The role of environmental taxation in support of sustainability transitions

The role of (environmental) taxation in supporting sustainability transitions

This briefing looks at the role of environmental taxes through two lenses. First, it analyses past and current trends in taxes in their ability to raise revenues, and their use as a basis for reform programmes that aim to shift taxes from labour and capital to resource use and environmental pollution. Second, it considers the potential for generating revenue from energy taxes and carbon pricing in the coming decade and their role in achieving the EU's aim of being climate neutral by 2050, and the implications of this for tax shifting programmes.

Key messages

- Revenues from environmental taxes could support the transition to a climate-neutral economy by 2050 and achieving the objectives of the European Green Deal reaching a net reduction of greenhouse gas emissions by 55% by 2030. Given Europe's ageing population and the implications of this for labour tax revenues and welfare system costs, the arguments in favour of environmental taxes have never been stronger.

- Despite calls for more environmental taxes at the national, European and global levels, implementation has been very slow. In the EU, environmental taxes account for 5.9% of total taxes, less than the 6.6% almost 20 years ago. This varies considerably by country however.

- The European Green Deal acknowledges the crucial role of taxation in the transition to a greener and more sustainable economy, and this may drive the implementation of environmental taxes in coming years.

- Carbon pricing measures are essential components of the European Green Deal and also the European Commission's 'Fit for 55' package, supporting the transition to a climate-neutral economy.

- The amendment and revision of current EU energy taxation and carbon pricing schemes, including of the EU Emission Trading System, will also lead to higher revenues in the coming decade.

- However, decarbonising the European economy will inevitably erode the tax base, as current energy taxation and carbon pricing schemes rely heavily on non-renewable energy products. It will be essential to strike the right balance between achieving transition objectives and maintaining revenue stability, and to future proof tax systems with new revenue sources.

- The long-standing idea of shifting taxes from labour to environment in support to sustainability objectives has largely not been realised. With the EU facing multiple fiscal pressures in coming decades, the idea could be reformulated as sustainable fiscal reform, embracing taxes from other revenue sources e.g. financial transactions, land, wealth.

Publications

There is a growing understanding across the world that current tax systems need to be overhauled and modernised to deal with prevalent environmental, social and economic challenges. These challenges include the technological transition, demographic changes, rising inequality and the triple environmental crises: climate change, biodiversity loss and the overconsumption of natural resources (EEA, 2020; OECD, 2020a).

Furthermore, the economic and financial crisis of 2008/2009 and the fiscal implications of the COVID-19 pandemic have made it clear that fiscal sustainability — understood as the 'solvency' of the public sector — is critical for addressing multiple aspects of transition. It influences the ability of the EU and its neighbours to finance investments in transitions and maintain prosperity and social justice, while also maintaining the resilience of the economic system (EEA, 2020; OECD, 2020a). Therefore, studying the revenue aspect of overall taxation schemes with a particular focus on past trends and the future outlook of environmental taxes and emissions trading schemes seems worthwhile and appropriate. If governments are not able to allocate financial resources to public investments, which are unconditionally required for the transition process, and social spending for the well-being of their citizens, they will fail in their primary policy objectives.

Outlines of how a future-proof fiscal system may look are also discussed in the context of the growth dependency of the economy, in particular if and how the current welfare state can be financed in a post-growth environment (EEA, 2020; Walker et al., 2021).

A tax system is required that supports social welfare systems and also contributes to financing the objectives of the European Green Deal (EC, 2019). The EU has ambitious environmental and climate objectives and economic instruments, such as environmental taxes and trading schemes, which can support the transition process. Carbon pricing, for example, is a crucial part of the current decarbonisation debate in Europe, as stressed in the 'Fit for 55' package presented by the European Commission in July 2021.

From a revenue perspective, exploring environmental taxation alongside environmental subsidies is essential, as the latter can also be useful for the transition process. However, many subsidies are environmentally harmful and have been identified as economically inefficient and trade-distorting, hindering the effectiveness of environmental taxes and emissions trading schemes. In addition, environmentally harmful subsidies come with a fiscal burden: they affect the public budget because tax reductions for specific economic activities or products, which are numerous in the field of energy taxation, lead to a lower overall tax take. The provision of subsidies is also of relevance in terms of expenditure, as subsidies may result in less funds being available for spending on other public services and may also thwart policy measures that aim to reduce environmental pollution or lead to an increase in resource use.

It is therefore no surprise that numerous attempts have been made at the global, EU and national levels to phase out environmentally harmful subsidies. The success of these attempts has been rather modest, as a recurrent challenge is agreeing on a common criterion for defining an environmentally harmful subsidy [1]. Phasing out environmentally harmful subsidies is also included in

the proposal for an Eighth Environment Action Programme (EC, 2020a) and in the European Green Deal (EC, 2019) and highlighted in the EC State of the Energy Union 2021 report [2], although the need to consider a socially fair transition is also emphasised.

