

Economic impacts of the green transition

SUMMARY

The aim of the European Green Deal is to make Europe the first climate-neutral continent, by 2050, while maintaining economic growth and prosperity. It is Europe's growth strategy. The transition to a climate-neutral economy with net zero greenhouse gas emissions (GHG) over the course of just 28 years represents an industrial revolution at unprecedented speed, with significant impacts on gross domestic product (GDP), investment, employment, competitiveness, distribution, public finances and monetary stability.

Outlining the expected impact of transition to a climate-neutral economy on economic indicators on the basis of analysis by academics and think-tanks and the Commission's impact assessment (IA) of the climate target plan, this briefing focuses in particular on economic output (GDP), public debt, competitiveness, labour markets, energy prices, inflation and distributional effects.

Climate mitigation policies affect economic output. According to the IA, transition towards net zero is expected to have only limited impacts on aggregate output (GDP), but its composition will shift from consumption towards investment. Moreover, the impacts on sectoral output, investment and the labour market are likely to be significant, creating a need for policy measures to ensure a just transition. There is a risk of negative short-term impacts if consumption and production decrease, e.g. as a result of carbon pricing. However, increased investment, for example in low-carbon technologies, would potentially boost productivity and economic growth in the long term.

Transition to climate neutrality demands solid economic governance to manage the risk to macroeconomic and financial stability. The Commission's sustainable growth strategy in the European Semester framework is built around four aspects of competitive sustainability. Parliament has called for the addition of a climate indicator and coordinated efforts to implement the digital and environmental transitions, alongside the current approach to fiscal and budgetary policies.



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Introduction

The objective of the 2015 [Paris Agreement](#) on climate change is to limit global warming to well below 2 °C, preferably to 1.5 °C, compared with pre-industrial levels. This would require countries to reach global climate neutrality (net zero GHG emissions)¹ in the second half of this century. To date, countries representing approximately 70% of global GHG emissions have pledged to achieve [climate neutrality](#) between 2035 (Finland) and 2070 (India), but most pledges are not supported by short-term policies.

The EU is committed to an ambitious climate policy, aiming to become the world's first climate-neutral continent by 2050. The EU's growth strategy, defined in the [European Green Deal](#), aims at net zero GHG emissions by 2050 while decoupling economic growth from GHG emissions and resource use. In September 2020, on the basis of a public consultation and an in-depth [impact assessment](#), the Commission adopted a communication on the [climate target plan](#). The plan proposed to increase the 2030 target from a 40% emissions reduction to a 55% net emissions reduction, compared with 1990 levels. The IA showed that a 55% reduction would be the most cost-effective way to achieve climate neutrality by 2050. The [European Climate Law](#), passed in 2020, made the climate neutrality commitment and the 55% target legally binding. The July 2021 '[fit for 55](#)' package presented legislative proposals for the revision of existing EU legislation and new initiatives to implement the 55% target. These proposals are geared towards updating the key EU climate and energy policy instruments, including the [EU emissions trading system](#) (ETS), the [Effort-sharing Regulation](#), and the [Land Use and Forestry Regulation \(LULUCF\)](#). To promote decarbonisation in specific sectors, the Green Deal uses [various inter-related measures](#) to influence the areas of energy, mobility, buildings and food production.

With only a few exceptions, economic growth has traditionally been linked with increasing energy consumption. In an energy system that is still dependent on fossil fuels, this translates to higher GHG emissions. While it is necessary to reach global peak GHG emissions as soon as possible in order to achieve climate neutrality, the potential impacts of the transition on the economy are open to debate. The low-carbon transition involves [risks](#) in the short and medium run, such as demand and supply shocks that could affect economic growth.

This briefing focuses on the [macroeconomic consequences](#) of the net zero transition and does not address the impact of the transition on climate change mitigation. Nor does it take into account the climate impacts avoided or the impact of the transition on the environment, biodiversity or other aspects of society's welfare. The [PESETA IV](#) project assessed the potential biophysical and economic consequences of climate change by addressing the question of how the current economy would be affected if global warming of 1.5 °C, 2 °C and 3 °C occurred today. The analysis found that additional loss of welfare would rise sharply with higher temperatures, and would be greater in southern Europe than in the north at all levels of warming. The estimated losses depended predominantly on the valuation of human lives lost through extreme heat.

Table 1 – Welfare losses under various global warming scenarios

Annual additional welfare losses in EU+UK (€ billion)	1.5°C	2.0°C	3.0°C
with human mortality	42	83	175
without human mortality	6	18	54

Data source: [Welfare loss from climate change impacts](#), Joint Research Centre, 2020.

Impact assessment based on energy-economic modelling

For policy-makers, it is important to understand the impacts that policy choices would have on the economy and on environmental objectives. The EU [Better Regulation Guidelines](#) therefore require that legislative proposals be accompanied by impact assessments to help to identify the most effective policy options.

Statements about the expected impacts of climate change policies are generally based on computer models that provide quantitative estimates of the economic and environmental impacts of various policy options and scenarios. A model is a simplified version of reality that captures key relationships between variables, and shows how a change in one or more of these variables affects the other variables over time.

