Can more ambitious NDCs also lead to economic growth?

1. Introduction

Nationally Determined Contributions (NDCs) are at the heart of the Paris Agreement, and pivotal for transforming global climate goals into co-ordinated, concrete actions. Countries are due to put forward new NDCs by February 2025, with expectations that this next round of NDCs are aligned with limiting global temperature rise to 1.5°C. While current efforts fall far short of what is needed to keep the Paris Agreement's goals within reach, the next NDCs provide a critical opportunity to produce the step-change needed for the world to get on track to reach net-zero and build resilience to worsening climate impacts.

Yet, there is resistance to calls for more ambitious NDCs, for a variety of reasons including the perception that ambitious climate action may hinder economic growth and the competitiveness of strategic sectors. To ramp up ambition, governments need to feel confident that their national climate goals can be financed and delivered without harming their economies and development trajectories.

More ambitious NDCs can play a critical role to accelerate climate action, but they can also deliver growth and wider socio-economic benefits, if implemented in a way that can attract investment. With the right policies in place, investing in climate ambition can deliver economic opportunities in the short term, while paving the way for securing sustainable long-term growth and well-being.

This paper will analyse the link between higher climate ambition and economic growth in the current economic outlook. The paper will compare two key scenarios:

- A scenario reflecting current policies
- A scenario reflecting more ambitious NDCs, which in the long run would imply a pathway compatible with the Paris Agreement goals.

These scenarios would be analysed with a global multi-region multi-sector computable general equilibrium (CGE) model (ENV-Linkages),[1] so as to capture economy-wide effects of climate

[1] An Overview of the OECD ENV-Linkages Model

policies. To capture the effects of investment on economic growth, ENV-Linkages will be coupled with a growth model – NiGEM[2] – that is able to capture the short-term effects of the transition. The analysis will focus on the year 2035 for short term effects, as that is the year targeted by the upcoming round of NDCs, and on the year 2050, to ensure that the pathway considered is compatible with the Paris Agreement goals. The global analysis will also distinguish results across regions and key countries, to outline different regional circumstances. For instance, results can be expected to be different for fossil fuel importing and exporting countries and for countries.

The analysis will tease out key opposing effects that can be expected from the transition. On the one hand, climate mitigation policies impose a constraint to the economy that would normally result in a cost. On the other hand, they can reduce inefficiencies and stimulate investment, which can boost economic growth. Furthermore, climate mitigation will lead to reduced climate damages. While the economic benefits from reduced climate damages will not be substantial in the short term, they can be in the longer term, including by the middle of the century; subject to uncertainty surrounding future climate damages.

Overall, the paper aims to provide a quantitative analysis supporting higher ambition in on climate mitigation, including in the upcoming round of NDCs. While models have shortcomings, this type of analysis can contribute to reduce the concerns of countries in scaling up ambition, by teasing out effects and providing economic arguments – besides environmental ones – in support of more ambitious climate policies.

The remaining of the paper is structured as follows. Section 2 presents the scenarios and modelling framework. Section 3 presents results at the macroeconomic level, while Section 4 focuses on sectoral results. Section 5 concludes.

2. A modelling analysis: scenario description and modelling framework

This paper presents a modelling analysis of the macroeconomic effects of climate change mitigation policies. While the analysis also considers the benefits of policy action in reducing climate damages, its focus is on climate change mitigation policies and there is no explicit modelling of adaptation measures.[3] The analysis aims to support governments make evidence-based, informed policy choices, identify trade-offs, and minimise the cost of climate action while maximising the benefits. It focuses on understanding whether and how, in the current economic outlook, enhanced NDCs can mitigate climate change, while also ensuring economic growth and prosperity.

[2] NiGEM Macroeconomic Model - NIESR

[3] The modelling framework is also focused on climate change and cannot quantify costs and benefits from indirect impacts of climate action on other environmental issues, most notably the climate co-benefits for air quality.

The analysis compares two scenarios to assess how different climate policy pathways interact with economic growth and emissions trajectories between 2022 and 2040:

- ***Current Policies* scenario**: This scenario reflects policies already in place or legislated, incorporating the existing ambition and implementation gap in current NDCs. This scenario leads to an estimated 2.4°C of warming by the end of the century.
- ***Enhanced NDCs scenario***: This scenario assumes accelerated climate policies and investments able to achieve emission reductions in line with the "well-below 2°C" goal of the Paris Agreement. This scenario puts the world on a pathway consistent with limiting global warming to 1.7°C by the end of the century.

In this scenario, Enhanced NDCs are intended as national climate plans that are:

- **Ambitious:** Setting emission reduction targets that are compatible with the Paris Agreement goal to hold global temperature increase to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.
- **Implementable:** Ensuring that NDCs are backed by clear policies and actions that integrate climate and development priorities.
- **Investable:** Creating condition for public and private investment, to mobilise sufficient resources for the structural changes needed to achieve their ambitious emission reduction targets.

The scenario analysis of the *Current Policies* and the *Enhanced NDCs* scenarios is based on a modelling framework, primarily based on simulations of the OECD's ENV-Linkages model (Château, Dellink and Lanzi, 2014[1]). ENV-Linkages is a dynamic; multi-sector, multi-region computable general equilibrium (CGE) model that links greenhouse gas emissions to economic activities. As a general equilibrium model, ENV-Linkages is the ideal tool to compare different projections of the global economy, namely its current state two possible future states by 2040, under *Current Policies* and under *Enhanced NDCs*. However, CGE models are usually weak in evaluating short-term macroeconomic effects, such as the positive effects of investment on economic growth. To capture short- and medium-term investment effects, ENV-Linkages has been calibrated relying on simulations with the National Institute Global Econometric Model (NiGEM) model, developed by the National Institute of Economic and Social Research (NIESR) (Hantzsche, Lopresto and Young, 2018[2]). NiGEM is a structural macro-econometric model of the world economy, used for the OECD Economic Outlooks. NiGEM captures demand, supply, monetary and financial dynamics, reflecting the current macro-economic outlook. NiGEM is also endowed with a climate module, which allows for an analysis of the economic consequences of climate policies, related revenue recycling as well as the effects of energy-related investment.