Revenues from environmental taxes also provide the foundation for tax shifting policies, commonly known as environmental fiscal reform. This relates to changes in national tax systems, where the source of revenue raised by taxes shifts from economic functions, sometimes called 'goods', such as labour (personal income tax), to activities that lead to environmental pollution and climate change, sometimes called 'bads', often in a revenue-neutral way (EEA, 2005). Such tax shifting policies continue to be promoted by policymakers, most recently by the European Commission in the European Green Deal: '[A]t national level, the European Green Deal will create the context for broad-based tax reforms, removing subsidies for fossil fuels, shifting the tax burden from labour to pollution, and taking into account social considerations' (EC, 2019).

Although the overall composition of tax revenue in the EU has remained relatively stable over the last two decades, megatrends such as climate change and the digital transformation of the labour market are likely to have an impact on the future tax mix in EU Member States (EEA, 2020; OECD, 2020b, 2021).

Trends in environmental tax revenues

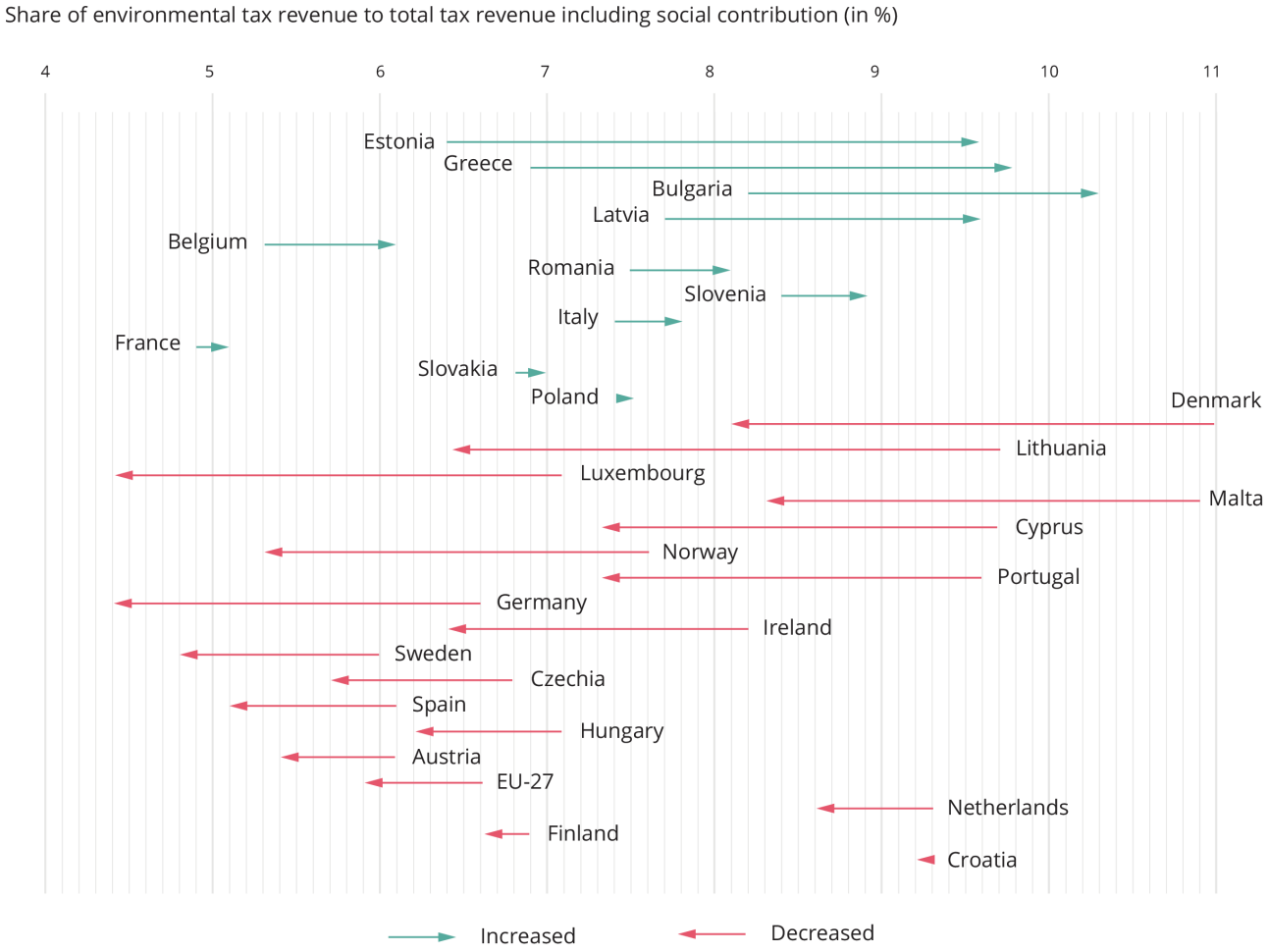
When studying the trends in generating environmental tax revenues during the last two decades, a diverse picture is observed in Europe. At level of the 27 EU Member States (EU-27), environmental tax revenues increased by 18%, from EUR 253 billion in 2002 to EUR 298 billion in 2019 [3]. However, this growth was less than the increase in GDP (26%) and total tax revenues (31%). Revenues increased in most EU Member States. For example, they more than doubled in Bulgaria, Estonia, Latvia, Poland and Slovakia between 2002 and 2019. By contrast, revenues declined in Denmark, Germany, Norway and Portugal by about 5-15%.