Modellers make use of scenarios that generally include a baseline scenario (business as usual) and alternative futures (e.g. EU climate neutrality at a certain date, global ambition to reach a 1.5 degree target). Models include assumptions, for example about future energy prices or the cost of renewable energy technologies.

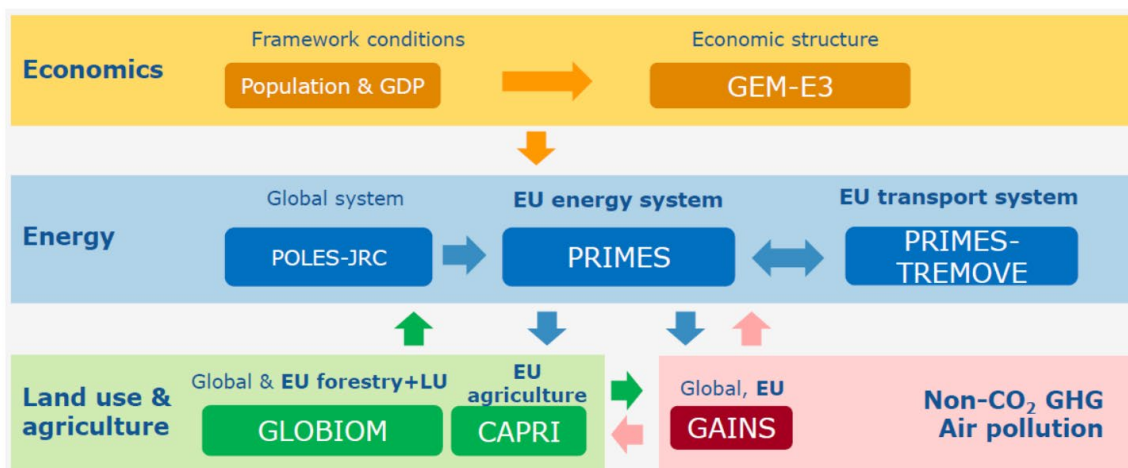
Although models are useful tools when it comes to understanding the expected impacts of policy choices, they are not predictions of the future. The outcome of the modelling is critically dependent on the assumptions that form the input variables for the models. In particular, future costs and benefits are discounted, and the choice of the discount rate influences cost-benefit analyses. Finally, models that work for today's economy may become less accurate for an economy that is changing rapidly and radically.

Models provide precise numbers, for example about employment or GDP impacts, but these are associated with uncertainties. Nonetheless, modelling helps by offering an understanding of the potential effectiveness of alternative policy interventions.

To assess the overall impacts of climate and energy policies, economic models are coupled with models of the energy and transport systems, land use and the environment. The coupling of heterogeneous models reveals systemic relationships, but care must be taken to take account of each model's specificities.

The IA relies on a combination of qualitative and quantitative assessments. The quantitative assessment of the scenarios was performed using the modelling suites PRIMES (energy), GAINS (environment) and GLOBIOM (land use), as shown in Figure 1. Impacts on GDP, competitiveness and employment were assessed using the macro-economic modelling tools JRC-GEM-E3, QUEST and E3ME, which use the results of the PRIMES energy modelling. EPRS carried out an [initial appraisal](#) of the impact assessment.

Figure 1 – Links between models in the impact assessment of the climate target plan



Source: Impact assessment of the climate target plan, [Part 2](#), SWD(2020) 176 final.

Decoupling emissions and economic growth

From mid-20th century onwards, economists have used gross domestic product (GDP) as the preferred metric to measure the economic health of national economies. GHG emissions and GDP used to correlate, meaning that when one grew or shrank, the other would move in the same

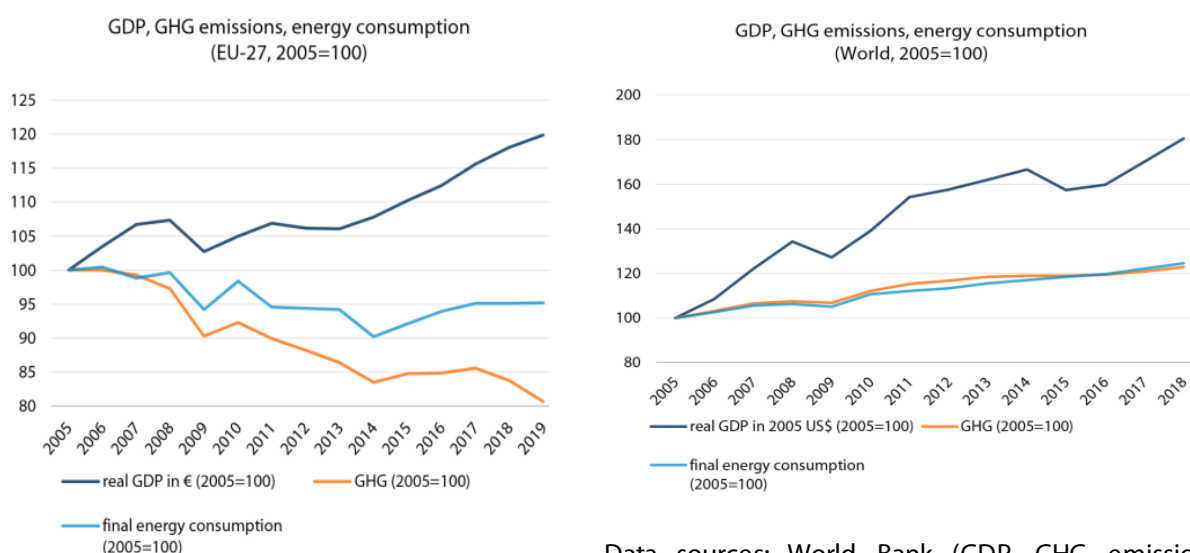
direction. However, some countries have managed to weaken this link either by addressing the energy system (e.g. energy efficiency improvements and low-carbon energy sources), or through a shift in their economic activities, e.g. a focus on high-tech goods and services to the detriment of heavy industries. The decoupling of GHG emissions and GDP is either relative or absolute (see box).