This modelling framework brings about two innovative changes, which increase the potential of modelling toolkits in robustly assessing the economic consequences of climate policies. First, this framework reflects the short- and medium-term effects of investment in an economy-wide analysis of the effects of climate policies. This helps understand the impact of climate change policies for business and economic growth in the short term, and the structural changes and adjustments needed in adapting to climate policies. Second, ENV-Linkages reflects comprehensive policy packages on climate change mitigation, including carbon pricing as well as subsidies and regulations. This modelling approach ensures a realistic assessment of the economic consequences of climate policies, rather than a simplified approach through carbon pricing only, building on previous work (OECD, 2024[3]; Fouré et al., 2023[4]).

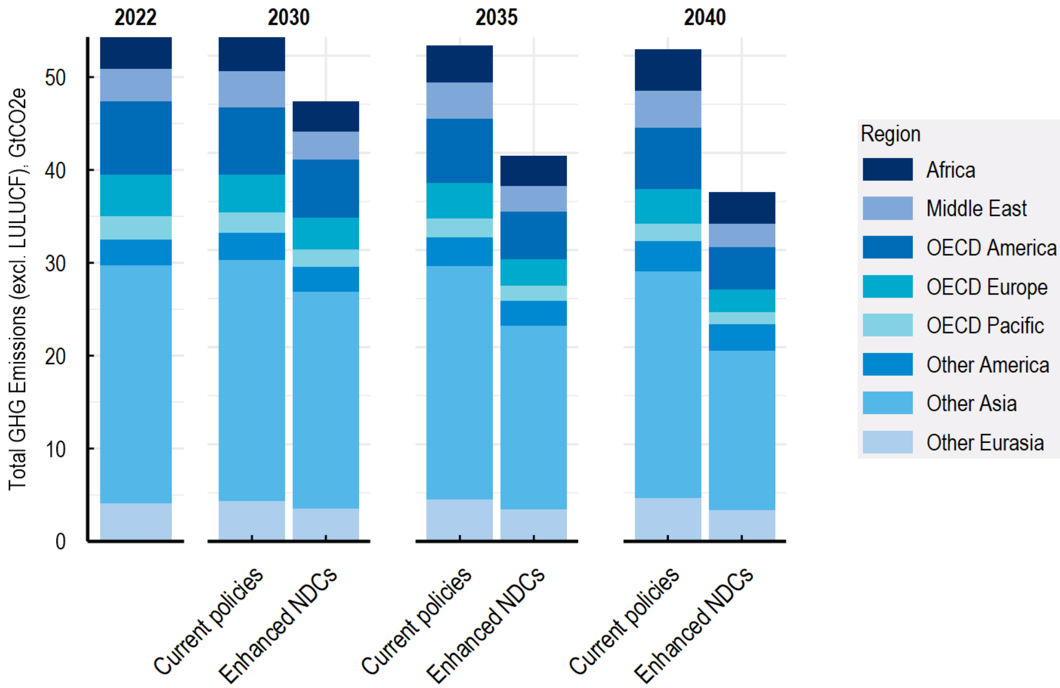
The calibration of the two scenarios relies on inputs from the International Energy Agency's World Energy Outlook (IEA, 2023[7]), which provides information on future policy-induced changes in the energy system. In the *Enhanced NDCs* scenario, energy-related investment grows by 40% between 2022 and 2030. Clean energy investment accounts for USD 3.1 trillion of the USD 3.8 trillion invested in energy in 2030, while fossil fuel investment falls from USD 1.1 trillion in 2022 to USD 0.7 trillion in 2030. Energy system transformation sees global installed capacity of renewable power sources almost tripling by 2030. The share of renewables in electricity capacity increases from 42% in 2022 to 64% in 2030 and 75% in 2040, while the share of fossil fuels decreases from 52% in 2022 to 28% in 2030 and to 13% in 2040. Energy intensity improves at an average rate of 3% per year compared to a 2% annual rate under *Current Policies*.

In the *Enhanced NDCs* scenario, current national policy packages and NDC pledges are used as a starting point to model countries' accelerated climate action. Countries that currently have long-term net zero or carbon neutrality pledges are assumed to implement them in full and on time, and higher CO_2 prices are introduced across all regions that currently have net zero emissions pledges. No explicit pricing is assumed in sub-Saharan Africa (excluding South Africa) and some parts of Asia. Instead, these countries are assumed to rely on other policy interventions to transform their energy systems. Investments in the transition are also scaled up across regions. In the short-term, the EU and other advanced economies are projected to show the highest increased capital energy-related investments. By contrast, by 2050, Latin America, Africa and the Middle East see the highest levels of additional energy-related investments as a percentage of GDP. In a few fossil-fuel producing countries the decrease in fossil fuel supply investments exceeds increases in low emissions- power generation investments, resulting an overall decrease in energy-related investments.

All regions reduce their emissions in the *Enhanced NDC* scenario compared to the *Current policies* scenarios, but at different rates (Figure 1). In the *Enhanced NDCs* scenario, faster emissions reductions occur in the OECD. OECD Europe, OECD America and OECD Pacific reduce their emissions by 38 to 40% by 2035 compared to 2022 levels, versus 17 to 24% emissions reductions over the same period in the *Current policies* scenario. Outside the OECD, Africa, Asia, Eurasia, America and the Middle East reduce their emissions by 6% (Africa) to 26% (Asia) between 2022 and 2035 in the *Enhanced NDCs* scenario.

Figure 1. In the Enhanced NDCs scenario, all regions reduce their emissions compared to the Current policies scenario

Total greenhouse gas emissions (excluding LULUCF) by region and scenario between 2022 and 2040, GtCO2e