A more insightful presentation of trends in environmental tax revenues is provided in Figure 1. Here, revenues from environmental taxes are expressed as a share of total tax revenues including social contributions. At EU-27 level, the share slightly declined overall, from 6.6% in 2002 to 5.9% in 2019, with trends varying among countries.

Figure 1: The trend of environmental tax revenues in EU-27, EU Member States and Norway (2002-2019) (as expressed as percentages of total tax revenues including social contributions)

Between 2002 and 2019, some countries have increased their share of environmental tax revenues, while others have seen a decline.

Publications



Source: Eurostat (https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_tax&lang=en)
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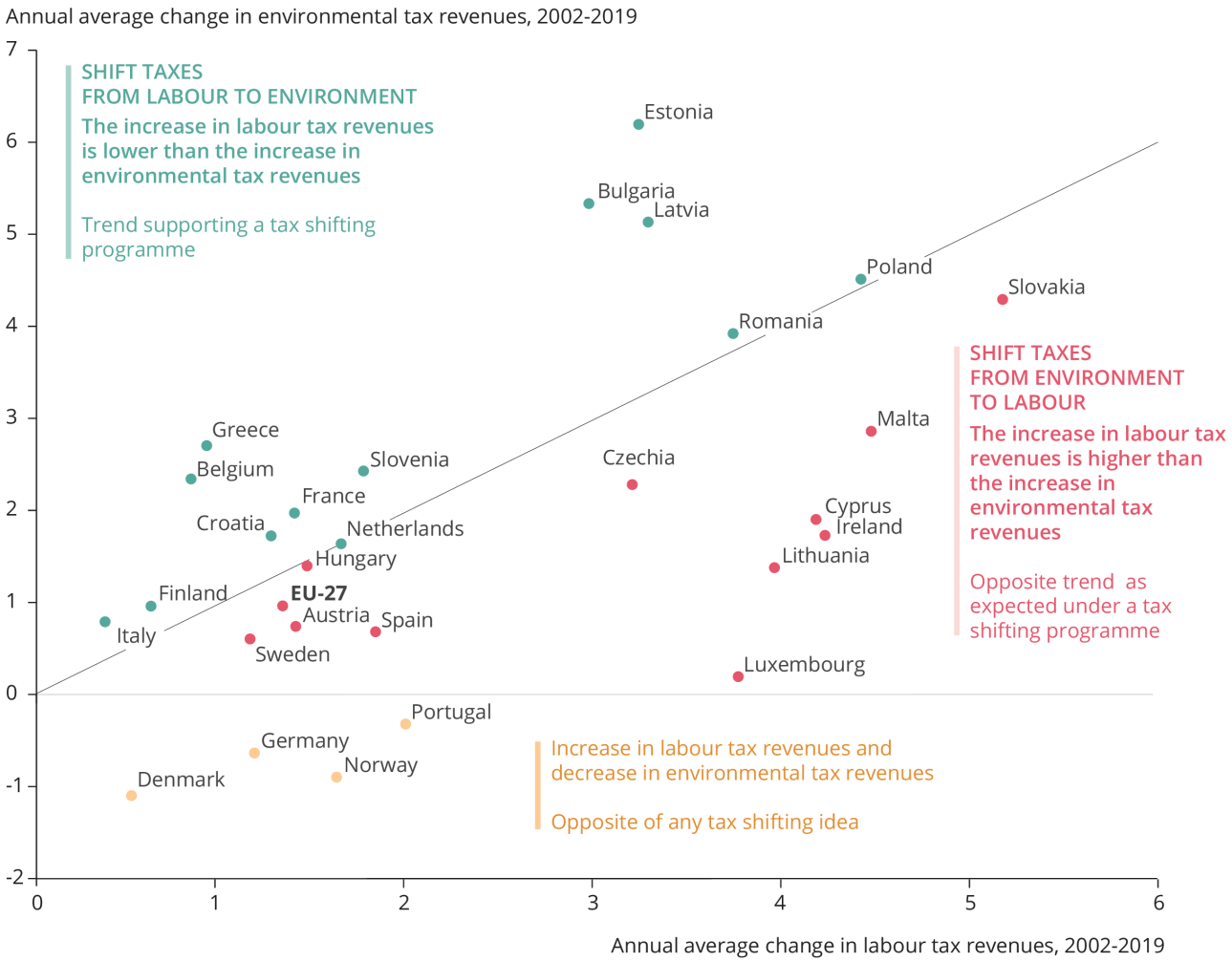
The contributions of environmental taxes to financing countries' budgets also show large disparities, ranging from 4.5% in Germany and Luxembourg to around 10% in Greece and Bulgaria.

