the development of short-distance regional value chains in developing countries, helping CDDCs to design a different diversification path that could capture more value in commodity value chains.

Entry points

Green industrial policies in CDDCs should also be tailored to the opportunities and risks present

in individual economies. In many cases, these are strongly linked to the type of commodity dependence:

Fossil fuels – In countries that depend on the export of fossil fuels, one entry point for GIP could be the transformation of hydrocarbon assets and resources, which risk being stranded, into other, more sustainable forms of capital such as human capital, infrastructure and productive capacity.

- **Create sovereign wealth funds** – Considering the large flows of capital associated with fossil fuels transactions, especially during periods of high prices, windfall gains and large capital inflows during boom periods could be used for creating commodity-based sovereign wealth funds (SWFs), which stabilize fiscal policy by transferring income into a diverse portfolio of assets (see chapter 2). However, SWFs are only effective and sustainable if they remain transparent, with strong governance and have robust inflow/outflow rules.

Minerals – In CDDCs with large mining sectors and reserves of critical energy transition minerals, harnessing the potential economic benefits of a large-scale expansion of markets for clean technology could be a key area for GIPs.

- **Harness clean technology markets** – From 2025 to 2030, the energy transition will globally bring cumulative global mining investments of $1.7 trillion.[55] This represents a huge opportunity for countries such as the Democratic Republic of the Congo, which in 2022 accounted for 68 per cent of global cobalt mine production and 48 per cent of global cobalt resources.[56] Rather than contributing to 'resource curses', the mining of these resources should be linked with domestic or regional value chains in mineral-based products. The recent agreement between the Democratic Republic of the Congo and Zambia to jointly manufacture precursors to electric car batteries is an example of what CDDCs could do. [57]
- **Respect environmental, social and governance (ESG) guidelines** – The mining industry is under external pressure to address environmental and social concerns, with national governments and legislation enforcing compliance with environmental and social laws and companies participating in sustainability initiatives and industry associations to demonstrate their commitment to sustainable practices and adopt best practices.[58] Ensuring responsible mining operations will mitigate the negative impact of mining operations on communities, while maximizing the benefits in terms of job creation, tax revenue, and infrastructure development. Also, building strong institutions and preventing corruption is vital to promote inclusive mineral development and equitable distribution of its benefits.

Agriculture – For CDDCs that depend on the agriculture sector, potential entry points for GIPs are sustainable value upgrading into agri-processing industries and climate-smart agriculture.

- **Process crops locally** – Currently, African CDDCs grow most of the global cashew nut crop but export this for processing in Asia.[59] Instead, producer countries could also process the crops and add value locally while shortening supply chains. This may not be easy. MNEs have often used their market power to create entry barriers, limiting the scope for learning in developing countries – as with cocoa and coffee.[60] In Ghana, MNEs have financialized the cocoa and chocolate sectors, constraining the ability of local producers to move along the global value chains. Large corporations have created food-based assets for financial investors. As a result, financial institutions are now part of the agri-food system, while agri-food companies are behaving like financial institutions. Newcomers, therefore, need access to deep and cheap capital markets to compete, which is difficult for most companies in developing and emerging markets.[61]
- **Move to smarter agriculture** – Through climate-smart agricultural practices, agricultural

productivity growth – an important element for structural transformation – could be safeguarded from the impacts of climate change and/or decoupled from rising GHG emissions.[62] The timed release of nitrogen fertilizers, for example, increases crop productivity while reducing GHG emissions.

Regional integration

Given the small sizes of individual CDDC markets and differences in the potential for export diversification across CDDCs, regionally coordinated diversification policies could be beneficial.

Coordinate diversification strategies regionally – Infant industries in CDDCs can avoid competing for space in global markets by prioritizing diversification efforts in different sectors based on a region's type of commodity dependence and income level. Such a regional strategy could ensure that such policies do not lead to regional imbalances or exacerbate existing inequalities. It would create a coordinated and supportive environment that enables all CDDCs to pursue sustainable and inclusive economic diversification. Such coordination requires effective policies and institutional support, as well as strong regional cooperation and integration to ensure that all countries benefit from the process of economic diversification.

Leverage regional trade – Regional markets can be a valuable avenue for CDDCs to promote their diversification, particularly in Africa, where intraregional trade is lower than in other regions.[63] Indeed, there are significant opportunities for African CDDCs to diversify their exports in sectors such as plastics, iron and steel, machinery, and electrical equipment.[64] By focusing on these sectors and leveraging regional trade agreements and partnerships, African countries can tap into a growing demand for these goods and services within the continent. This can reduce their dependence on traditional commodity exports while also promoting regional integration and economic development.

Foster regional value chains – Promoting partnerships within regions can be an effective strategy for CDDCs to participate in sectors that offer common opportunities for diversification. By joining forces, countries at different levels of development can collaborate in different stages of value chains, allowing them to take advantage of each other's strengths and resources. This can include sharing knowledge and expertise, pooling resources and investments, and establishing joint ventures and partnerships with firms in more developed countries. By working together, CDDCs can improve their bargaining power and access to markets, while also building more robust and resilient economies that rely less on a single commodity or market. However, such partnerships require careful planning and management, as well as strong institutional frameworks and governance mechanisms to ensure that all partners benefit from the collaboration.