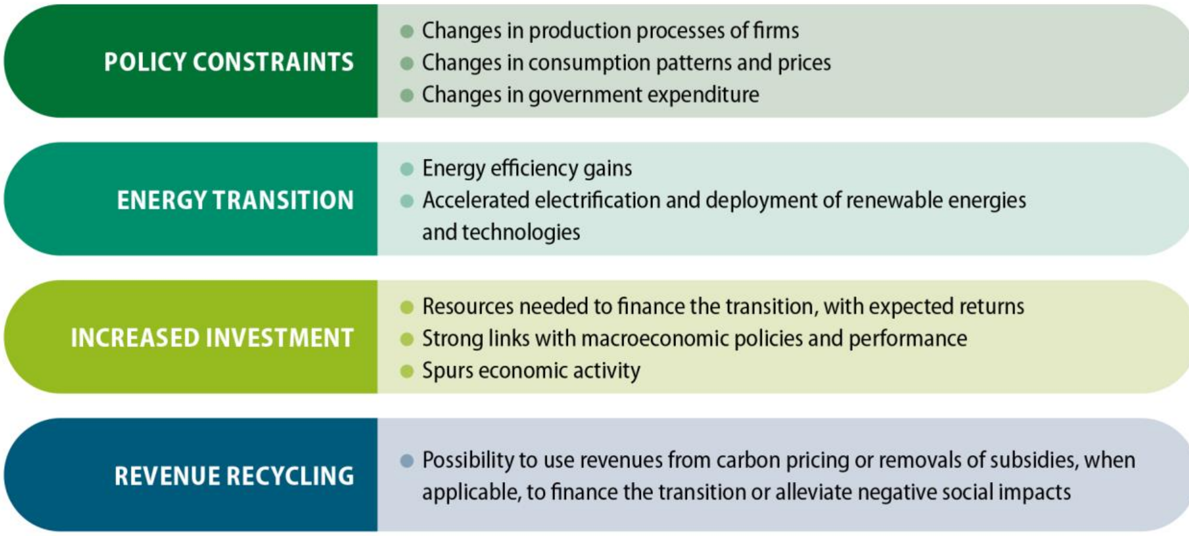


Source: ENV-Linkages model.

The macroeconomic impact of the *Enhanced NDCs* scenario is the result of a combination of key effects triggered by policies (Figure 1). When countries initially implement and scale up climate mitigation policies, production and consumption patterns are constrained to adjust to pricing mechanisms and regulations, driving GDP down (*Policy constraints* effect). At the same time, the large-scale deployment of energy efficiency technologies partly counterbalances these costs, reducing energy expenditures and thereby facilitating consumption and production (*Energy transition* effect). Furthermore, accelerated investment in energy and clean technologies stimulates aggregate demand in the short term and increases the productive capacity of economies (*Increased investment* effect). Recycling carbon revenues also increases GDP, while limiting distributive impacts and increasing the acceptability of climate policies (*Revenue recycling* effect).

The extent to which these different mechanisms initiated by climate policies balance each other and interact in how they affect the economy determines the overall economic consequence of climate action. Understanding whether one effect outweighs the others is important in understanding the acceptability of accelerated climate action, including through new NDCs targets and their implementation.

Figure 1. Four main mechanisms connect climate action to economic growth



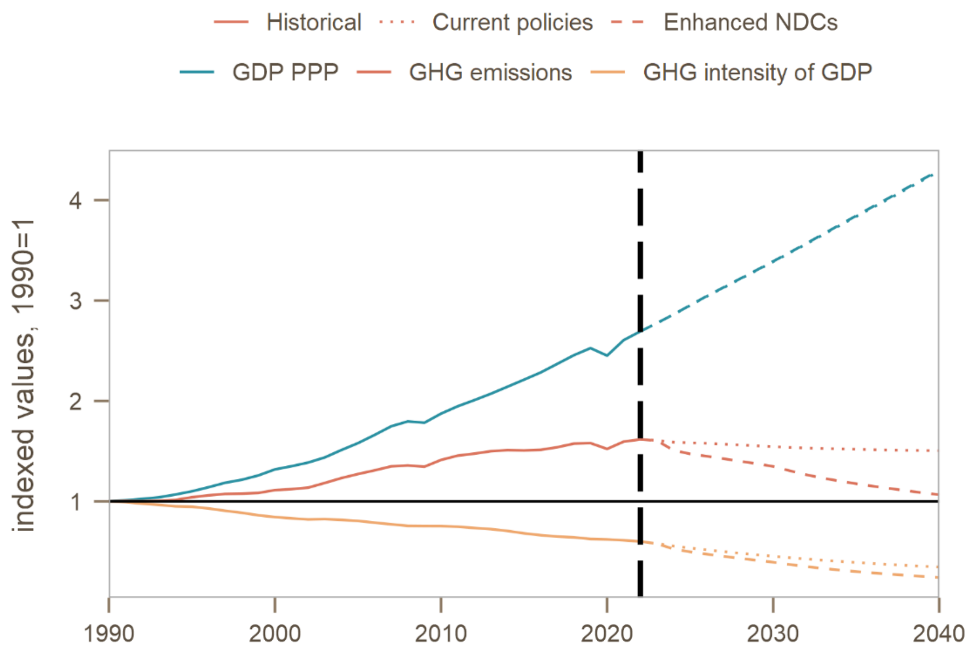
3. Ambitious emissions reductions can be achieved with robust economic growth

Global results

The modelling results show that accelerated climate action in the *Enhanced NDCs* scenario can lead to the absolute decoupling of emissions from economic growth. *Enhanced NDCs* are projected to lead to robust global economic growth while cutting emissions, bringing these back to close to their 1990 levels by 2040. This would exceed progress made since the 1990s when relative decoupling of global emissions from GDP was achieved (Figure 2). Policies currently in place are projected to curb slightly global emissions growth, but not enough to be on a pathway compatible with the Paris Agreement temperature goal.

Figure 2. From relative to absolute decoupling: scaled up climate action with *Enhanced NDCs* would sustain economic growth and reduce emissions globally

% change with respect to 1990 (1990 indexed at 1), global



Note: Total GHG emissions from all sources, excluding LULUCF (land use, land use change, and forestry) emissions. GDP PPP constant 2021 international $. Global GHG intensity of GDP is global total GHG emissions divided by global GDP.
Source: Historical: authors, using the World Bank's PPP (constant 2021 international $) indicator dataset (2024[15]), and the EDGAR dataset of GHG emissions (EC, EU and IEA, 2023[16]; Crippa et al., 2023[17]). *Enhanced NDCs* projections: ENV-Linkages model.

The climate mitigation policies included in the *Enhanced NDCs* scenario are projected to have a small but positive effect on global GDP in the next 15 years. Compared to the *Current Policies* scenario, global GDP is projected to increase by 0.1% in 2030, and 0.2% in 2035 and in 2040. These gains reflect the combined effects outlined above, with the effect of investment triggered by climate policies and the efficiency gains from the transition counterbalancing the negative effect of policy constraints on economic growth. This result is similar to that of other modelling studies on the economic consequences of Paris-aligned policy scenarios.

Investment is the strongest driver of growth in the *Enhanced NDC* scenario. Climate-related investment plays a crucial role in supporting economic expansion, reinforcing the need for implementing ambitious policies. Carbon revenues, which in this scenario are partially redistributed to households and used to reduce labour taxes, can be used to help limit negative effects on consumption and labour markets, further supporting the transition. The modelling framework assumes that countries use a mix of policies, not just carbon pricing, to achieve emissions reductions, which limits the amount of carbon revenue recycling. However, when designed effectively, recycling revenues can enhance equity, protect vulnerable households, and create additional social and economic benefits beyond aggregate GDP growth.