GHG emissions accounting plays an important role in climate policy-making, and the basis used can make a crucial difference. Accounting for domestic (territorial) emissions is the standard in the United Nations Framework Convention on Climate Change, and in national and European policy-making. The emissions taken into account are those generated within a given territory. An alternative is to account for emissions related to the production and transport of imported goods in the country where these are consumed. Such consumption-based accounting (also known as [carbon footprint](#)) provides a clearer view of the emissions for which a country is ultimately responsible, its carbon footprint. For example, a country may reduce its domestic emissions by outsourcing the production of carbon-intensive goods to another country. To some extent, this has happened with the shift of manufacturing activities from the United States (US) and the EU to east Asian countries.²

Absolute and relative decoupling

Between 1990 and 2018, the [world's GDP](#) grew by 279 % while [GHG emissions](#) grew by 54 %. During the same period, the EU's GDP grew by 146 % while GHG emissions dropped by 22 %. Within this timeframe, the EU showed signs of **absolute decoupling** (emissions fell while GDP remained on an increasing path). Worldwide, both emissions and GDP increased, but with **relative decoupling**, i.e. GDP grew faster than GHG emissions. Figure 2 also shows that GHG emissions and final energy consumption correlated closely at world level, while the EU reduced its GHG emissions much faster than its energy consumption.

Figure 2 – GDP, energy consumption and GHG emissions (World and EU)



Data source: Eurostat.

Data sources: World Bank (GDP, GHG emissions), International Energy Agency (final energy consumption).

Domestic GHG emissions in the EU have decreased as a result of a combination of factors, including climate and energy policies, growing use of renewable energy sources and less carbon-intensive fuels, improvements in energy efficiency, and structural changes to the economy. The GHG intensities of Member States' economies have decreased as well as converged since 1990, translating into more similar GHG emissions per capita and per unit of GDP.

Energy demand still correlates positively with economic growth, and fossil fuels remain the largest source of energy and emissions in the EU. Therefore, further energy efficiency and carbon intensity improvements are essential to maintain economic growth while transitioning towards a low-carbon

and potentially climate-neutral economy. Only long-term absolute decoupling can lead to climate neutrality in a growing economy. However, to achieve climate neutrality by 2050, the speed of decoupling must be much higher than it has been to date. Between 2005 and 2019, the EU's GHG emissions fell annually on average by 1.38 % of 2005 emissions, while from 2019, they must fall by 2.6 % of 2005 emissions annually to reach climate neutrality by 2050 – which means almost doubling the absolute annual emission reduction, and an even higher percentual effort compared with current emission levels.

Impact on economic growth

The majority of Europeans (56 %) believe that climate policies are a source of economic growth, according to the latest [climate survey](#) of the European Investment Bank (EIB). Climate action involves various regulations, subsidies, taxes, incentives, border measures and government expenditures. Although it may eventually increase productivity and economic growth, the transition is likely to involve friction.

Fundamentally, decarbonisation of the economy often involves [carbon pricing](#) as a tool to incentivise emissions reductions. The pricing can be explicit (e.g. taxation and emissions trading system) or implicit (through regulation). The increased pace of the EU's transition and the scale of measures involved mean that there are likely to be profound impacts on the economy. The European Green Deal rests on the premise, that – because of the amount of investment involved – the transition towards climate neutrality will translate into a [Keynesian boost](#) of the economy and higher employment in certain sectors. However, in addition to the major investment push, the transition will also involve significant relative price changes, especially if the carbon price is unexpectedly high. Together with [surging energy prices](#), this could translate into accelerated [obsolescence](#) of existing capital stock (stranded assets), especially in the energy, transportation, manufacturing and buildings sectors. From an economic perspective, this would have the effect of an [adverse supply shock](#).

Carbon pricing

[Carbon pricing](#) typically takes the form of an emissions trading system or carbon tax. In emissions trading systems, such as the EU's emissions trading system (EU ETS), a cap is set on total GHG emissions, and the price is subsequently established on the carbon market. A carbon tax sets the carbon price directly, and the quantity of emissions is established by the economic actors.