Figure 2 illustrates the annual average growth rates of two indicators (environmental and labour tax revenues) for the 27 EU Member States and Norway between 2002 and 2019. This geographical presentation illustrates that, in 12 Member States, the tax burden shifted from labour to environment pollution and resource use taxes, as environmental tax revenues increased more than labour tax revenues in these Member States (those depicted above the blue line). This may be seen to indicate a tax shifting policy. The opposite is true in the remaining 15 EU Member States plus Norway, with environmental tax revenues declining (in four countries; yellow area) or increasing less than labour tax revenues [4].

Figure 2. Annual average change in environmental tax revenues and labour tax revenues between 2002 and 2019



Source: Author compilation from Eurostat data: Environmental tax revenues [env_ac_tax]; European Commission: 'Taxation trends in the European Union' different years https://ec.europa.eu/taxation_customs/taxation-1/economic-analysis-taxation/taxation-trends-european-union_en; and Eurostat: GDP and main components (output, expenditure and income) [nama_10_gdp]).

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It is also notable that the forerunner countries in environmental taxation, Denmark, Norway and Sweden, have all seen a decline in the share of environmental tax revenues in total tax revenues since the early 2000s. Since the 1990s, these countries have implemented the largest number of environmental taxes - including CO_2 taxes - and significantly, have been indexing their tax rates in line with inflation (EEA, 2016). These past trends should be taken into account when analysing policy options for tax shifting programmes until 2050, in particular for the second half of this 30-year period,

as discussed below.

. The intention of altering human behaviour has not always been an important aspect during the initial design of many energy taxes. This aspect has, however, now been mentioned by the European Commission: 'While the ETD [Energy Taxation Directive] is historically an instrument for Member States to collect tax revenues, the environmental objective of taxation has gained relevance in the present context' (EC, 2021b).

Whether or not energy taxation will continue as a revenue-generating economic instrument needs to be critically questioned in the context of assessing the decarbonisation of the transport sector, essential for achieving a climate-neutral Europe. Data show that revenues from taxes on petrol in Norway and Denmark dropped massively, by 65% (constant 2010 NOK prices) and 44% (constant 2010 DKK prices), respectively, between 2002 and 2019 (Statistics Norway, 2021a; Statistics Denmark, 2021). Therefore, it is not surprising that CO_2 emissions from passenger cars fuelled by petrol and kerosene declined by 61% in Norway but overall CO_2 emissions from passenger cars dropped by only 14% during this period (Statistics Norway, 2021b). Reasons for these developments are numerous and can be attributed to the switch between petrol- and diesel-powered private passenger cars, as well as the massive increase in purchases of electric vehicles in recent years. It may therefore be time to think about and assess the future role of environmental tax revenues in public budgets, as the latter trend of an increase in electric vehicles can be expected to accelerate.

Scanning the trend in carbon tax revenues in Sweden might also be useful, as Sweden is often referred to as a role model in terms of carbon pricing, as it has the highest CO_2 tax rate globally. The revenues from CO_2 tax (in constant 2010 SEK prices) dropped by about 17% between 2002 and 2019 (Statistics Sweden, 2021). When revenues from the EU Emissions Trading System (ETS) are included, aggregated revenues fall by about 12%. Approximately 95% of all Swedish fossil carbon emissions are covered by the two carbon pricing schemes (CO_2 taxation and the EU ETS) (Government Offices of Sweden, 2021). The trade-off between environmental taxes being effective and generating revenues is emphasised in the context of Swedish carbon taxation by Criqui et al. (2019). They explain that Sweden's low share of environmental tax in total tax revenues (as shown in Figure 1) is not the result of taxation not being efficient: '[T]he truth is the opposite. The [carbon] tax has been effective over a long time so the tax base has already eroded' (Criqui et al., 2019).

What is the role of environmental tax revenues in the decarbonisation transition?

As previously discussed, multiple transition processes have fiscal implications for taxpayers and for the public budget (EEA, 2020). However, not transitioning towards sustainability would also have fiscal implications, i.e. there would also be costs of inaction (see for example Sanderson and O'Neill (2020) and Swiss Re Institute (2021)). Moreover, the widespread implementation of carbon pricing — in the form of either carbon taxes or emissions trading schemes — is one of the policy measures

playing a central role in decarbonisation efforts, including in the Commission's 'Fit for 55' package [5].

The introduction of any new economic instrument is deemed likely to generate additional revenues over time, especially any ambitious carbon pricing policy (OECD, 2021). For example, the International Monetary Fund (IMF) estimates that the introduction of a carbon price of USD50 per tonne of CO_2 on top of existing energy/carbon pricing schemes could generate approximately 1% of GDP in 2030 for emission-intensive countries and about 0.5% in EU Member States such as France, Germany and Italy (IMF, 2021; IMF and OECD, 2021; Black et al., 2021) [6].