The reallocation of resources induced by climate policy constraints (mainly through changes in energy prices) are projected to lead to a small slowdown in economic growth, if they were not compensated by increased energy efficiency, total investment increases and other positive effects stemming from the transition. If only distortive impacts were considered the Global GDP would decrease by 0.4% in 2035 and -0.9% in 2040 in the

Enhanced NDCs scenario in comparison with the *Current Policies* scenario (Figure 3). As countries implement and scale up climate mitigation policy packages from their enhanced NDCs, including carbon taxation, fossil fuel prices increase in most countries, constraining private consumption and leading to structural changes in the economy.

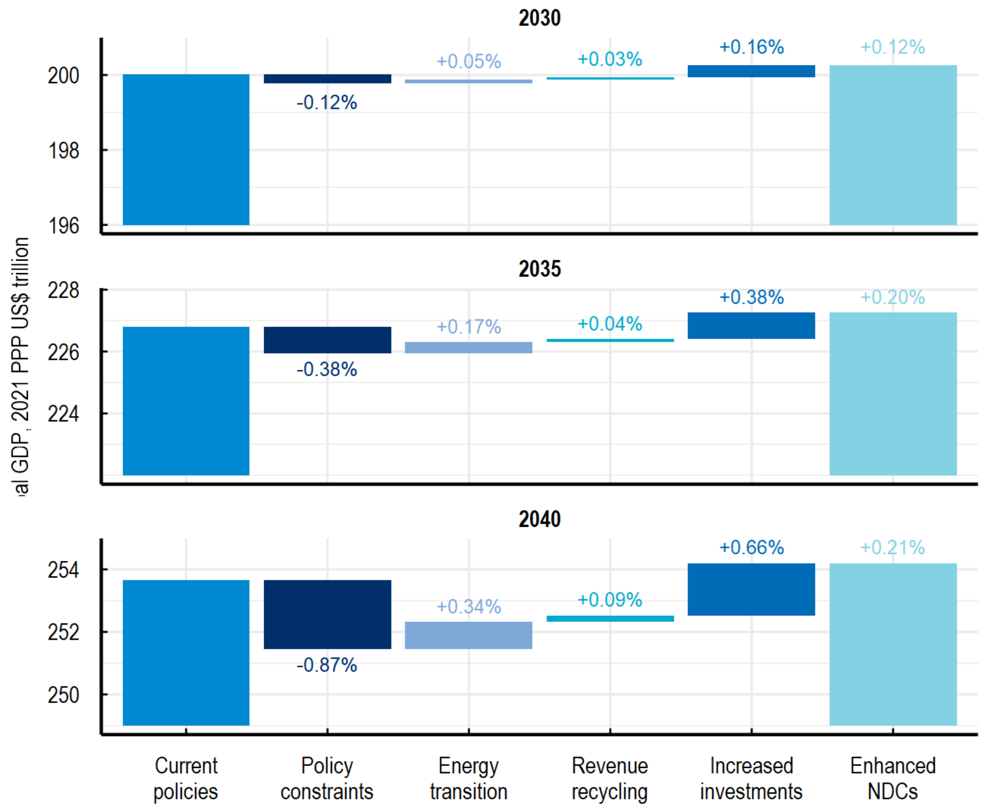
The distortive effects of climate policies are projected to be partly compensated by the accelerated energy efficiency gains resulting from a faster energy sector transition, which taken in isolation leads to global GDP increase by 0.17% in 2035 and 0.34% in 2040, compared to *Current Policies*. The accelerated electrification and switch to renewable energies and energy-efficient technologies resulting from increased investments in the energy production and end-use sectors and from climate policies, allow most countries to achieve higher economy-wide energy efficiency gains in comparison with both past rates and projected rates with *Current Policies*. This is projected to increase the productivity of economies with respect to energy use and reduces households spending on energy over time. In the medium to longer term, the effect of energy efficiency gains on GDP is projected to become stronger as technology deployment accelerates.

A wise use of budgetary surpluses realised by the climate policies can help to mitigate the adverse distributional effects of climate policies on households while also fostering modest economic growth through relevant tax rate reductions. The *Enhanced NDCs* scenario assumes that governments which rely on carbon taxation or fossil-fuel subsidy reforms in their climate policy packages are able to recycle the resulting additional fiscal revenues as reduced labour tax rates and as direct transfers to households. Transfers to households are projected to partially compensate households for higher energy prices and mitigation the distributional impacts of climate policies, while reduced labour taxes mitigate possible negative impacts on total employment. Overall, carbon tax revenue recycling is projected to have a modest positive effect on global GDP of 0.09% by 2040 in the *Enhanced NDCs* scenario (Figure 3).

Additional investment for the transition, as included in the *Enhanced NDCs* scenario, is projected to boost global GDP by 0.38% in 2035 and by 0.66% in 2040 (Figure 3), assuming that these additional investments do not crowd out other productive investments. The additional investments stimulate aggregate demand in the short term and increase the productive capacity of economies in the medium term. Within the NiGEM model, which is used to estimate the short to medium-term effects of investment on growth, additional investment efforts in the climate transition are assumed to be shared in equal proportions between governments and firms. This reflects the current state of climate finance, where private finance represents a little over 50% and public finance a little less than 50% of mitigation flows globally (Climate Policy Initiative, 2024[18]). Public investment efforts are assumed to be primarily financed by a temporary increase in income tax over the next decade. This ensures government deficits and debt levels stay in check in the medium term. The rise in income tax, however, also reduces households' disposable income and constrains private consumption, limiting the positive impact (or multiplier effect) of investments on GDP in the short term.

Figure 3. *Enhanced NDCs* can increase global GDP in the medium term

Decomposition of changes in global GDP between the *Current Policies* and *Enhanced NDCs* scenarios, in 2021 trillion USD (PPP)



Source: OECD ENV-Linkages model, with inputs from the NiGEM and IEA's GCEM models.

Regional results

Under an *Enhanced NDCs* scenario, accelerated climate action is compatible with continued economic growth across all regions, while building more efficient and sustainable systems. The results of the modelling analysis show that the global economy would continue growing at a sustained rate in the coming decades, driven by population growth and increasing living standards. while overall GDP growth remains similar to the *Current Policies* scenario, stronger climate policies in the *Enhanced NDCs scenario* enable a shift toward cleaner, more resilient economies. This transition reduces emissions, enhances resource efficiency, and strengthens long-term economic and environmental sustainability.

