Candidates for taxing environmental bads at national level

RPA Europe

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1 Introduction

1.1 Purpose and scope of the paper

This issue paper seeks to answer the following questions: If we were to extend the approach of the Energy Taxation Directive to set minimum tax rates to a wider basket of products/resources and environmental impacts: (1) what environmental impacts should we target through the imposition of an environmental tax, and (2) how should they be developed and implemented? The paper offers a starter for the discussion of such taxes applied across Member States as part of an Environmental Tax Reform, so not at the EU level.

The goal is to clarify how environmental taxes (also referred to as green taxes) could be better designed and more widely applied to address issues such as water pollution, air pollution, soil pollution, damage to nature etc. Which are the best candidates for such an extension? As a result of the analysis, a list of 12 possible taxes that could be taken forward is proposed from a wider list of over 40 environmental taxes that are currently imposed in at least one of the Member States.

The list of environmental taxes currently imposed is taken from the National Tax Lists prepared by Eurostat filtering out those classified as Pollution and Resource Taxes and Transport Taxes. Energy Taxes and Carbon Taxes are excluded as they are covered by the Energy Taxation Directive[1]. Also not included are taxes imposed for health reasons, such as a sugar tax or a "fat" tax as these do not address environmental issues. The policies that have influenced the selection of instruments fall under the following policy priorities (POs) of the 8th EAP:

- PO3 advancing towards a regenerative growth model, decoupling economic growth from resource use and environmental degradation, and **accelerating the transition to a circular economy.**
- PO4 pursuing a **zero-pollution ambition**, including for **air, water** and **soil** and protecting the health and well-being of Europeans.
- PO5 protecting, preserving and restoring **biodiversity**, and enhancing **natural capital.**

The criteria for inclusion in the list are laid out in Section 2, where the methodology is presented. These include: experience with existing environmental taxes with respect to impacts on the environmental burdens; (preliminary) findings of the PPP study regarding coverage of costs by polluters; degree of relevance across EU; likely significance and stability of tax revenues; complementarity to existing policies; coverage of a wide range of issues etc. Particular importance is given to the findings of the PPP study which identifies sectors where polluters pay the least.

The study is based on the assumption that taxes are to be implemented at national or regional level, . For the different environmental taxes, the review aims to identify the extent of application in the EU, and any information on good or bad practice including rates for existing application.

This issue paper does not look at the legal form of the extension (so whether it is done through an EU Directive, a Recommendation or soft law). This question is outside its scope.

[1] A number of taxes on pollution and resources and transport also have implications for energy use. Where this is the case, the cross effects have been noted. Also note that EU ETS revenues of are reported as energy tax revenues by Eurostat when presenting the share of environmental tax revenues to total tax revenues / GDP.

2 Methodology

This section provides an overview of the methodology we used. The methodology consists of the following steps:

A. Set out the rationale for environmental taxes and charges.
B. Review databases which list existing environmental taxes in the EU.
C. From the wider literature, make a review of each tax or charge across MS.
D. Based on a predefined criterion, make an appraisal of the performance of taxes.

2.1 Rationale for environmental taxes and charges

First, we set out the rationale for environmental taxes and charges, we clarify the distinction between taxes and charges and present arguments for and against such instruments covering:

- Links to the Polluter Pays principle (PPP).
- Internalizing externalities.
- Distributional considerations.
- Spillover effects.
- Tax interactions and the theory of the Second Best.
- Revenue creation/domestic resource mobilisation
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At the outset it is useful to define the terms taxes and charges as well as others that are frequently used, such as feels and levies as applied here. The OECD defines an (environmental) tax as any compulsory, unrequited payment to the government levied on tax bases deemed to be of environmental relevance, i.e., taxes that have a tax base with a proven, specific negative impact on the environment. Taxes are unrequited in the sense that benefits provided by the government to taxpayers are not in proportion to, or in return for their payments. Charges or fees are defined as compulsory requited payments to the government that are levied more-or-less in proportion to the services provided. In the OECD database, the terms "fees" and "charges" are used interchangeably[2].