These findings are similar to those described in the European Commission's impact assessments of the fiscal implications of implementing a more extensive carbon pricing policy to achieve policy objective of a 55% greenhouse gas (GHG) reduction at EU level by 2030 (EC, 2020b). The European Commission concluded that:

> "While in the baseline energy taxes and carbon prices in 2030 raise revenue equivalent to 1.8% of GDP, in CPRICE [a carbon pricing scenario] this increases to 2.25%. The extension of carbon pricing to a wider range of sectors of the economy should therefore not be seen as a game-changer in terms of the structure of public finance[7]."
>
> EC, 2020b, p.68

To understand these results in context, it is critical to note that energy tax and carbon pricing revenues amounted to 1.8% of GDP in the EU-27 in 2019, illustrating a potential increase of about 0.4 percentage points by 2030.

As part of the 'Fit for 55' package, the European Commission proposed a revision of the Energy Tax Directive (ETD) (EC, 2021c). Several options for revisions to the current ETD are assessed in the accompanying impact assessment, demonstrating that revenues can increase in the short to medium term (EC, 2021b). However, by 2035, the last year of the evaluation process, the revenues under all options are expected to be between 3% and 33% lower than revenues in 2020 at the EU-27 level (see Figure 23 in EC, 2021b).

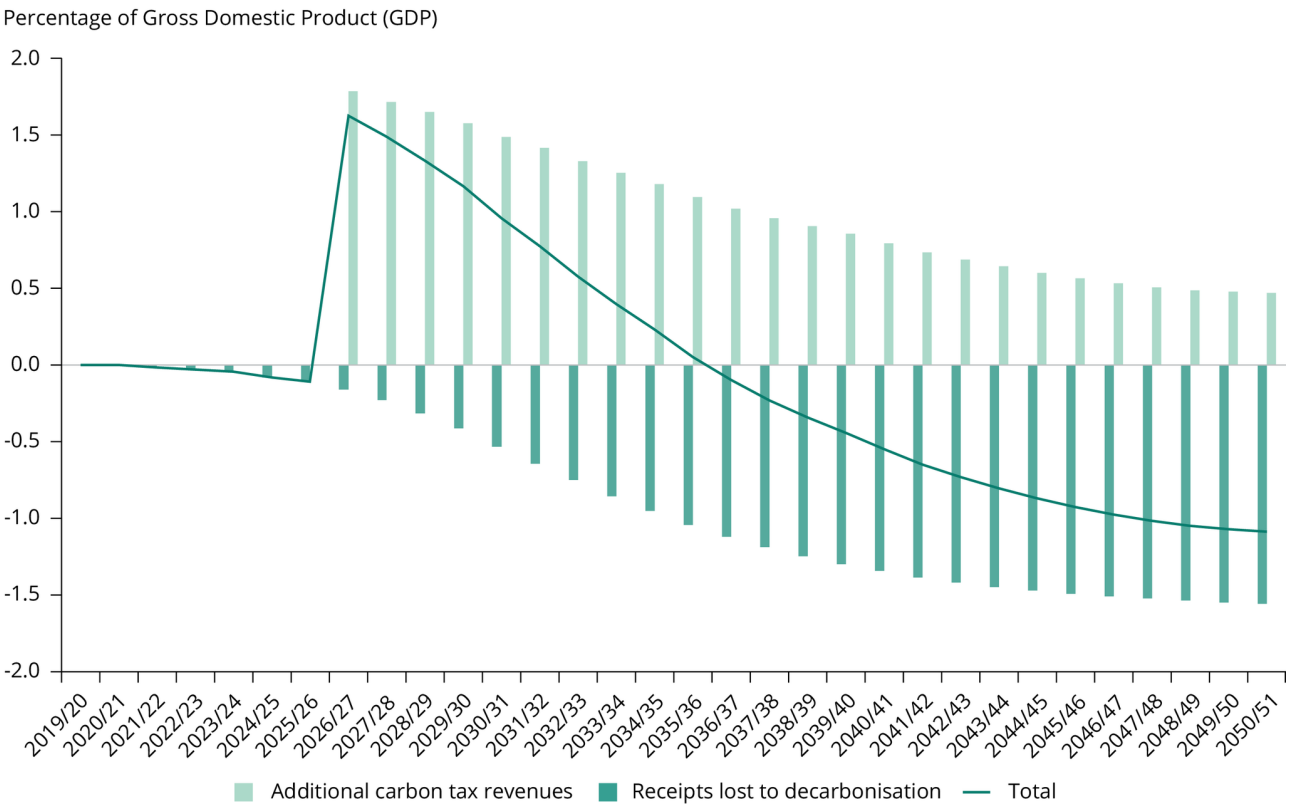
The primary objective of any carbon pricing policy is to reduce carbon emissions, implying that, if effective, the consumption of fossil fuels will reduce over time. But this also means that revenues from existing or newly introduced energy taxes and carbon pricing policies will decrease because of the erosion of the tax base as the policies work effectively. It is therefore the overall net effect that is relevant for any meaningful analysis. One of the most relevant and comprehensive analyses of the overall fiscal repercussions of stringent climate and energy policies was undertaken by the United Kingdom's Office for Budget Responsibility (OBR) in its 2021 fiscal risk report (OBR, 2021). The report assesses the costs of decarbonising the UK economy until the fiscal year 2050/51, including

the wider fiscal implications of the transition to net zero emissions. The OBR's analysis projects how the receipts from environmental taxes will develop during the transition process. This analysis is based on scenarios developed by the UK Committee on Climate Change (CCC, 2020) and the Bank of England (2021). The key insights from analysing the implications of stricter UK energy and climate policies for budgetary revenues are as follows:

- Revenue will be lost from energy taxes (fuel duties), vehicle excise duties, air passenger duty, and landfill and plastics taxes because of the decarbonisation of the economy. It is estimated that these environmental taxes will generate about 1.6% of GDP in the fiscal year 2025/26 but will decline over time and will be completely gone by 2050 (Figure 3) [8].
- A carbon price will be introduced in all sectors of the economy that currently do not pay a carbon price [9]. The carbon price will enter into force in all sectors from 2026/27 with a starting price of about GBP 100 per tonne CO_2 and thereafter increasing by an average annual rate of 2.6%, reaching GBP 187 per tonne CO_2 in 2050/51 (all figures in 2019 prices). Additional carbon tax revenues will be generated from 2026/27, amounting to 1.8% of GDP. These revenues are then projected to decline, reaching 0.5% of GDP, as the reduction in emissions can no longer be offset by the rather steep increase in carbon tax rates.

Overall, a massive increase in the environmental tax revenues is projected, caused by the introduction of the carbon pricing policy offsetting the loss of revenues from existing environmental taxes. Over time, it will not be possible to balance the loss of these with revenues from the carbon tax because of the stringent climate policy measures, resulting in a net negative effect. A small amount of revenues would still be generated from environmental taxes at the end of the period. It should also be highlighted that this analysis is based on the existing environmental taxation scheme, except for the introduction of the carbon tax in 2026/2027.

Figure 3 Total direct impact on receipts of the transition to net zero emissions



Source: OBR (2021) (http://nationalarchives.gov.uk/doc/open-government-licence/version/3/).
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One of the crucial differences between the studies cited is the time horizon. The OBR study projects the fiscal implications until 2050 (transition to net zero emissions in the United Kingdom) and the European Commission report has a time horizon until 2030 (55% GHG reduction).

All of these findings demonstrate that fiscal challenges result from the conscious policy objective of decarbonising the economy, and these challenges are triggered by the erosion of the associated tax base. A reduction in GHG emissions must be aligned with a sharp reduction in the use of energy fuels, which are currently the largest revenue generator in the context of environmental taxation (EEA, 2016) [10]. This challenge is also addressed by the European Commission's report on the 2020 survey on tax policies in the EU (EC, 2020c). This report focuses on the design and principles of fair and efficient tax systems in a changing world. It defines the term 'sustainable tax revenues' — which is closely linked to the notion of fiscal sustainability — as revenues that 'come from tax bases that do not erode and secure sufficient funding for current spending and probably increased spending in the future' (EC, 2020c). The report also clarifies what is meant by eroding tax bases: 'changes in the way people travel or heat their homes could lead to drastic revenue losses from energy taxation' (EC, 2020c).

Assessing the potential of tax shifting programmes must not focus on short-term prospects alone but rather should focus on the ability to deliver medium- to long-term policy objectives. In other words,

can these programmes meet the essential condition of guaranteeing the sustainable tax revenues required in the long run to sustain current and future public spending programmes in a world of multiple transitions, ranging from the need to decarbonise the economy to dealing with the fiscal challenges of an ageing and in some EU Member States shrinking population and technological transitions (EEA, 2020). For example, the current energy taxation scheme is largely based on the use of fossil fuels, which must decline as decarbonisation of the economy is realised. Furthermore, the current scheme of transport taxation is oriented to support the uptake of electric vehicles (EVs) via a reduction in annual vehicle tax and sales tax rates, or even the complete exemption of EVs from any form of transport tax [11]. It can be expected that the design of these taxes will change over time, particularly when the ban of the sale of fossil fuel -powered vehicles takes effect [12].

Such trends can be expected to have disproportionate implications for the public budgets of EU Member States that rely heavily on energy tax revenues from transport fuels under existing national energy taxation regimes. Such Member States include Luxembourg, where 90% of all environmental tax revenues were generated from transport fuels in 2019, Lithuania (89%), Czechia and Poland (73%), and Estonia (72%). This gives rise to the question — based on current energy taxation schemes — of if and how these countries can compensate for this shortfall in their public budget given the relatively high shares of transport fuel tax revenues in total tax take. For example, this amounts to 7% in Estonia and 6.5% in Bulgaria, compared with the EU-27 average of 3% in 2019 figures [13].