International support

Green industrial policies take place in a changing global context that will determine their success or failure, and CDDCs cannot succeed without important contributions from the international community. Indeed, GIPs and diversification in CDDCs should be considered a global objective as part of the mitigation response to climate change. Therefore, international actors will have an important role to play:

Stabilize commodity markets – International action will be needed to tackle the increasingly financialized commodity markets – with rules to limit speculation, and new, counter-cyclical financing facilities that can mitigate price shocks.[65] South-South cooperation among CDDCs would increase their bargaining power with international commodity buyers and their ability to negotiate for more favourable rules governing global trade and investment. To help create

space for industrial policy, the international community could also reinstate stabilization funds.

Combat tax evasion and illicit financial flows – Measures could include greater regulation of transnational capital flows and international collaboration to reduce tax avoidance and tax evasion while directing the global financial system towards more productive investment.[66] In this connection, the implementation of the Base Erosion and Profit Shifting (BEPS) framework, which aims to prevent multinational enterprises from shifting profits to low-tax jurisdictions, is expected to reduce some types of tax avoidance.[67] The international community should increase technical assistance to developing countries to support BEPS implementation and investment in policy adjustment. Another important measure is improving transparency and information exchange between tax authorities, as well as strengthening the capacity of developing countries to participate in international tax cooperation.[68] Multiple donors have made commitments to double their aid for tax capacity-building from 2015 to 2020 as part of the Addis Ababa Tax Initiative, which aims to enhance domestic resource mobilization in partner countries by increasing the quantity and quality of technical assistance provided.[69] Additionally, the Organisation for Economic Co-operation and Development (OECD), in collaboration with Germany, Italy and Kenya, launched a pilot program known as the Africa Academy for Tax and Financial Crime Investigation during the Group of 20 Africa Conference in Berlin in June 2017. [70] These collective efforts hold great potential to support African countries in mobilizing resources and attaining their sustainable development goals by combating illicit financial flows.

Promote technology transfer – Support for the development of green technologies is likely to be the most effective policy for achieving the goals of green development in the long run. Currently, green technologies are developed in the North, and most low-income and middle-income CDDCs have limited means to acquire these independently. For CDDCs to successfully transition to low-carbon development paths, they will need better access to new technologies and should be able to adapt them to local contexts. They should thus take maximum advantage of policy instruments such as the possibility to impose on foreign investors requirements for technology transfer and hiring local labour, as provided for in the Trade Related Investment Measures (TRIMs) agreement. There is a need for an international framework along the lines of the Technology Mechanism created under the UNFCCC to ensure the transfer of green technology to CDDCs.[71]

Use stronger trade and investment measures – CDDCs can stimulate transitions with targeted investments in infrastructure, research and development,[72] and those eligible can take advantage of the special and differentiated treatment provided in most WTO rules for increasing protective tariffs and regulating some aspects of foreign direct investment.[73] For example, many developing countries that have not met the upper limits on tariffs still have room to increase them; these countries are also able to regulate some aspects of foreign direct investment and make use of provisions for emergency tariff increases, over which they have considerable discretion. CDDCs should also be strategic about attracting FDI into targeted industries.[74]

Support energy transition and mitigate the consequences of stranded resources – It is unrealistic to expect CDDCs to voluntarily strand fossil-fuel resources that provide the bulk of their export revenues without a transparent and credible compensatory mechanism. International financial institutions, large MNEs, donor governments, and aid agencies could rally behind CDDCs to offer them incentives for transitioning.

Be supported by international funding – To implement nationally determined contributions, estimates show that countries in Africa alone needs to invest $3 trillion in mitigation and adaptation by 2030.[75, 76] In Latin America and the Caribbean, several countries' GHG mitigation

commitments are contingent on international assistance. In the Caribbean, between 50 and 100 per cent of NDC pledges are conditional on international funding.[77] Investment is needed to fund research and development of new technologies, as well as to provide incentives for businesses and individuals to adopt these technologies. Coordinated investment is particularly important because green innovation often involves complex supply chains and global markets, which require collaboration between different actors across sectors and countries. By working together, countries can pool their resources and expertise to accelerate the development and adoption of cleaner technologies, while ensuring that these innovations are supported by a supportive policy environment.[78]

Towards a greener world

Just diversification and green transitions in CDDCs will require strong political commitment and leadership in CDDCs and at the global level. While many issues relating to diversification and the green transition in CDDCs are similar around the world, each country has to chart its own path – making a detailed assessment of opportunities and obstacles and designing a green industrial policy.

Until recently, the benefits of industrial policy and economic diversification were thought to accrue primarily to individual CDDCs, offering little incentive for other countries to support this transition. Climate change has shifted that calculus: the global community as a whole stands to benefit if CDDCs succeed in transitioning along low-carbon development paths. Simply calling for these countries to 'leave the resources in the ground' is a political and economic dead end. The only way to a greener world is through mutual support and cooperation.