In the short run, a supply shock translates into decreased output. However, GDP growth does not necessarily need to decline, as carbon pricing incentivises research and development, infrastructure spending and accelerated renewal of equipment and buildings. This may mean that only the composition of growth will change, as investments increase, while the immediate effect on consumption could be [negative](#). The IA estimates that the average annual investment-to-GDP ratio (including transportation) will increase by 1.5 to 1.8 percentage points between 2021 and 2030, compared to the previous decade.

In the long run, however, society would achieve higher [net welfare](#) by preventing severe [climate disruptions](#) and the associated costs, indicating a trade-off between current and future welfare. In addition to the climate impacts avoided, lower adaptation costs and co-benefits for biodiversity and air quality, citizens may benefit from investments connected to the green transition, including, for example, better public transport infrastructure, or better building insulation. Moreover, spill-overs from investment in research and innovation may increase potential output in the long run.

The IA provides estimates of the macroeconomic impacts of the European Green Deal on EU GDP using the modelling tools mentioned above. Given the important role of the EU's economic interactions with the rest of the world, especially those relating to the domestic output of sectors open to international trade and competition, the IA considers different levels of climate policy stringency in non-EU countries.

1. The first option assumes that non-EU countries are implementing their current nationally determined contributions (NDCs) under the Paris Agreement ('fragmented action').
2. The second option assumes that the countries are applying more stringent emissions reductions policies compatible with the 1.5°C target ('global action').

Moreover, the modelling variants use different scenarios, e.g. for the use of revenues from carbon pricing or emissions trading systems (lump sum redistribution to households, reduction in labour taxation, support for investment towards the climate and energy transition, or reduction in VAT rates), the role of labour market imperfections and the behaviour of energy-intensive industries in relation to free allocation or auctioning of EU ETS permits.

The overall impact of the European Green Deal on GDP is projected to be relatively muted. Assuming 55 % net emissions reductions by 2030, and fragmented action in the countries outside the EU, the worst-case scenario suggests aggregate GDP by 2030 to be 0.4 % below the baseline. The negative impact on GDP is explained by a decrease in private consumption as well as by a decrease in net exports. On the other hand, the best-case scenario projects a 2030 GDP about 0.5 % above the baseline, resulting from an increase in private consumption due to use of carbon revenues to reduce VAT and to support energy efficiency investments. The second underlying reason is the demand stimulus triggered by higher investments.

Assuming that the countries outside the EU increase their climate policy stringency in line with the 1.5°C target, the estimates of the deviation of the EU's GDP from baseline range from a larger negative impact of -0.7 % to a positive impact of 0.55 %. The estimated negative impact is due to the repercussions of a loss of output outside the EU. Furthermore, the output of energy-intensive industries in the EU is estimated to increase due to the higher carbon efficiency compared with the rest of the world. This higher output translates into higher costs associated with abatement investments in order to remain within the cap under the EU ETS. On the other hand, the estimated positive impact is due to increased global investments translating into demand stimulus with a positive impact on the EU.³

Overall, the **GDP composition is estimated to be affected more significantly than the aggregate itself**. Although investments are projected to increase under all scenarios, the effect on consumption is ambiguous. Overall, the European Green Deal could be either a modest contributor, or a limited impediment to GDP growth.

Impact of climate action on the global economy

According to the [Sixth Assessment Report](#) of the Intergovernmental Panel on Climate Change, the aggregate impact of climate change mitigation on global GDP is small compared with global projected GDP, which is projected to at least double between 2020 and 2050, in modelled global scenarios that quantify macroeconomic effects, but that do not account for damage from climate change or adaptation costs. Compared with pathways that assume the continuation of existing policies, in pathways assuming coordinated global action to limit warming to 2 °C global GDP is reduced by 1.3 to 2.7 % in 2050 – a reduction of the annual GDP growth rate by 0.04 to 0.09 percentage points. Models that account for economic damage from climate change find that the global economic benefits of reducing warming exceed the global cost of limiting warming to 2 °C over the 21st century.

A May 2022 [research report](#) by Deloitte estimates that inaction on climate change will lead to US\$178 trillion in GDP destruction over the next 50 years, while achieving global climate targets could yield US\$43 trillion in economic benefit. The economic impact of inaction would be highest in the Asia-Pacific region, with the cumulative present value of losses estimated at US\$96 trillion by 2070, followed by the Americas at US\$36 trillion and Europe at US\$10 trillion.

A research report from [Swiss Re Institute](#) expects the world to lose around 10 % of total economic value from climate change by mid-century if temperature increases stay on the current trajectory,

and neither the Paris Agreement nor the 2050 net-zero emissions targets are met. Economies in south and south-east Asia, which are most vulnerable to the physical risks related with climate change, have most to gain if temperature increases are limited. Many advanced economies in the northern hemisphere are less vulnerable because they are less exposed to weather-related climate impacts, and better able to adapt. Asian countries are also most exposed to financial and economic impacts related to transition risks, for example higher costs for businesses and large shifts in asset values as a result of the transition to a low-carbon economy.