It is unlikely that energy tax revenues will decrease substantially over the next 10-20 years, but it is clear that this will happen eventually, as already evident in Norway. The trajectory will depend on how seriously governments implement stringent fiscal policy instruments alongside regulatory measures aiming to decarbonise the economy including the transport sector. A finely nuanced approach is probably required to assess options for environmental taxes in the context of the European Green Deal and its aims to decouple economic growth from resource use and to reach climate neutrality by 2050.

Tax shifting programmes may no longer be relevant

Regarding the future potential of tax shifting programmes, it appears that the momentum has stalled, as summarised by Pisany-Ferry (2021):

> This approach [tax shifting programme] has increasingly been questioned for overlooking the fact that decarbonization entails significant distributional consequences. Carbon taxation/pricing is regressive and often affects residents of some areas disproportionally. …
> This reality (and the corresponding discontent, vividly illustrated by the French Yellow Vests movement) has led governments to reconsider plans for carbon taxation. Whereas it was viewed a few years ago as a potential source of revenue or an opportunity to substitute for other taxes (according to the‘ double dividend’ hypothesis), there is growing recognition that revenue from carbon taxation or the auctioning of tradable permits must largely be redistributed in order to neutralize their income effects, at least for the bottom half of the income distribution.
>
> Pisany-Ferry, 2021, p.11

The proposals included in the ‘Fit for 55’ package of July 2021 follow these lines of argument, including a proposal for the introduction of a social climate fund (EC, 2021d). The objective of this fund is twofold: (1) to ‘finance temporary direct income support for vulnerable households’ and (2) to ‘support measures and investments that reduce emissions in road transport and buildings sectors and as a result reduce costs for vulnerable households, micro-enterprises and transport users’ (EC, 2021e), pledging a socially fair transition (EEA and Eurofound, 2021). The financial resources to be allocated to the social climate fund are projected to amount to 25% of the expected revenues from the auctioning of emission allowances under the EU Emissions Trading System covering buildings and road transport [14]. The majority of revenues from emission trading is proposed to be spent in its entirety on climate- and energy-related projects, thus being a critical policy instrument for financing the energy transition. The proposal is going further than the current policy which specifies as an objective that Member States spend at least half of the revenues from the ETS auctioning in actions for climate and energy purpose.

The ‘Fit-for-55’ package makes it less likely that tax shifting programmes will be implemented in the short term. Other environmental taxes do not generate enough revenues, limiting the scope for tax shifts that are revenue neutral. For example, in 2019, EU-27 revenues from pollution and resource taxes amounted to 3% of total environmental tax revenues (EUR 9.5 billion), compared with 78% from energy taxes (including carbon pricing measures) (EUR 232 billion) and 19% from transport taxes (EUR 56 billion). A study commissioned by the European Commission modelled a tax shifting programme that raised revenues from pollution and resource taxes while reducing labour costs, revealing positive but nearly negligible macroeconomic impacts in terms of increases in GDP and employment (EC, 2021f).

It is undoubtedly time for environmental taxes and carbon pricing policies to take centre stage, and their importance and significance can be expected to gain greater prominence during the transition to a climate-neutral economy. However, these economic instruments must be designed to support the

sustainability transition by fulfilling the principle of 'getting the prices right' in line with the polluter pays principle. The revenue-generating aspect of environmental taxes, including carbon pricing policies, should no longer be at the forefront of policy discussion.

Offsetting, or at least compensating for, expected revenue shortfalls in the coming decades will require revising the current taxation schemes to fit transition objectives, as well as accelerating the phasing out of environmentally harmful subsidies as an additional source of budgetary revenues.

Concepts and proposals for redesigning transport taxes, including distance-based road charges, can be found (Gago et al., 2019; OECD and ITF, 2019; Blank et al., 2021). One of the challenges is making sure that new taxation schemes are implemented at the right time. Running existing and new schemes in parallel may lead to unwanted outcomes. Such outcomes would be expected if for example distance-based charges were introduced alongside current road fuel taxation schemes, as owners of passenger vehicles powered by fossil fuels would be negatively affected, leading to further disruptions in society

Last but not least, it may be a good time to revise the concept of environmental fiscal/tax reform — shifting the tax burden from labour to environmental pollution and resource use — to achieve sustainable fiscal reform. It is anticipated that fiscal challenges will continue in the multiple transition setting (EEA, 2020), since fiscal sustainability, when understood as the 'solvency' of the public sector, will be crucial in the sustainability transition.

The Organisation for Economic Co-operation and Development summed it up nicely, saying that '[E]nsuring long-term fiscal sustainability requires that governments engage in continual strategic forecasting of future revenues and liabilities, environmental factors and socio-economic trends to adapt financial planning accordingly' (OECD, 2013). When assessing the macroeconomic policy environment, which needs to balance public budgets, fiscal sustainability emerges as a constraint on all public policies. The climate and energy transition, as well as the demographic transition, must reflect the effects in terms of both the revenue and spending of public budgets. The ageing population will have macroeconomic and fiscal impacts, as it will increase the need for spending on social protection and health, while also eroding the tax base through a reduced labour force. This is highly relevant in those EU Member States whose populations are projected to shrink (EEA, 2020).