Endnotes

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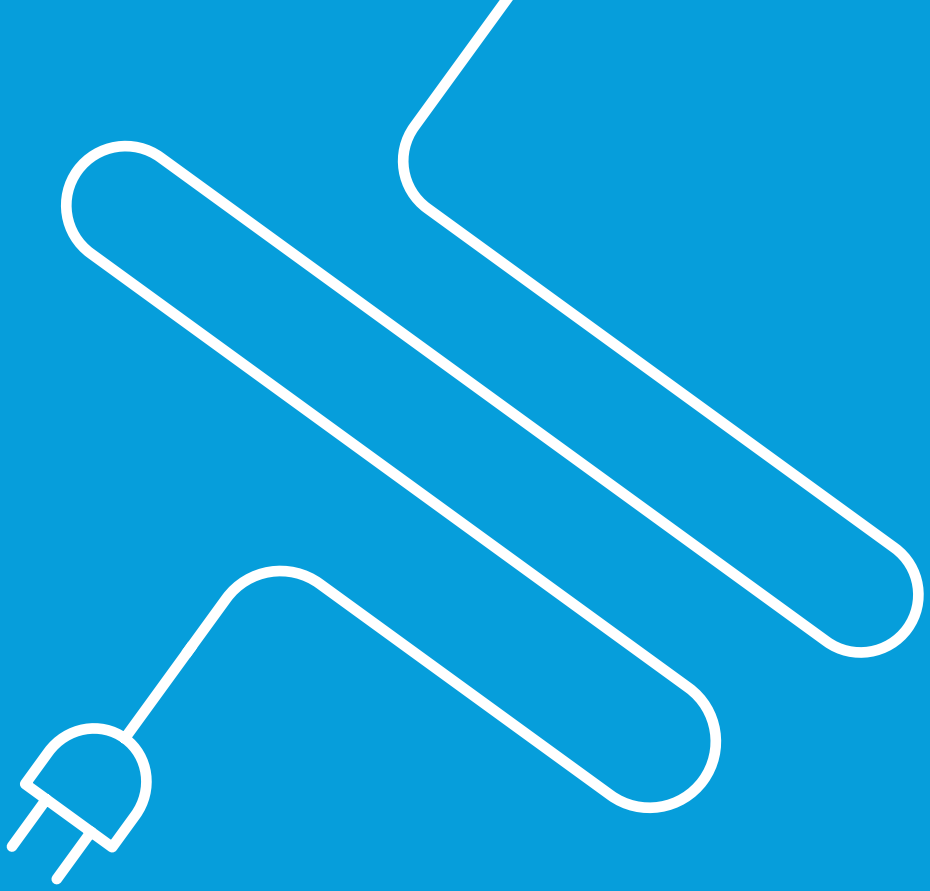
Appendices



Appendices

Appendix A – Technical note on the relationship between diversification and inequality

Chapter 3 outlines the results of an analysis of the relationship between diversification and inequality based on a sample of 182 countries over the period 1998 to 2018. The data used in this study was primarily collected from UNU-WIDER and UNCTAD. Inequality data was drawn from the UNU-WIDER WIID Companion, which provides the most comprehensive adjusted income inequality statistics covering 201 economies from 1960 to 2021.[1,2] Data covering 1998 to 2018 was considered based on the availability of export diversification and covariates data from UNCTAD. These covariates include GDP per capita (lagged term, in log), population size (in log), trade openness (expressed as the sum of imports and exports over GDP, in log), and human capital (expressed as a composite score, which captures the education, skills, and health conditions possessed by the population.

Appendix table A1 reports the regression results of the linear fixed effects model for the overall sample. The econometric analysis suggests a linear negative relationship between commodity dependence and income inequality, indicating that export diversification is associated with higher inequality. This suggests that diversification has adverse distributional effects on the population. This may be attributed to a more differentiated occupational structure, and wage differentials that arise with a more diversified economic structure. This relationship remains statistically significant across most different income inequality measures (Palma ratio and Theil's L index).

With respect to the effect of income, there is a statistically significant effect between GDP per capita (lagged term) and inequality, which is negative when considering the whole sample. This can proxy for economic development and implies that as incomes increase, inequality declines. Past income is used to reduce the effect of potential endogeneity between income and inequality. Indeed, the variable used measures income three years prior to current inequality, so it is a pre-determined variable. Trade openness is also negatively correlated with income inequality. This result is robust to the different specifications and dependent variables measuring inequality. This suggests that trade offers opportunities to different segments of the population, reducing the income gap.

Human capital appears to be positively correlated with income inequality measured by the Gini coefficient. This coefficient is also positive and statistically significant when considering the inter-decile ratio as the dependent variable. Population size is also significant and shows a negative coefficient. These findings remain robust when using the concentration index as the main regressor, which shows a significant negative association between income inequality (measured by the Gini coefficient) and export concentration (measured by the Finger-Kreinin similarity in trade indicator). Results also hold when considering the third export diversification measure (number of country product exports at the HS 6-digit level), which shows a positive association between export diversification and income inequality (measured by the Gini coefficient, the Palma ratio and Theil's L Index).