The [World Energy Transitions Outlook](#), published by the International Renewable Energy Agency in March 2022, finds that policies in line with the 1.5 degree target would lead to 2.3% more cumulative GDP growth by 2030 than existing policies, and create around 85 million new jobs relating to the energy-transition (26.5 million jobs in renewables and 58.3 million extra jobs in energy efficiency, power grids and flexibility, and hydrogen), while 12 million jobs would be lost in the fossil fuel and nuclear industries.

Impact on public debt

The transition to climate neutrality is likely to include substantial [public expenditure](#). On the one hand, co-benefits may arise, for example when revenues from carbon pricing are used to decrease distortionary taxes on labour or capital ('[double dividend](#)' theory). On the other hand, fiscal expenditures on climate change mitigation put an additional strain on public budgets. At the same time, countries worldwide are struggling with the sustainability of public finance amid [concerns](#) that the impacts of climate change may endanger their ability to repay their COVID-19 debts. The EU is tackling the net zero transition at a time when euro-area sovereign debt has reached [96% of GDP](#).

According to the Commission, meeting the 2030 climate and energy targets of the European Green Deal will require [€260 billion](#) of additional annual investment (1.5 % of 2018 GDP) from both public and private sectors. At least 30 % of the EU's long-term budget (2021-2027) and the Next Generation EU (NGEU) instrument is allocated to climate action. The Recovery and Resilience Facility, NGEU's centrepiece, provides loans and grants to enable Member States to support investment and reforms in their sustainable recovery from the COVID-19 pandemic. In their national plans, Member States must [allocate](#) at least 37 % of the funds to investments and reforms that support climate objectives. To finance NGEU, the Commission is raising funds on capital markets, 30 % of which should be raised by issuing green bonds.

Financing mitigation through debt raises the issue of [intergenerational justice](#). Governments can use long-term debt to enhance the shift to clean technology to support climate action, while supporting industries and workers affected by the transition. By applying debt-financed mitigation, the financial burden of the transition is shifted to future generations. However, while inheriting the debt, the future generations stand to benefit from reduced exposure to climate change risks, a preserved environment, and technological advances.

Impact on employment

According to the [EIB climate survey](#), 56 % of Europeans think climate policies create more jobs than they destroy. Climate change mitigation policies will [reshape](#) the labour market, while labour market policies may contribute to a successful transition by facilitating the required structural change. The 'greening' of the labour market involves significant opportunities and risks, where certain countries, industries and groups of workers may be disproportionately affected. While the transition will affect most occupations indirectly through energy prices, green technologies and working practices, certain industries, such as [energy supply](#) and energy-intensive industries, will face stronger impacts. However, the overall [impact on employment](#) in developed countries is expected to be modest, as the most strongly affected industries represent only a small share of total employment.

The macroeconomic models used in the IA indicate that the effects on employment in the EU will be limited, and will depend on the use of carbon revenues. Under the standard model,⁴ together

with the lump-sum redistribution of carbon revenues to households, the 55 % fragmented action scenario generates a negative effect on employment of -0.26 % (about 494 000 jobs) by 2030. However, if the carbon revenues are used to reduce labour taxation, a limited positive impact on employment of 0.06 % (about 110 000 jobs) is generated. Under a different model, no changes in employment are induced using lump sum transfers to households. If the revenues are recycled to support energy efficiency investment and to reduce VAT, a stimulus of consumption and GDP translates into an increase in employment of up to 0.20 % (412 000 jobs). Finally, the last model considers using carbon revenue to reduce labour taxation for lower-skilled workers. This stimulates lower-skilled labour supply through higher net wages while lowering labour costs for firms, leading to an overall increase in employment of about 0.45 %.

Although the overall effects are limited, all models used in the IA indicate significant **changes in the sectoral composition of employment**, underlining the importance of addressing the distributional effects. For example, employment in the coal sector is expected to decline by about 50 % below baseline by 2030, under the 55 % emissions reduction scenario. Significant drops in employment are also expected in other fossil fuel sectors. Changes in employment in energy-intensive industries are projected to be closely aligned with the impact of the transition on output in these sectors. Market services, the largest job provider sector in the EU, are affected by the transition only to a limited extent.

On the other hand, employment in electricity supply and construction is expected to increase. More specifically, the transition towards climate neutrality may [enhance](#) employment in the production of renewable energy and in building renovation. Already between 2004 and 2018, [employment](#) in renewable energy in the EU more than doubled from 660 000 to 1.51 million jobs. New job creation will concern mostly low- and medium-skilled workers, offsetting some of the negative impacts of the digital transition on demand for low-skilled labour. The IA shows that – without policies to reduce labour tax – high-skilled workers may be more negatively affected than the low-skilled. On the other hand, if carbon revenue is used to reduce taxes, aggregate employment is expected to increase, with a lower impact on high-skilled workers.