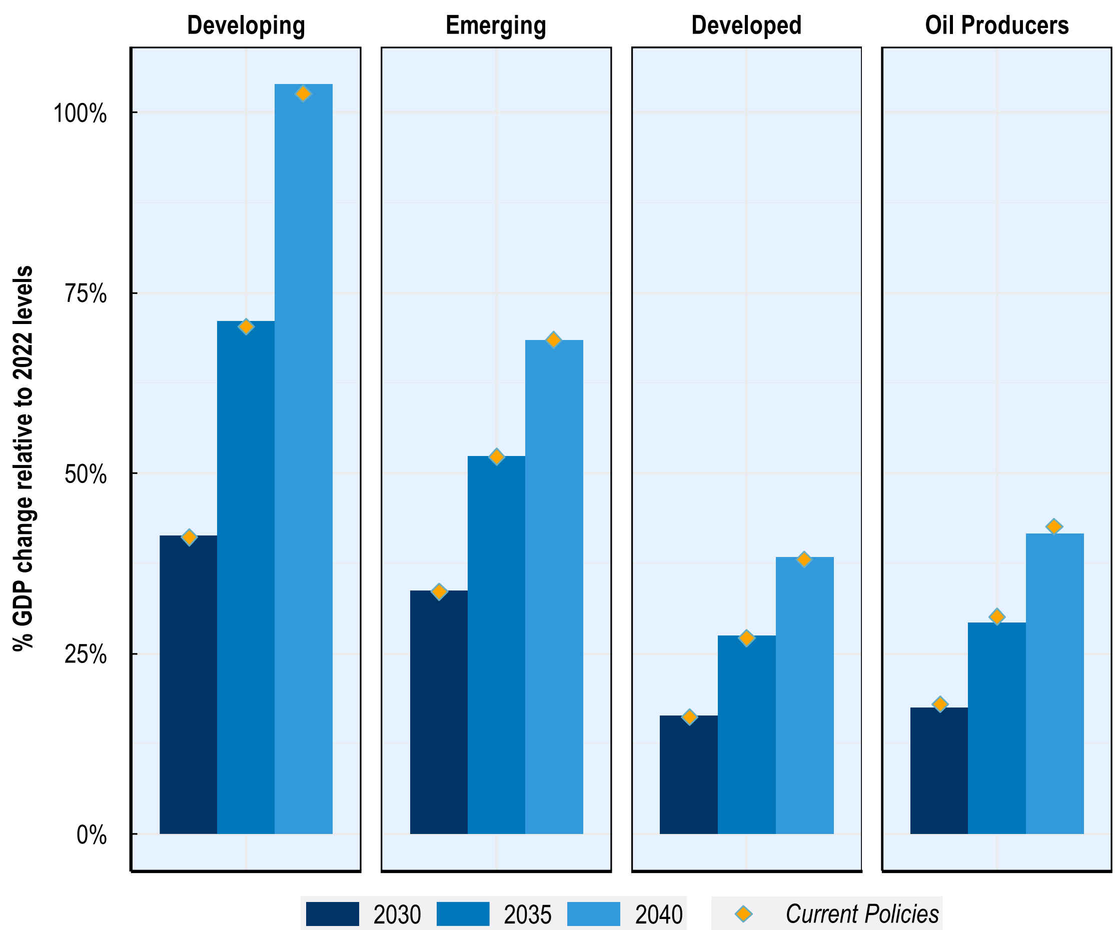
Most regions could see additional economic benefits from *Enhanced NDCs*, though outcomes will depend on countries' starting points and economic structure (Figure 4). The benefits of increased investment will be greatest in developing countries, where such investment might not have materialised without climate policies. Here, climate-driven investments can stimulate economic growth, accelerate clean technology deployment and support more sustainable development pathways. Revenue recycling will have the strongest effect on regions that include carbon pricing in their policy mixes. In countries with current high fossil fuel support and with low capacity to adopt carbon pricing, revenue recycling can stem from reforming fossil fuel support, which amounted to more than USD 1 trillion globally in 2023 (OECD, 2024[21]).

An *Enhanced NDCs* scenario presents specific challenges for fossil fuel-exporting countries and especially oil producers. As fossil fuel importers accelerate the switch of their energy mix away from fossil fuels, they will improve their trade balances, energy security and resilience to commodity price shocks. However, for economies heavily dependent on fossil fuel exports this shift will negatively impact export revenues. For instance, according to the modelling analysis, Oil Producers would still benefit from economic growth but at a slightly lower rate (Figure 4). Strategic policy responses can help mitigate these impacts. Reforming fossil fuel support and freeing fiscal space can support counties in implementing macroeconomic policies that accelerate diversification and support new sources of economic growth. Some countries have already taken steps in this direction; for instance, the Future Made in Australia agenda aims to maximise the economic and industrial benefits of the transition to a net-zero global economy by supporting the development of new clean energy industries and supply chains, including the critical mineral processing industry with the Critical Minerals Production Tax Incentive. Saudi Arabia has managed to sustain robust economic growth while diversifying away from fossil fuels by heavily investing in non-oil sectors, such as technology, entertainment, and renewable energy, through initiatives like Vision 2030.[4]

[4] Diversification has been driven by improvements in the regulatory and business environment.

Figure 4. Economic growth will continue in the coming decades with *Enhanced NDCs*

% change in GDP in the *Enhanced NDCs* scenario in 2030, 2035 and 2040 with respect to 2022 levels, by region



Note: ENV-L model regions are grouped into developing, emerging and developed country aggregates based on their national income. Oil producers are economies which rely predominantly on extracting and exporting fossil fuels, regardless of income levels. Countries included in the Oil producers group are excluded from any of the three income groups (developing, emerging and developed countries).
Source: OECD ENV-Linkages model, with inputs from the NiGEM and IEA's GCEM models.