When disaggregating the sample by income and commodity dependence groups, table A2 unveils the following results. While there seem to be no statistically significant differences across income groups when measuring inequality with the Gini coefficient, there are differences when using the Palma ratio, the Theil's L index and the inter-decile ratio. These inequality measurements are more sensitive to changes in the tails of the income distribution

and may provide additional information on the association between export diversification and income inequality. It seems that the positive relationship between diversification and inequality only holds in low and low-middle-income countries (and CDDCs), reflected by the significant coefficients in these specifications compared to high-income countries (non-CDDCs), where no diversification coefficient is statistically significant. The associations related to commodity exports highlighted in the low and low-middle-income subsamples remain statistically significant when using the Theil's L index and the inter-decile ratio as income inequality measures. This suggests that export diversification has negative distributional effects in lower-income countries. However, an alternative explanation could be that diversification in low-income and lower-middle-income countries is relatively limited and perhaps not extensive enough to create opportunities in all segments of the population. These results also suggest that trade openness decreases inequality in low and lower-middle-income countries. This is consistent with the Stolper-Samuelson theorem,[3] where an increase in trade in countries with relatively abundant low-skilled labour leads to lower inequality.

Table A1 Fixed effects coefficients (Linear, full sample)

Variables	(1) Gini	(2) Palma ratio	(3) Theil's L Index	(4) Inter-decile ratio
Commodity exports (% total merchandise exports, in log)	**-0.655***	**-0.197***	**-1.860***	-1.476
	(0.380)	(0.118)	(1.067)	(0.950)
Lagged term of GDP per capita (in log)	-2.127**	-0.134	-3.016*	-1.919
	(1.064)	(0.170)	(1.795)	(1.524)
Trade openness (in log)	-1.007**	-0.277**	-2.646**	-2.339*
	(0.449)	(0.122)	(1.216)	(1.336)
Population (in log)	-3.263**	-0.693*	-6.790*	-2.077
	(1.414)	(0.354)	(3.489)	(3.147)
Human capital index	0.0988*	0.00738	0.195	0.242**
	(0.0560)	(0.0128)	(0.119)	(0.108)
Constant	89.70***	10.73***	123.0***	43.17
	(13.60)	(3.146)	(31.50)	(31.78)
Observations	1,109	1,109	1,109	1,109
R-squared	0.149	0.077	0.102	0.026
Number of countries	182	182	182	182

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: UNCTAD.

Similar results are observed in the subsample comprising CDDCs, which indicates that the benefits of diversification may be constrained to a specific portion of the population in these countries. Nonetheless, as outlined previously, another interpretation could be that the limited diversification happening in these countries in the first place generates little benefits that cannot be spread out among the population. By contrast, most variables in the subsample containing non-CDDCs are statistically non-significant.

Table A2 Fixed effects coefficients (Linear, subsamples)

	Dependent variable: Gini				Dependent variable: Palma ratio			
Variables	(1) Low- and Low-middle-income	(2) High income	(3) CDDCs	(4) Non-CDDCs	(5) Low- and Low-middle-income	(6) High income	(7) CDDCs	(8) Non-CDDCs
Commodity exports (% total merchandise exports, in log)	-0.764	-0.462	-1.847	-0.625	**-0.399****	-0.0474	**-1.193***	-0.1
	(0.528)	(0.585)	(0.437)	(0.696)	(0.181)	(0.0523)	(0.147)	(0.0509)
L.GDP per capita (in log)	-1.173	-0.0636	-2.320**	-1.257	-0.0293	0.0243	-0.143	-0.134
	(1.200)	(1.466)	(1.159)	(2.119)	(0.305)	(0.121)	(0.195)	(0.151)
Trade openness (in log)	-1.153	0.624	-1.411***	0.772	-0.322*	0.0604	-0.350**	0.0487
	(0.703)	(0.450)	(0.505)	(0.764)	(0.187)	(0.0445)	(0.145)	(0.0599)
Population (in log)	-4.899	-1.184	-2.138	2.198	-1.074*	-0.128**	-0.445	0.196
	(2.960)	(0.721)	(1.403)	(2.685)	(0.634)	(0.0558)	(0.335)	(0.191)
Human capital index	0.159	-0.0165	0.0695	0.0292	0.0191	-0.00189	-0.00200	0.00158
	(0.110)	(0.0491)	(0.0723)	(0.0535)	(0.0308)	(0.00377)	(0.0187)	(0.00394)
Constant	98.82***	44.02***	86.68***	19.53	13.67**	2.239**	9.634***	0.503
	(26.42)	(13.73)	(13.55)	(27.02)	(5.867)	(1.071)	(2.996)	(1.855)
Observations	578	259	855	254	578	259	855	254
R-squared	0.119	0.031	0.188	0.032	0.074	0.035	0.09	0.03
Number of countries	105	48	136	46	105	48	136	46

Table A2 Fixed effects coefficients (Linear, subsamples) [Continued]