Many workers will need to [reskill](#) to be able to adopt alternative production methods or relocate towards different sectors and occupations. Significant investment in human capital will be needed to ensure that the labour market can match labour demand and supply. In the EU, the [Just Transition Mechanism](#) is designed to ensure that the transition happens in a fair way, by facilitating employment opportunities and supporting the reskilling of citizens.

Impact on distribution and competitiveness

The transition towards climate neutrality involves significant [distributional effects](#). Carbon pricing is often viewed as regressive in the sense that low-income households are disproportionately affected by the increasing carbon price, as they spend a higher proportion of their income on necessary goods, such as energy. To deal with this regressivity issue, the revenue from carbon pricing may be used to limit or offset these effects, e.g. by recycling the revenue through labour tax cuts, or increasing welfare transfers.

The IA shows that the estimated changes in relative prices, including fuel, electricity and housing, induced by the climate ambition under the Green Deal, would affect lower-income workers significantly more than high-income workers. The IA suggests several policies to alleviate this disproportional impact, including lump-sum transfers to compensate for rising energy prices and means-tested support for energy investments targeted at low-income households. Energy taxation can play an important role in the distribution of the burden, as progressive tax rates would reduce costs for vulnerable consumers. Moreover, a tax shift from labour to carbon could be directed at low-income earners, e.g. through [earned income tax credit](#) schemes. Under the [review of the EU ETS](#) in the fit for 55 package, the Commission proposes a [social climate fund](#), which would use new revenue from emissions trading in the building and road transport sectors to support vulnerable

households, micro-enterprises and transport users by means of income support and investments to decrease reliance on fossil fuels. The fund would be complementary to the existing instruments, including the [Resilience and Recovery Facility](#) – which supports Member States in reducing energy poverty – and the [Just Transition Fund](#).

To [assess](#) the **green transition's impact on competitiveness**, it is important to consider national differences in climate policy. Generally, higher national climate ambitions result in a higher cost for business. In the IA, industry competitiveness is affected by free allocation of ETS allowances, use of carbon revenues and the level of climate ambition in non-EU countries. If these countries align their mitigation efforts with the Paris Agreement's 1.5°C objective, the output of energy-intensive industries in the EU is affected to a lesser extent, and EU industries could even benefit from a first-mover advantage. However, if their climate policies are weaker than those of the EU, there is a risk of decreased international competitiveness of EU business and of [carbon leakage](#), where production – in particular that of energy-intensive industries – is relocated to countries with lower climate ambition. As a result, global emissions could remain constant or even increase.

On the other hand, properly designed environmental standards and carbon pricing could [trigger](#) innovation that could partially or fully offset the costs of compliance, possibly even resulting in absolute advantage over firms in foreign countries with less stringent regulations. By stimulating innovation, environmental regulations can thus enhance competitiveness.

Under the EU ETS, industries at risk of carbon leakage receive free emissions allowances. Under the fit for 55 package, the Commission is seeking to phase out this free allocation and introduce a carbon border adjustment mechanism ([CBAM](#)). The CBAM would put a price on the GHG emissions associated with imports of certain carbon-intensive products by requiring EU importers to purchase certificates equivalent to the price of the ETS allowance. In this way, the relocation of production or imports of carbon-intensive products would be reduced. However, representatives of the industries covered have expressed concerns regarding their exports, as prices of their inputs and products would rise. Industry alliance AEGIS Europe has therefore proposed a system of [export rebates](#) to safeguard competitiveness on global markets.

Policies addressing competitiveness concerns may have unintended [impacts](#) on income distribution across households. For instance, free allocation of allowances may lower the auctioning revenues available to counterbalance regressive impacts. Similarly, trade-offs emerge when dividing the tax and carbon revenues between lump sum transfers to households, labour tax cuts and investment in industrial transformation. Climate policy design must therefore take these interactions and competitiveness-equity trade-offs into account.

Impact on energy prices and inflation

Another pertinent impact the transition towards a greener economy will have is its structural influence on general price development and energy prices in particular. While it is difficult to measure the exact macroeconomic impact on price developments arising from the green transition, the latest ECB [monetary policy strategy review](#) incorporates climate considerations in its monetary policy framework. The ECB has laid out a [roadmap](#) with detailed climate change-related measures for the next years. These include the development of new macroeconomic models to monitor the implications of climate change for monetary policy, the introduction of new indicators covering green financial instruments and the carbon footprint of financial institutions, and new climate stress tests for banks in the Euro system.

The EU's plans for a green transition towards a more sustainable economy include ambitious [goals](#) for cutting net emissions by 55% by 2030 (with respect to 1990). The centrepiece, carbon pricing under an extended emissions trading system ([ETS](#)), will have wide-ranging consequences for prices in various economic sectors, such as energy, manufacturing, transportation and buildings. Furthermore, institutional investors have started to reduce their [exposure](#) to fossil energy producers and are redirecting capital to more climate-friendly low-carbon alternatives. At the same time

investors demand a [premium](#) for exposures to climate-related risks. As a result, the green transition, encompassing the energy transition, poses measurable upside risks to the inflation projections on the basis of which monetary policy decisions need to be taken.