Reduced damages

When looking further ahead, the economic case for climate ambition is even more compelling as the bulk of environmental and economic benefits from accelerated climate action will be realised in the second half of the century. Following the IEA (2023[7]), it is assumed that, if the trends of the *Enhanced NDCs* scenario continued beyond 2040, by 2100, emission reductions would limit global average temperature rise to 1.7°C above pre-industrial levels, compared to 2.4°C under *Current Policies*.[5] This lower global temperature rise will limit the expected economic and physical impacts of climate change, such as ecosystem degradation, more frequent extreme weather events, and rising sea levels, compared to a *Current Policies* scenario, and perhaps even more importantly limit the risk of very severe negative consequences. Reducing physical damages and

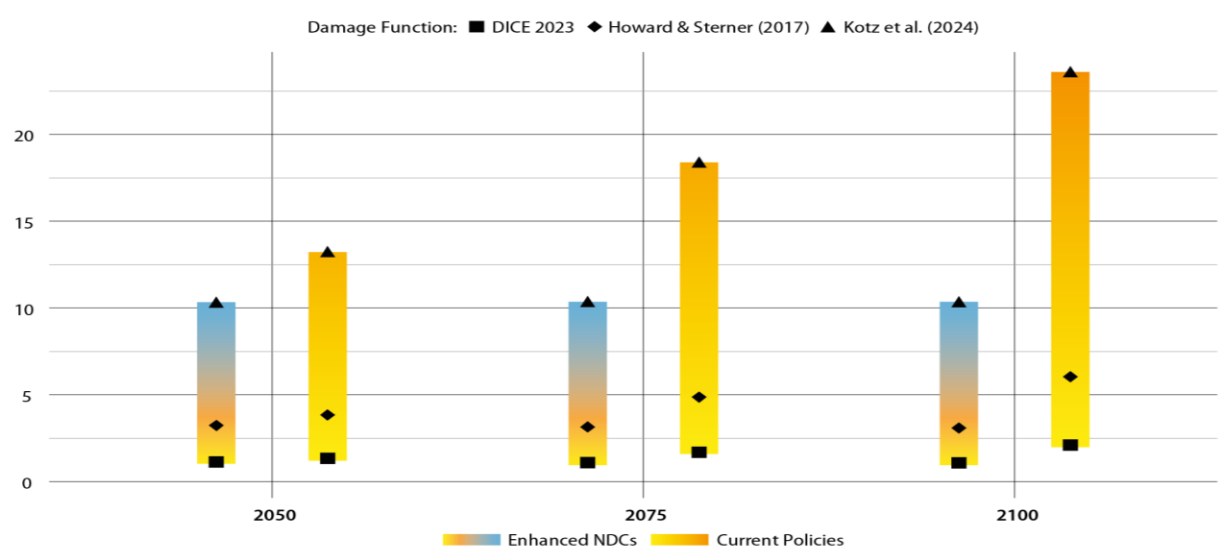
[5] Global mean surface temperature at the 50% likelihood level.

risks from climate change will generate significant economic and welfare benefits, e.g. enhancing food security, minimising productivity losses and health impacts due to heat stress, lowering risks to the financial system, and decreasing expenditures on disaster recovery and infrastructure repairs.

While the precise scale of their economic benefits remains uncertain, avoided damages are likely to be substantial in the long-run. Considering three prominent damage functions:[6] Howard and Sterner (2017[27]), Barrage and Nordhaus (Barrage and Nordhaus, 2024[28]), and Kotz, Levermann and Wenz (Kotz, Levermann and Wenz, 2024[29]).collective global action to mitigate climate change in the *Enhanced NDCs* scenario could lead to reduced physical impacts, such as those on sea level rise, health or agricultural crop yields, and risks. GDP losses under the *Enhanced NDCs* would be reduced to 1–10% by 2050 and to 1-10% by 2100, from 1-13% in 2050 and 2-23% in 2100 in the *Current Policies* scenario (Figure 6). The estimates of aggregate global avoided damages by an increased ambition scenario in 2050 compared to the *Current Policies* scenario range from 0.2 % to 3 % of potential global output. While short- to medium term economic effects are limited, they will be higher in the second half of the century. In the short term, the differences in damages across scenarios remain small, as cumulative emissions have already locked in near-term warming. However, as carbon concentrations lower in the *Enhanced NDCs* scenario and temperature trajectories begin to diverge, the benefits will increase.

Figure 6. *Enhanced NDCs* can lead to substantial economic benefits from reduced climate damages, with estimates varying depending on the damage function used

GDP loss from climate damages by scenario, % potential GDP



[6] The selection of damage functions used in this analysis reflects a range of plausible estimates from the literature. The 2023 DICE damage function (Barrage and Nordhaus, 2024[28]), widely used in integrated assessment models, represents a low-end estimate derived from a synthesis of existing studies. For a high-end estimate, the econometrically derived damage function from (Kotz, Levermann and Wenz, 2024[37]) is used. This function is utilized in the NGFS scenarios and reflects the most recent empirical advancements in climate-econometric modelling. As a middle-ground but still rather conservative estimate, the damage function from (Howard and Sterner, 2017[77]) is used. This function is based on a meta-analysis of previous studies and is also used in the OECD Long-Term Macroeconomic Model. Together, these functions capture a broad range of projected economic impacts from climate change across different methodological approaches.

Note: Future emission of both policy scenarios are based on the integrated assessment model (IAM) REMIND-MAgPIE 3.3-4.8 for the NGFS Policy Scenarios Below 2°C, which closely aligns with the ***Enhanced NDCs*** scenario, and Fragmented World, which closely aligns with the ***Current Policies*** scenario. Based on the respective emission trajectories future temperature projections correspond to the median percentile of the temperature distribution from the MAGICC climate model. Damage estimates for Kotz et al. (2024) are directly taken from the NGFS scenarios, where the median percentile of the damage distribution is shown. For Howard and Sterner (2017) and DICE (2023) the author's preferred specification from the respective papers is shown.
Source: Authors, based on three damage functions (Howard and Sterner, 2017[27]; Barrage and Nordhaus, 2024[28]; Kotz, Levermann and Wenz, 2024[29]).

4. *Enhanced NDCs* will entail structural changes to the economy

Accelerated climate policies drive structural transformations across the economy, which affect both production and consumption. Both production and consumption are projected to change in the coming years and decades in response to socio-economic trends, including demographic changes such as urbanisation and ageing, and digitalisation. These trends strongly interact with the climate transition. Understanding these structural changes is essential to anticipate adjustment needs, particularly in labour markets and in considering distributional implications of accelerated action.