	Dependent variable: Theil's L index				Dependent variable: Inter-decile ratio			
Variables	(9) Low- and Low-middle-income	(10) High income	(11) CDDCs	(12) Non-CDDCs	(13) Low- and Low-middle-income	(14) High income	(15) CDDCs	(16) Non-CDDCs
Commodity exports (% total merchandise exports, in log)	**-3.196****	-0.636	**-8.219***	-1.400	**-3.122****	-0.202	**-9.200***	-0.934
	(1.587)	(0.822)	(4.924)	(1.028)	(1.437)	(0.418)	(5.376)	(0.775)
L.GDP per capita (in log)	-2.304	-0.123	-3.245	-2.022	-2.283	-0.202	-2.106	-0.524
	(3.030)	(2.174)	(2.301)	(1.788)	(2.666)	(0.909)	(2.122)	(1.143)
Trade openness (in log)	-2.987	1.136	-3.570**	0.579	-2.916	0.425	-3.212	-0.203
	(1.892)	(0.728)	(1.711)	(1.260)	(1.865)	(0.383)	(2.081)	(1.026)
Population (in log)	-10.56	-1.786*	-1.823	-12.37***	-5.007	-0.470	0.425	-4.504**
	(7.265)	(1.061)	(3.572)	(3.851)	(6.906)	(0.471)	(2.880)	(2.183)
Human capital index	0.369	-0.00553	0.0116	0.186	0.495*	0.0190	0.179	0.181*
	(0.289)	(0.0719)	(0.219)	(0.128)	(0.265)	(0.0308)	(0.198)	(0.107)
Constant	152.0**	34.43*	95.74***	148.1***	66.33	9.974	30.21	44.96**
	(65.11)	(19.40)	(34.47)	(34.09)	(66.29)	(7.633)	(33.01)	(20.36)
Observations	578	259	623	486	578	259	623	486
R-squared	0.090	0.029	0.111	0.107	0.028	0.023	0.033	0.055
Number of countries	105	48	114	99	105	48	114	99

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: UNCTAD.

Table A3 Countries included in the analysis

Afghanistan
Albania
Algeria
Andorra
Angola
Argentina
Armenia
Australia
Austria
Azerbaijan
Bahamas
Bahrain
Bangladesh
Barbados
Belarus
Belize
Benin
Bhutan
Bolivia (Plurinational State of)
Bosnia and Herzegovina
Botswana
Brazil
Brunei Darussalam
Bulgaria
Burkina Faso
Burundi
Cabo Verde
Cambodia
Cameroon
Canada
Central African Republic
Chad
Chile
China
Colombia
Comoros
Congo
Democratic Republic of the Congo
Costa Rica
Côte d'Ivoire
Croatia
Cuba
Cyprus
Czechia
Denmark
Djibouti
Dominica
Dominican Republic
Ecuador
Egypt
El Salvador
Equatorial Guinea
Eritrea
Estonia
Eswatini
Ethiopia
Fiji
Finland
France
Gabon
Gambia
Georgia
Germany
Ghana
Greece
Grenada
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Honduras
Hungary
Iceland
India
Indonesia
Iran (Islamic Republic of)
Iraq
Ireland
Israel
Italy
Jamaica
Japan
Jordan
Kazakhstan
Kenya
Kiribati
Republic of Korea
Kuwait
Kyrgyzstan
Lao People's Democratic Republic
Latvia
Lebanon
Lesotho
Liberia
Libya
Lithuania
Luxembourg
Madagascar
Malawi
Maldives
Mali
Malta
Marshall Islands
Mauritania
Mauritius
Mexico
Republic of Moldova
Mongolia
Montenegro
Morocco
Mozambique
Myanmar
Namibia
Nepal
Kingdom of the Netherlands
New Zealand
Nicaragua
Niger
Nigeria
North Macedonia
Norway
Oman
Pakistan
Palau
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Poland
Portugal
Qatar
Romania
Russian Federation
Rwanda
Saint Lucia
Saint Vincent and the Grenadines
Samoa
Sao Tome and Principe
Saudi Arabia
Senegal
Serbia
Seychelles
Sierra Leone
Slovakia
Slovenia
Solomon Islands
Somalia
South Africa
South Sudan
Spain
Sri Lanka
Sudan
Suriname
Sweden
Switzerland, Liechtenstein*
Syrian Arab Republic
Tajikistan
Tanzania, United Republic of
Thailand
Timor-Leste
Togo
Tonga
Trinidad and Tobago
Tunisia
Turkmenistan
Türkiye
Tuvalu
Uganda
Ukraine
United Arab Emirates
United Kingdom of Great Britain and Northern Ireland
United States of America
Uruguay
Uzbekistan
Vanuatu
Venezuela (Bolivarian Republic of)
Viet Nam
Yemen
Zambia
Zimbabwe

Note: Commodity-dependent developing countries are marked in bold; the standard font is for non-CDDCs. Grouping countries into CDDCs and non-CDDCs is derived from the UNCTAD definition of commodity export dependence, when more than 60 per cent of its total merchandise exports are composed of commodities, in line with the *State of Commodity Dependence 2021*.

* This grouping is based on the UNCTAD target economies classification, available at https://unctadstat.unctad.org/EN/Classifications/DimCountries_TargetEconomies_Classification.pdf. For the purposes of this *study*, they are counted as a single country.

Appendix B – Estimating the cyclical and trend components of output-elasticities of emissions

Following (Cohen et al., 2018) and (Jalles and Ge, 2020), this report uses the Hodrick-Prescott (HP) filter to decompose real GDP per capita and GHG emissions series into their trend and cyclical components.[4] Despite its limitations, the HP filter has been widely used in the literature, so this report follows past practice. The cyclical component reflects the relationship between output and emissions due to the business cycle, and the trend component captures the long-run, structural relationship between output and emissions.[5] These decompositions were carried out for 186 countries classified as CDDCs, diversified developing countries (DDCs) or developed countries, over the period 1980-2018.