On the general impact of the green transition on prices, two main channels can be highlighted. First, large-scale public and private investment programmes are expected to be used to facilitate the transition, which will boost aggregate demand. Second, unlike an oil supply shock in cases of energy importing economies, a carbon tax is ultimately a domestic levy that shifts financial resources from the private to the public sector and will not work like a negative terms-of-trade shock by transferring wealth abroad. Such revenues can be used either for lump-sum transfers or energy bill subsidies to protect the most vulnerable households, or for cuts to other distorting taxes. Either way they can boost economic activity. Evidence suggests that carbon taxes do have a modest positive impact on GDP growth and employment.⁵ Consequently, if prospects of persistently rising (energy) prices contribute to a de-anchoring of inflation expectations, or if underlying price pressures boost rather than suppress growth, employment and aggregate demand over the medium term, monetary policy cannot just [look through](#) structural (energy) price shifts.

On top of this general impact on price dynamics, the necessary change in energy production will be crucial. The German finance minister, Christian Lindner, recently coined renewable energy sources as 'freedom energies'. Freedom not only from current dependence of fossil fuel supply from certain countries, but more structural freedom as in the dual objective of safeguarding both the planet and the right to self-determination. The building of a more sustainable economy will come hand in hand with a new age of energy inflation. In a recent [speech](#), Isabel Schnabel, Member of the ECB Executive Board, categorised three distinct but inter-related shocks that can be expected to lead to a prolonged period of upside pressure on inflation: climateflation, fossilflation and greenflation:

- **climateflation** as costs from natural disasters and severe weather events rise;
- **fossilflation** reflecting the [legacy cost](#) of dependency on fossil energy sources;
- and the more subtle impact of **greenflation**, as the roll-out of green technologies greatly increases demand for and hence the price of critical [raw materials](#).

Risk management and economic governance

The [pace of the transition](#) will have a significant impact on macroeconomic risks and financial stability: too rapid a transition may result in stranded assets, while too slow climate action will increase the risk of physical damage, [affecting](#) the economy through wealth destruction, reduction and volatility of income and growth, and effects on income and wealth distribution. Appropriate policy should avoid rapid shocks by accounting for the value dynamics of assets and projecting to what extent economic lives could be affected by climate action or climate change.

The urgent efforts to [substitute imports of Russian gas](#) with gas from other sources will affect the speed of the transition as investments are redirected to long-lived fossil fuel infrastructure, such as liquefied natural gas terminals, accompanied by long-term contracts with gas suppliers. The challenge is to allocate infrastructure investments to ensure short-term gas demand is met, while avoiding fossil fuel lock-in by making sure that new gas infrastructure can later be converted for clean or low-carbon hydrogen. Finally, there is a balance to be struck between investment in gas infrastructure to meet short-term needs and investment to accelerate the roll-out of renewable energy sources.

In its [resolution of 11 March 2021](#) on the European Semester for economic policy coordination, the European Parliament proposed that the European Semester should include a climate indicator to build the achievement of climate objectives into the EU economic governance framework. The European Commission has set up an expert group [on greening the European Semester](#), which meets twice a year. A March 2022 [report](#) by Climate & Company makes proposals to reform the European Semester by introducing a common green budgeting tool; monitoring the sustainable investment gap, employment policies for a just transition and environmentally harmful government support;

and using the European Central Bank's climate stress tests to understand the exposure of Member States' economies to physical and transition risks.

The Commission's [annual sustainable growth survey](#) for 2022 is structured around four dimensions of competitive sustainability as guiding principles for the EU's recovery: stability, productivity, fairness and environment. It calls for immediate action on climate change and environmental degradation, swift implementation of the Green Deal agenda to safeguard prosperity and well-being, backed up by significant investment. It highlights the social dimension and the contribution of digitalisation to the green transition, and points out that the clean energy transition should offer protection against energy price shocks.

The European Parliament [resolution of 10 March 2022](#) on the survey highlights the need for coordinated efforts to implement the digital and environmental transitions and asks the Commission to consider all these elements in the future European Semester processes, without undermining the current approach based on fiscal and budgetary policies. Parliament warns that otherwise 'European economies may suffer long-lasting damage, thereby undermining any attempts to promote sustainable and credible fiscal policies'.

MAIN REFERENCES

- Asikainen T., [The future of jobs is green](#), European Commission, Joint Research Centre, 2021.
- Barbieri N. et al, [Sustainability transition and the European Green Deal: A macro-dynamic perspective](#), ETC/WMGE Report 8/2021, December 2021.
- [Exploring the social challenges of low-carbon energy policies in Europe](#), European Environment Agency and Eurofound, October 2021.
- [Make EU economic governance fit for climate neutrality: Time to reform the European Semester](#), Climate & Company, March 2022.
- Montt G. et al, [Does climate action destroy jobs? An assessment of the employment implications of the 2-degree goal](#), *International Labour Review*, 2018.
- Pisani-Ferry J., [Climate policy is macroeconomic policy, and the implications will be significant](#), Peterson Institute for International Economics, August 2021.
- Rendall M., [Public debt and intergenerational ethics: how to fund a clean technology 'Apollo program'?](#), Climate Policy, June 2021.