Accelerated climate policies serve as powerful catalysts for transitioning production and consumption patterns toward cleaner, more sustainable alternatives. Where switching is not technically or economically feasible, such policies may lead to the contraction of specific sectoral activities, either at regional or global level.[7] Climate initiatives targeting end-use sectors, such as transportation and services, typically focus on reducing energy demand, promoting energy efficiency, and fostering the adoption of low-emission technologies. Unlike fossil fuel production, these sectors are often positioned to undergo structural transformations rather than outright contractions. Their capacity for adaptation hinges on the extent to which they can substitute carbon-intensive inputs with sustainable alternatives. For instance, service industries and light manufacturing, with their higher reliance on electricity rather than direct fossil fuel combustion, can benefit from the transition to renewable energy sources without requiring fundamental changes to their operational frameworks. Conversely, heavy industries like steel and cement face greater hurdles due to the technical challenges of replacing high-temperature combustion processes or fossil-based feedstocks, integral to their production methods.

In the *Enhanced NDCs* scenario, the limited effects of the policies on aggregate economic growth hides stronger sectoral changes (Figure).[8] Sectoral emissions intensity is projected to change over time. Significant reductions in emission intensity highlight the key role for low-emission technologies in mitigating emissions. In the *Enhanced NDCs* scenario, emission intensity is projected to decline substantially for fossil-powered electricity, from almost 1,000 kg CO_2eq per unit of output in 2022 to around 650 kg CO_2eq in 2040. This change is due to a switch towards less carbon-intensive fossil fuels, mostly notably gas, as well as the phase-out of coal-powered electricity production.[9] In fossil fuels extraction and distribution, emission intensity is projected to more than half between 2022 and 2040 in the *Enhanced NDCs* scenario. More moderate declines are observed in non-energy sectors, including transport, agriculture and food, and industry. Services and construction show no notable changes in CO_2 intensity in the *Enhanced NDCs* scenario.

[7] Firms could decide to relocate production activities, or the competitive position of firms could be reduced vis-à-vis competitors, or there may be a contraction of the global market.

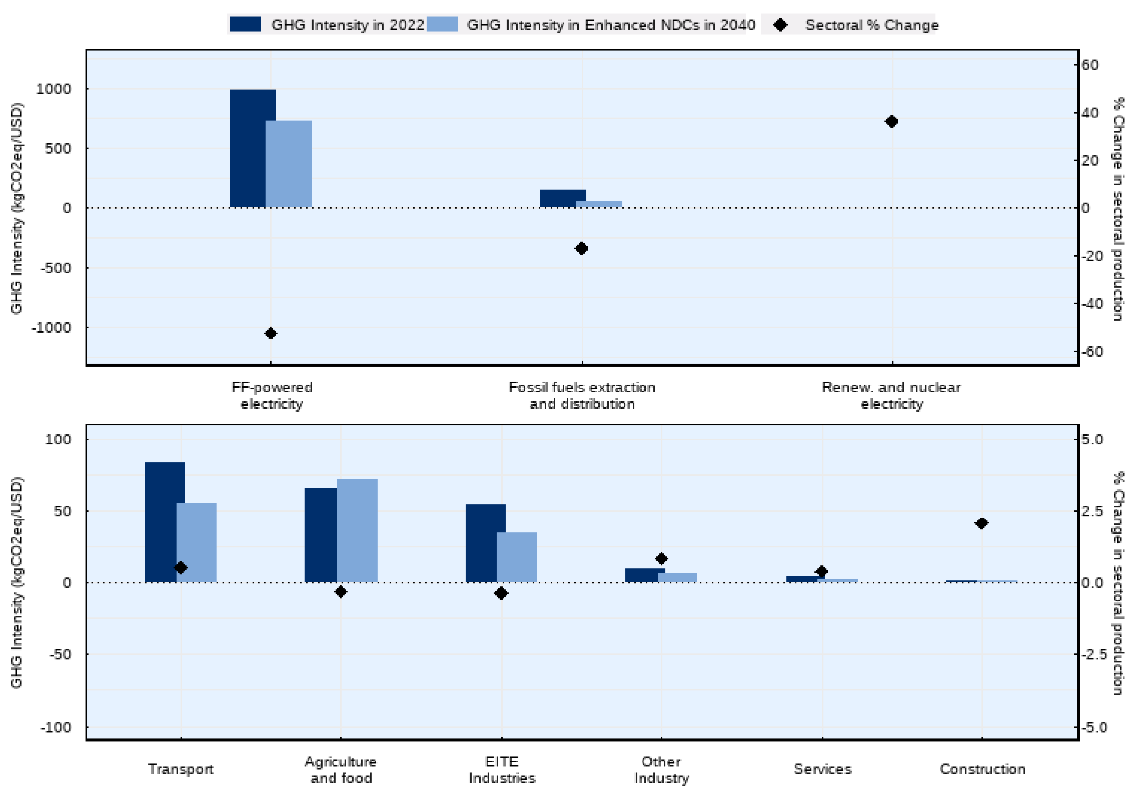
[8] The *Current Policies* scenario already implies a non-zero level of climate action and living standards are projected to increase worldwide in both scenarios. Subsequent changes in household demand change the sectoral demand structure over time irrespective of climate policies (non-homothetic preferences in ENV-L).

[9] This refers to coal-powered electricity, without carbon capture and storage (CCS).

The most substantial shifts in sectoral production occur within the energy system, marked by a sharp decline in fossil fuel production and significant growth in renewable energy (Figure 1). By 2040, fossil fuel energy output is projected to drop by approximately 60% under the *Enhanced NDCs* scenario, compared to the *Current Policies* scenario. In stark contrast, renewable electricity sectors are projected to expand by 40%, as direct replacements for fossil-based energy and thanks to targeted investments. The effects on non-energy sectors are less pronounced in the *Enhanced NDCs* scenario. At the global level, gross output for non-energy sectors is projected to experience limited effects, supported by advancements in technology and targeted sectoral investments that help sustain economic activity. Among these sectors, construction stands out with the most notable change, anticipated to grow by 2.5% by 2040 relative to the *Current Policies* scenario. This increase is due to the higher demand for low-carbon infrastructure, including for low-carbon public transport and for the expansion of the electricity grid. The relatively minor impacts on non-energy sectors can also be attributed, in part, to the scenario's strong emphasis on energy-related policy measures.[10]

Figure 7. Change in global sectoral production and carbon intensity in the *Enhanced NDCs* scenario

GHG intensity in kg CO_2 equivalent/USD (primary axis) and % change in sectoral production in million USD (real) in 2040 (secondary axis), aggregate sectors