Data on real output (in 2010 United States dollars) are from the World Bank's World Development Indicators. Data on greenhouse gas emissions come from the Emissions Database for Global Atmospheric Research (EDGAR) which contains data sets covering the three direct greenhouse gases – carbon dioxide, nitrous oxide and methane aggregated by country and sector, using the IPCC 2006 sector designations.[6] For the historical analysis focusing on the five major industrialized economies, data for real GDP is from the Maddison Project, and data for historical carbon dioxide emissions are from the Carbon Dioxide Information and Analysis Center (CDIAC).[7] Total CO_2 emissions are the sum of fossil fuel emissions for solid, liquid, and gas fuels, as well as gas flaring and cement production. Combined GDP and CO_2 emissions data for each country is available as follows: United States (1800–2017), United Kingdom (1751–2017), Germany (1850–2017), France (1820–2017), and Japan (1870–2017).

The cyclical relationship between emissions and output is established by estimating the following fixed effects specification:[8]

$$e_{ti}^{c} = \beta^{c}\, y_{ti}^{c} + \gamma_{\boldsymbol{i}} + \epsilon_{ti}^{c} \qquad (1)$$

where e_{ti}^{c} and y_{ti}^{c} are respectively the cyclical components of the log of emissions and log of real output for each country in the group, β^{c} is the estimated cyclical elasticity of emissions with respect to output, γ_i captures country-fixed effects and ϵ_{ti}^{c} is a random error term.

The trend elasticity is estimated as follows:

$$e_{ti}^{\tau} = \beta_0 + \beta^{\tau}\, y_{ti}^{\tau} + \gamma_i + \epsilon_{ti}^{\tau} \qquad (2)$$

Where e_{ti}^{τ} and y_{ti}^{τ} are the trend components of the log of emissions and the log of real output, β^{τ} is the estimated trend elasticity of emissions with respect to output and ϵ_{ti}^{τ} is a random error term. An intercept is included to account for differing initial levels of output and emissions.

In both specifications, γ_i are the country-specific fixed effects and ϵ_t^{τ} and ϵ_{ti}^{τ} are the error terms.

For individual countries, the cyclical and trend output elasticities of emissions are estimated using OLS regressions as follows:

$$e_t^{c} = \beta^{c} y_t^{c} + \epsilon_t^{c} \qquad (3)$$

$$e_t^{\tau} = \beta^{0} + \beta^{\tau} y_t^{\tau} + \epsilon_t^{\tau} \qquad (4)$$

where e_t^c and e_t^τ are the cyclical and trend components of the log emissions series for each country, y_t^c and y_t^τ are the cyclical and trend component of log GDP, and β^c and β^τ are the trend and cyclical elasticities.

Typically, the cyclical (trend) component of the log of emissions is regressed on the cyclical (trend) component of the log of real GDP for a country in a given year. The estimated coefficient beta is the cyclical (trend) elasticity of emissions with respect to output, accounting for country-fixed effects.

In addition, to provide a longer-term context about how these elasticities evolve, the same decompositions are conducted for much longer time periods – starting from the mid-18th or mid-19th centuries – for five major developed countries: France, Germany, Japan, the United Kingdom and the United States. These decomposed series are then divided into 30-year periods for each country, and elasticities are estimated on these shorter periods to better reflect changes in output-elasticities of emissions for these countries at different stages of their industrial development.

Furthermore, the time-series properties of the variables are analysed to ensure that the relationships are not spurious. For each country with adequate data, Augmented Dicky-Fuller tests are conducted to test for the presence of a unit root of the individual series before estimating the relevant elasticities. The results are presented for different country groups. Pickbourn et al. (2022) provides more information about country-level elasticities. Nevertheless, more in-depth country analyses might be needed to properly account for country specificities.

Empirical results – output-elasticities of emissions:

Table B1 shows the cyclical and trend elasticities for CDDCs, DDCs and developed countries. In general, these results are similar to those obtained for individual countries by Cohen et al. (2018) and Jalles and Ge (2020). These empirical results confirm the information in appendix table B2: higher trend elasticities for both CDDCs and DDCs suggest that emissions are more sensitive to changes in output in the long run than in the short run. A pairwise comparison of the means test confirms that while the trend elasticities for CDDCs and DDCs are not statistically different between them, both values are highly statistically different from the elasticity for developed countries.

Table B1 Trend and cycle elasticities by country status (fixed-effects estimates)

Country category	Trend elasticity	Trend p-value	Cycle elasticity	Cycle p-value
CDDC	0.67	0.00	0.23	0.00
DDC	0.65	0.00	0.39	0.00
Developed countries	0.30	0.00	0.63	0.00

Source: UNCTAD.

Disaggregating the group of CDDCs by type of commodity dependence reveals some heterogeneity within the group: trend elasticities are higher for CDDCs that depend on agricultural and fuel exports than among mineral exporters (Appendix Table B3). Analysis at the country level reveals even more heterogeneity within these groups (see Appendix Table A3 in Pickbourn et al. (2022)).