The green growth controversy

Ever since [The limits to growth](#), a modelling study, was published in 1973, there has been debate over whether economic growth and environmental objectives can be reconciled in the long term. Proponents of [green growth](#) strategies argue that technological innovation and efficiency improvements will enable a decoupling of GDP from GHG emissions, material use and environmental pollution. However, there is [no empirical evidence](#) that absolute decoupling is possible at the speed and scale needed to deal with the challenge of climate change. The underlying reasons for this are factors such as the rising cost of energy production, [rebound effects](#), technological solutions creating new problems, insufficient technological change, and externalisation of environmental impact by international trade.

Proponents of post-growth¹ advocate an economic model that is not dependent on economic growth, complementing the existing policies pursuing efficiency with the pursuit of sufficiency, i.e. decreasing production and the parallel consumption in many sectors while ensuring overall well-being and non-material values. Post-growth economic models generally presuppose a reduction of wealth and income inequalities between individuals and between nations. They should be supported by [alternative indicators](#) of economic, environmental and social progress, such as the Transitions Performance Index, the Genuine Progress Indicator, or the Human Development Index.

Critics of degrowth warn there is a risk that decreased economic output might translate into rising unemployment and financial crises, with disproportionate effects on the lower-income population. Moreover, a lack of economic growth may make it difficult to mobilise the massive investment needed for the transition towards climate neutrality. The European Environment Agency therefore highlights the desirability of a more [resilient economic model](#) that does not depend on economic growth, and has begun a discussion on [scenarios for a sustainable Europe](#).

[Reflecting on green growth: Creating a resilient economy within environmental limits](#), EEA Report No 11/2021, European Environment Agency, November 2021.

Schnabel I., [A new age of energy inflation: climateflation, fossilflation and greenflation](#), The ECB and its Watchers XXII Conference, March 2022.

[The economics of climate change: no action not an option](#), Swiss Re Institute, April 2021.

Vandyck T et al., [Climate policy design, competitiveness and income distribution: A macro-micro assessment for 11 EU countries](#), Energy Economics, Volume 103, November 2021.

Volckaert K., [Roadmap for Reallocation: A critical assessment of the Green Deal's growth, financing and regulatory challenges](#), Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, April 2020.

ENDNOTES

¹ Net zero GHG emissions means that any GHG emissions are compensated by equivalent [removals of GHGs](#) from the atmosphere through nature-based and technological solutions.

² According to [Eurostat](#), EU per capita CO₂ emissions would be 1.04 tonnes higher if the EU produced all goods and services domestically, without any imports. Without exports, the EU per capita CO₂ emissions would be 1.33 tonnes lower. On balance, the EU emits 0.29 tonnes of CO₂ more per person because it trades goods and services. Eurostat uses a modelling approach, based on economic data and air emissions accounts to estimate the carbon footprint.

³ The difference between negative and positive estimated impacts lies in the underlying assumptions. The first model, generating the negative estimate, assumes that the economy operates with no spare capacity. The second model, showing positive impact of the transition on growth, assumes that the EU has some spare capacity to begin with, an assumption that is more likely to hold due to the current output gap caused by the COVID-19 crisis. However, both projections tend to converge in the long term as the stimulus generated by investments diminishes as the associated borrowings need to be repaid.

The impact of including road transport and buildings in the EU ETS is quantified using the model assuming no spare capacity. Results show that higher carbon revenues result in decreased negative impact of the Green Deal on GDP. Although consumption is more negatively affected in this scenario, the expenditure shifts significantly towards investment. The magnitude of the effects depends on the use of revenue either to make lump-sum payments to households, or to lower labour taxation.

⁴ Under JRC-GEM-E3 model, wages are fully flexible and unemployment remains at the baseline level. However, the model can represent imperfections in the labour market and involuntary unemployment. All scenarios assume free allocation in certain industries and auctioning in the power sector (as well as buildings and road transport sectors in the case of an extension of the ETS). For industrial sectors it is assumed that companies cannot incorporate the opportunity cost of free allocation and thus optimise market share.

⁵ See for instance G.E. Metcalf and J.H. Stock, [The Macroeconomic Impact of Europe's Carbon Taxes](#), NBER Working Paper Series, No 27488, July 2020; G.E. Metcalf and J.H. Stock, [Measuring the Macroeconomic Impact of Carbon Taxes](#), AEA Papers and Proceedings, Vol. 110, May 2020, pp. 101–06; G.E. Metcalf, [On the Economics of a Carbon Tax for the United States](#), Brookings Papers on Economic Activity Series, Vol. 49(1), March 2019, pp. 405–58; A. Yamazaki, '[Jobs and Climate Policy: Evidence from British Columbia's Revenue-Neutral Carbon Tax](#)', *Journal of Environmental Economics and Management*, Vol. 83, May 2017, pp. 197–216.

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