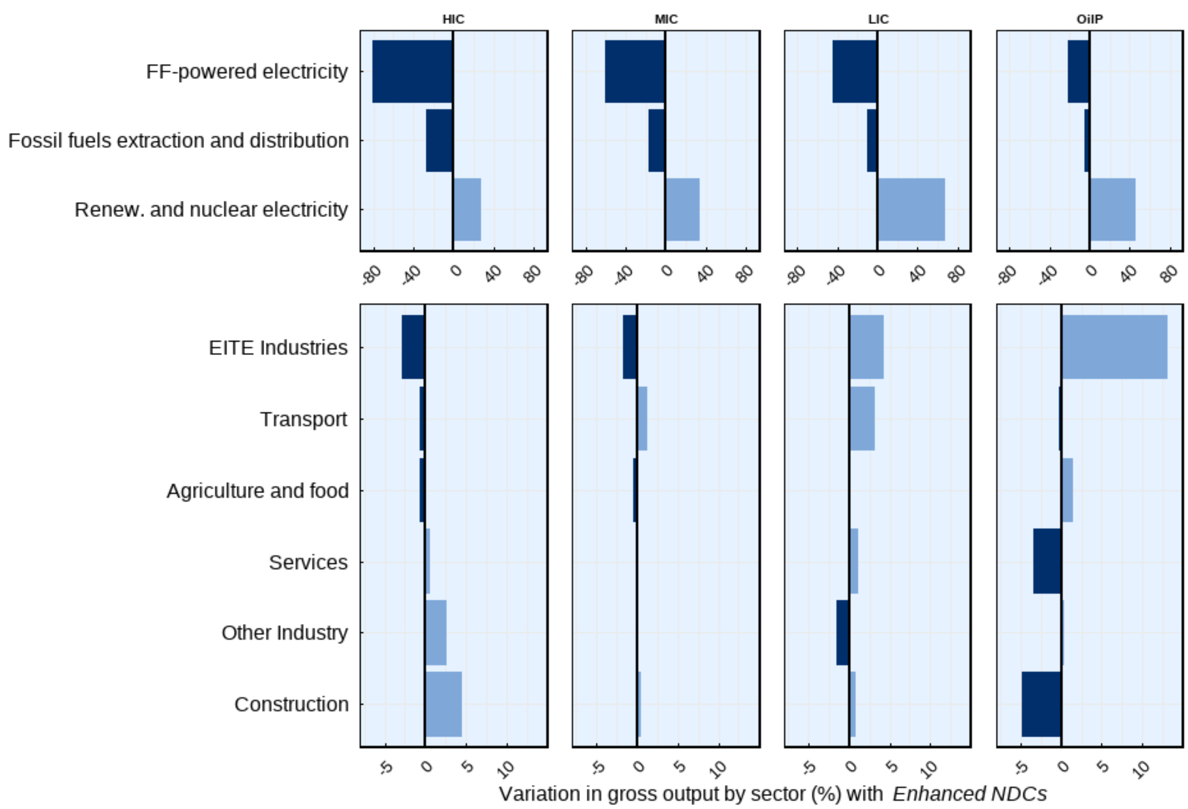
[10] The scenario design reflects the current focus of climate policies on the energy sector and relies on input from the IEA's World Energy Outlook. A scenario with more stringent policies in non-energy sector would likely lead to different results. The implications of such a scenario are discussed in Section 4.4.

Note: Aggregate sectors are ranked according to their GHG-intensity (CO_2-eq) in 2022.
Source: OECD ENV-Linkages model, with inputs from the NiGEM and IEA's GCEM models.

The regional differences in sectoral output are more marked for non-energy sectors. The largest changes take place in oil producing economies, as they need to substantially redirect economic activity from the energy sector towards other sectors, thereby differentiating their economies. Specifically, the energy-intensive industrial sectors in oil producing economies are projected to increase output by over 13% by 2040 in the *Enhanced NDCs* scenario, compared to *Current Policies*, suggesting shifts in comparative advantages and subsequent production relocation towards less regulated regions in energy-intensive industries. While high-income countries (HIC) experience a 3% output decline (–202 billion USD), low-income countries (LIC) and oil-producing economies see output increases of 4% (+124 billion USD) and 13% (+138 billion USD) by 2040, respectively. In absolute terms, however, this shift is offset in high-income countries by the expansion of non-energy-intensive industries, where output is projected to be 3% (+555 billion USD) higher by 2040 compared to *Current Policies*. Transport and construction generally show a mix of moderate positive trends, influenced by advancements in low-carbon solutions and investments in sustainable infrastructure. In reality, future changes in industrial output will depend on the ability of policies and policy packages to stimulate private sectors' efforts in innovating and deploying new technologies.

Figure 5. Changes in sectoral output vary across regions

Difference in gross sectoral output between *Current Policies* and *Enhanced NDCs* scenarios (%), 2040



Note: ENV-Linkages model regions are grouped into high-income (HIC), middle-income (MIC) and low-income (LIC) country aggregates based on their national income. Oil producers (OilP) are economies which rely predominantly on extracting and exporting fossil fuels, regardless of income levels. Countries included in the Oil producers group are not included in any of the three income groups.
Source: OECD ENV-Linkages model, with inputs from the NiGEM and IEA's GCEM models.

5. Conclusion

Accelerated climate action can drive economic growth while delivering significant environmental and social benefits. The OECD economic modelling assessment conducted for this report shows that over the next 15 years, ambitious climate policies can be implemented without compromising global and regional economic growth. Investments in low-emissions technologies and energy-efficiency will not only support economic expansion, but also enhance productivity and resilience. Accelerated climate action will also bring positive environmental and socio-economic benefits in the short and long run, including improved air quality and better public health outcomes.

Accelerated climate action will drive significant structural transformations across the global economy. OECD economic modelling indicates that, over the next 15 years, economic activity will shift towards less energy-intensive sectors in presence of accelerated climate action. While national climate plans often place a strong emphasis on the energy sector, the modelling underscores the potential benefits of expanding the sectoral coverage of climate policies. By better distributing ambition across various sectors and aligning actions with the specific sources of emissions, many global regions could achieve greater overall effectiveness at reducing emissions relying on least cost options. This chapter highlights the advantages of economy-wide policies, including the importance of addressing greenhouse gases beyond carbon dioxide. Furthermore, it emphasizes the critical role played by sectors such as agriculture, forestry, and other land uses in supporting the objectives of the Paris Agreement.

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