Table B2 Trend and cycle elasticities for CDDCs by type of commodity export

Country category	Trend elasticity	Trend SE	Trend p-value	Cycle coefficient	Cycle SE	Cycle p-value
Agricultural CDDC	0.72	0.03	0.00	0.25	0.05	0.00
Fuel CDDC	0.71	0.02	0.00	0.20	0.08	0.01
Mineral CDDC	0.53	0.02	0.00	0.27	0.07	0.00

Source: UNCTAD.

The differences among CDDCs are more striking when the elasticities are analysed by income (Table B3). How rich or poor a CDDC is clearly has some bearing on the sensitivity of emissions to output in that country: the trend output-elasticity of emissions in low-income CDDCs is 0.6, the same as in middle-income countries and 1.1 among high-income CDDCs. Again, elasticity estimates at the country level reveal considerable heterogeneity within these income groups.

Table B3 Trend and cycle elasticities for CDDCs by income group (fixed-effects estimates)

Income level (World Bank classification)	Trend coefficient	Trend p-value	Cycle coefficient	Cycle p-value
High	1.12	0.00	0.39	0.00
Low	0.60	0.00	0.11	0.00
Lower middle	0.62	0.00	0.23	0.00
Upper middle	0.60	0.00	0.27	0.01

Source: UNCTAD.

Note: See income group thresholds in Table 3.1.

Table B4 Elasticities of CDDCs by region (fixed-effects estimates)

Region	Trend coefficient	Trend p-value	Cycle coefficient	Cycle p-value
East Asia and the Pacific	0.48	0.00	0.23	0.09
Latin America and the Caribbean	0.73	0.00	0.61	0.00
Middle East and North Africa	1.04	0.00	0.18	0.08
Sub-Saharan Africa	0.62	0.00	0.16	0.01

Source: UNCTAD.

Regional analysis also reveals some important differences (Table B4). The long-run output-elasticity of emissions is highest in the Middle East and North Africa, which is rich in hydrocarbons, and considerably lower in East Asia and the Pacific, as well as in sub-Saharan Africa. A pairwise comparison of means reveals that compared with Europe and Central Asia, long-run elasticities are statistically higher in the Middle East and North Africa, sub-Saharan Africa, Latin America and the Caribbean. Emissions are also the least pro-cyclical in sub-Saharan Africa and more procyclical in Latin America and the Caribbean. These regional differences are likely due to differences in types of commodity dependence and production processes across regions. Within each region, there is again considerable heterogeneity among countries.

Long-run elasticities for early industrializers

Given the time that countries need to fully diversify their economies, it is important to take a long-term perspective. In this regard, the elasticities discussed in the previous section are compared with the historical elasticities of more developed countries. The trend growth-emissions elasticities are analysed for the five major developed economies since the middle of the 18th century. It is particularly interesting to consider these countries' elasticities in the early stages of industrial development, which is the stage where most CDDCs currently are. To do this, the full-time series of the five countries are split up into 30-year periods. The trend elasticity equations are estimated on each of these 30-year sub-periods. The results are plotted in Appendix A. The findings could inform the following argument that is frequently made: since today's developed countries are responsible for most of the accumulated stock of GHG emissions and currently have higher emissions than developing countries, should the latter not be allowed a greater share of the global carbon budget, at least until they have put in place the basic capabilities needed to fully engage and take advantage of the green transition? This debate is important in defining paths to the industrialization and diversification of CDDCs. Note that this analysis focuses only on CO_2 emissions, but as noted earlier, other emissions represent a marginal share of the total.[9]

Overall, the major industrialized economies appear to have followed highly carbon-intensive industrial growth paths, with a levelling-out of emissions growth in the late 20th century and ending with some modest attempts to reduce emissions.[10] Output growth in the early periods of industrialization led to more than proportionate increases in emissions, with trend elasticities greater than 2 in the mid to late 19th century for all the countries (Table A1). Each subsequent period generally witnesses a decline in the output elasticity of emissions. In their final period, they are at or near zero elasticity, suggesting most early industrializers have reached a state of relative decoupling. As earlier noted, this needs more investigation as this apparent decoupling might reflect the ability of the United States and Europe to outsource their most polluting productive activities to other regions, particularly East Asia, so that consumption in these countries embodies substantially more emissions than production (see Gough (2017), page 73; Pitron (2018); Jalles and Ge (2020)). The results show that these countries reached output-elasticities of emissions lower than one several decades after setting up their industrialization.

Country results show that generally, developing countries – both CDDCs and DDCs – have output-elasticities of emissions comparable to (and in several cases, less than) those of early industrializers when the latter were mostly well past a century of industrialization. The elasticities of several developing countries are at about the levels that the early industrializers reached in the mid-20th century (Pickbourn et al., 2022).

Endnotes

1 UNU-WIDER, 2022. UNU-WIDER: World Income Inequality Database - WIID [WWW Document]. UNU-WIDER. URL https://www.wider.unu.edu/database/world-income-inequality-database-wiid (accessed 4.27.23).

2 See WIDER Technical Notes for further information on the construction of the WIID Companion datasets (https://www.wider.unu.edu/publications?f%5b%5d=biblio_type:Technical+Note&query=WIID&order=desc&sort=string_date).

3 Stolper-Samuelson, 1941.

4 The Hodrick-Prescott Filter is a data-smoothing technique that minimizes the function where is a given series, is the trend component, is the cyclical component, and is the error component Hodrick and Prescott (1997). Following Cohen et al. (2019) and Jalles and Ge (2019), the smoothing parameter is used.