Thus, sustainable fiscal reform seems to be a worthwhile approach to further developing the environmental fiscal reform concept and making more broadly relevant that at present. Reforming the fiscal system and making it fit for the future will be demanding. The increasing demand for public spending for climate and energy investments, as well as in relation to the ageing population, is well documented (EC, 2018, 2021g; Rouzet et al., 2019). The bigger political challenge is how to revise current taxation schemes — in addition to phasing out subsidies — and find additional revenue to future proof the tax system. Different proposals are discussed in the literature including robot, financial transaction and digital service taxation schemes [15], as well as revising property taxation schemes and wealth taxes, especially to raise the revenues needed to recover from the COVID-19 pandemic (see, for example, Kapeller et al. (2021) and IMF (2021)).

Notes

[1] For further information, see Parry et al. (2021a), for the latest estimate of energy subsidies, and OECD (2005), for more on the challenges of reforming and phasing out environmentally harmful subsidies.

[2] See the annex of the state of the energy union report (EC, 2021a).

[3] All monetary values are expressed in 2010 constant EUR prices or in 2010 national currencies.

[4] It must be noted that the findings may have differed slightly if a different time horizon had been selected; for example, Denmark, Germany and Sweden introduced environmental tax reforms during the 1990s and early 2000s via policies to reduce taxes levied on labour and introducing new or increasing existing environmental taxes (Speck and Jilkova, 2009). However, the finding does not change in the case of Norway, as environmental tax revenues dropped by 5% between 1995 and 2019.

[5] See https://ec.europa.eu/commission/presscorner/detail/en/IP_21_3541

[6] See also WEF (2021), which projects the additional revenues generated from setting an international carbon price floor for greenhouse gases (GHGs) that by 2030 would reach USD75 per tonne for high-income countries, USD50 per tonne for middle-income countries and USD25 per tonne for low-income countries, and is based on a proposal made by the IMF (Parry et al., 2021b).

[7] The CPRICE scenario 'is a carbon-pricing based scenario that achieves around 55% GHG reductions. It assumes strengthening and further expanding of carbon pricing, be it via EU ETS or other carbon pricing instruments, to the transport and buildings sectors, combined with low intensification of transport policies while not intensifying energy efficiency, renewables policies' (EC, 2020b). The carbon price of the CPRICE scenario amounts to EUR60 per tonne CO2 (2015 prices) in 2030.

[8] The United Kingdom's share of environmental tax revenues in its total tax revenues and GDP amounted to 6.9% and 2.3%, respectively, in 2019.

[9] The carbon price is aligned with the price trajectory of the 'early action' scenario constructed by the Bank of England, which was undertaken to explore the implications of early action for the financial system and was aligned with the Central Banks and Supervisors Network for Greening the Financial System scenario (NGFS, 2021).

[10] See also Eurostat (2021).

[11] An interesting example of tax exemption for EVs can be found in Germany: EVs are exempt from annual vehicle taxation and the loss in tax revenues is projected to be about EUR295 million for the years 2021-2025. The shortfall in revenues will be offset by funds from the EU's Recovery and

Resilience Facility (RFF) under the approved German Recovery and Resilience Plan (RRP).

[12] See Wappelhorst (2021) for an overview of national and sub-national governments committed to phasing out the sale of newly registered internal combustion engine passenger vehicles (status as of June 2021).

[13] The significance of revenues generated from transport fuel taxes is more visible when these revenues are assessed as a share of the tax take excluding revenues from social contributions, as the latter are set aside to finance social benefits. In 2019, these shares totalled 10.6% in Estonia and more than 9% in Bulgaria, Romania and Slovenia, compared with the EU-27 average of 4.5%.

[14] See Defard (2021) for a discussion, including of the challenges that establishing a social climate fund may face. The economic and social consequences of the current sharp increase in end user energy prices are strong indications that political actions will be needed to reduce the adverse effects of higher energy costs for households and industries triggered by higher carbon prices, which foreseen as necessary for reaching climate neutrality in 2050.

[15] For more information, see EEA (2020). Digital service taxes (DSTs) are implemented in several EU Member States. But it is expected that DSTs will be repealed as part of the agreement to overhaul international tax rules imposing a minimum tax rate on business profits of 15%. For further information on the OECD/G20 Inclusive Framework on Base Erosion and Profit Sharing (BEPS), see https://www.oecd.org/tax/beps/ (accessed 21 December 2021).

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Identifiers

Briefing no. 22/2021
Title: **The role of (environmental) taxation in supporting sustainability transitions**
HTML - TH-AM-21-022-EN-Q - ISBN: 978-92-9480-428-0 - ISSN: 2467-3196 - doi: 10.2800/991280
PDF - TH-AM-21-022-EN-N - ISBN: 978-92-9480-429-7 - ISSN: 2467-3196 - doi: 10.2800/24487

Published on 07 Feb 2022