5 The values for the aggregate series are initially calculated by using the unweighted mean. For robustness, the series was also aggregated using population weights.

6 The IPCC sectors are defined as follows: energy industries comprises emissions from fuels combusted by the fuel extraction or energy-producing industries; manufacturing industries are emissions from combustion of fuels in industry, and includes combustion for the generation of electricity and heat for own use in these industries; transportation sector refers to emissions from the combustion and evaporation of fuel for all transport activity excluding military transport); manufacturing non-energy) covers emissions from industrial processes and product use, excluding those related to energy combustion. See the IPCC guidelines for further details.

7 This dataset provides country-level time-series estimates of CO_2 emissions from fossil fuel combustion and cement manufacture going back to 1751, and include emissions from solid fuel consumption, liquid fuel consumption, gas fuel consumption, cement production, and gas flaring https://data.ess-dive.lbl.gov/view/doi:10.15485/1712447)

8 For more details on the methodology, refer to the Pickbourn et al. (2022).

9 As shown previously, CO_2 dominates GHG emissions so limiting the analysis to this type of gas does not affect the general view about GHG emissions.

10 The trend-cycle decompositions for these five countries over the entire timespan are available upon request.

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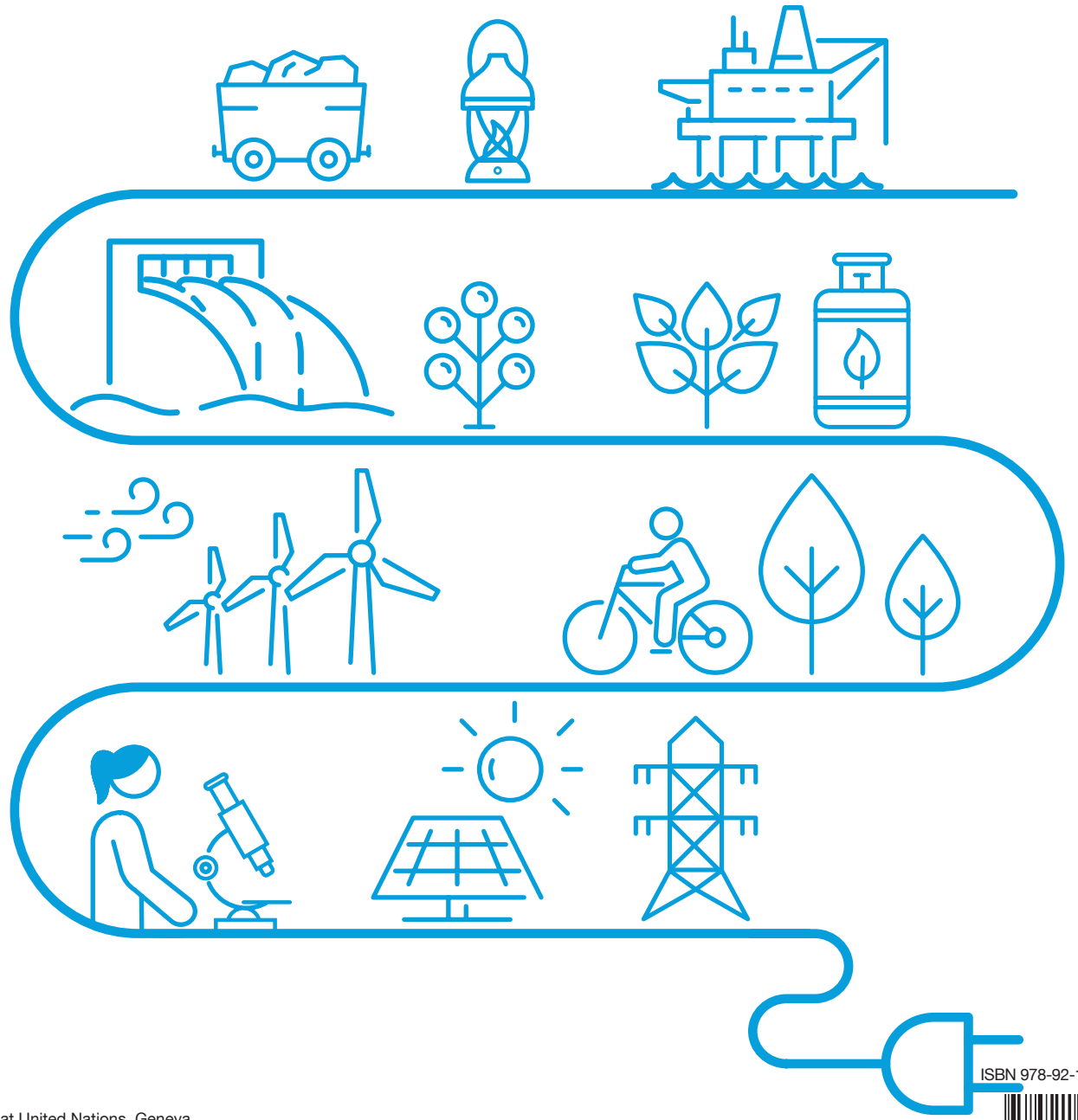

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