The main difference between taxes and fees/charges is the type of beneficiary: fees are paid for government services directed at a specific beneficiary, while taxes are used to raise revenue to fund government expenditure.

For example, a wastewater payment which varies according to the volume of water consumed would constitute a fee/charge, while a wastewater payment which varies according to the amount of pollution generated would be classified as a tax. This is because, in the first case, the benefits provided to taxpayers correspond to the volume of water consumed, while in the second case the payment is not in proportion to the government's benefits, but instead targets the pollution generated – which is here the redistributive element of a tax.

A levy could be considered as unrequited in the following cases: where the payment greatly exceeds the cost of providing the service; where the payer of the levy is not the receiver of the benefit; where the government is not providing a specific service in return for the levy which it collects; or where benefits are received only by those paying the levy, but the benefits received by each individual are not necessarily in proportion to their payments.

[2] PINE DB - Metadata and definitions.pdf (shinyapps.io).

Clearly, there are judgments to be made about the relation between the payment and the cost of service when deciding which term to use. With a water charge, for example a part is for the service but a part can be added to cover environmental costs. Thus, it can go under either category although as it has an environmental component it is appropriate to include it in this report.

2.2 Review databases

We review databases listing existing environmental taxes in the EU. The OECD[3] divides these taxes into emissions charges, product charges and user charges and identifies some 35 taxes and fees across the three categories[4]. Other databases from the EU have also been reviewed including the Eurostat National Lists. A summary of taxes from the database is given in Annex 1.

2.3 Literature review

From the wider literature, a review of each tax or charge was made across MS. Issues covered include the following:

- Information on current and past coverage (tax base) and exemptions.
- Compliance costs, including administration costs (See Fullerton et al., 1995).
- Rates applied (if available).
- Revenue raised.
- Variations in rates applied within and across countries
- Complementary measures that address environmental burdens associated with the charge or tax and their interactions.
- Information on reductions of environmental harms.
- Information on competitiveness impacts.
- Information on employment effects.
- Information on household income for different household categories and different categories of other agents.
- Compliance costs, including administration costs (See Fullerton et al., 1995).

2.4 Assess the performance of taxes

Finally, we make an appraisal of the performance of taxes according to the following criteria:

a. Net and gross revenues raised in absolute and relative terms across Member States the difference being account for in part by compliance costs.
b. Rates applied and exemptions given across MS.
c. Impact in terms of reduction in environmental burdens.
d. Impact in terms competitiveness including administrative feasibility of implementation.
e. Impact in terms of employment.
f. Impact on household real income across household categorized by income.
g. Degree of coverage across MS and uniformity of that coverage.

[3] http://www2.oecd.org/ecoinst/queries/

[4] According to the OECD, a tax is a compulsory payment where the benefits to the payer are not related to the amount paid. User charges are also compulsory payments where a service is provided is in proportion to the payment. User charges are also referred to as levies.

It is not possible to apply a quantitative scoring of the instruments given that a lot of information is qualitative and incomplete. Hence an expert judgement appraisal is made of each of the charges and taxes. A short list of 8-12 of taxes is recommended for consideration to be applied in the EU.

3 Rationale for Environmental Taxes

3.1 Background

As the EU 2023 Annual Report on Taxation notes, environmental taxation is one of the instruments that can be used to achieve environmental policy goals. Environmental taxes (i.e., energy, transport, pollution and resource taxes, including ETS) contributed around 5.5% of total tax revenues in the EU in 2021. Of this, energy taxes contribute most of the revenue (78%), while transport and pollution and resource use taxes contribute to 18% and 4% respectively of total environmental tax revenue raised. Environmental taxes, however, are by no means the only instrument to achieve environmental policy goals, sharing that role with environmental subsidies, command and control regulations as well as voluntary measures (including some that are partly motivated by information, education and the use of "nudges"). The strongest argument in their favour is that they are a cost-efficient method of achieving a reduction in environmental pollution but other arguments include incentives for innovation and raising public revenues in a non-distortionary manner. Furthermore, where rates of tax are high enough, they reduce environmental pollution significantly (see Section 4.4 for examples). The effectiveness of environmental taxes has been demonstrated through many research papers over the past three decades (Fisher, 2023). As the EU Green Paper (European Commission, 2007) on market-based instruments notes:

- "[Market-based instruments] improve price signals, by giving a value to the external costs and benefits of economic activities, so that economic actors take them into account and change their behaviour to reduce negative – and increase positive - environmental and other impacts".
- "They allow industry greater flexibility in meeting objectives and thus lower overall compliance costs".
- "They give firms an incentive, in the longer term, to pursue technological innovation to further reduce adverse impacts on the environment ("dynamic efficiency")".
- They support employment when used in the context of environmental tax or fiscal reform.

These issues are discussed further in the remainder of this section.

In its preliminary findings (the report is currently under review), the progress report on the implementation of the Polluter Pays Principle (RPA Europe Consortium, 2023) estimates that the combined use of taxes and charges account for the majority of national expenditure for environmental protection. This suggests that at the EU level such instruments are one policy mechanism to address the market failure of 'environmental externalities', either by internalising the externalities through levies on processes or products, or by creating a market for the use of environmental services (e.g., EU ETS). However, the same report also notes significant variation in tax revenues between Member States, which indicates a challenge for use of the tax instrument at EU level. This is a good reason to look at the potential for introducing a harmonized system of environmental taxation.

3.2 Links between environmental taxes and PPP

The PPP was introduced in 1972, by the OECD, as a recommendation on guiding principles for international economic aspects of environmental policies. It stated the polluter should bear the costs of pollution prevention and control measures. In this case, "control measures" referred to administrative costs borne by competent authorities to enforce environmental controls. To implement the PPP, authorities have the option of imposing direct regulations mandating certain technologies and other measures that prevent pollution. They can also offer polluter a subsidy for each unit of pollution reduced (an environmental beneficial subsidy) or impose a charge for every unit

of pollution generated. The choice between the two is partly a matter of equity: who can most easily bear the costs of pollution prevention; and partly a matter of fiscal capacity: subsidies add to the fiscal burden while taxes contribute to it.

The "right" combination of regulations and taxes to meet the PPP is a subject on which there is no general agreement. The argument in favour of regulations is that they are more likely to achieve a target reduction in pollution or use of a resource. As noted, the argument in favour of taxes is that they offer greater flexibility to different polluters to reduce pollution or pay the tax and can often have the potential to reduce a given reduction at a lower cost than regulations. They also encourage innovation in terms of technologies that would avoid the tax. At the EU level, while several regulations for pollution prevention are a matter of EU directives, the taxes are left to Member States. In view of this, the combination of taxes and regulations applied to different environmental objectives vary considerably across the EU. In looking at the trade-offs between the two, account needs to be taken of their environmental effectiveness as well as their social and economic impacts. This will vary from one environmental tax to another.

3.3 Internalising Externalities

An externality is the cost of an activity that is not borne by the party responsible for the activity but by society at large. Examples include the negative impacts of emissions of pollutants to air and water. To internalize the externality involves passing the cost back to the party responsible for creating the damage. The aim from an economic point of view, however, is not to reduce the damage to zero. Typically, that would incur a cost far in excess of the benefits gained. Rather it is to reduce the externality to the point where the reduction in damage from a small decrease in pollution is equal to the benefit gained from that reduction. Thus, from a policy perspective the externality's relevance will depend on how much pollution has been reduced as a result of measures introduced and what the marginal gains are from further reduction relative to the costs of making such a reduction. Environmental taxes set at a level equal to the marginal cost of abatement will bring about the internalization of an externality as long as the marginal damages are at least as high as those costs. As the 2023 Annual Taxation Report notes: "Environmental taxes are effective if they correct the price so that this reflects the marginal costs of an activity to society." Thus, the design of the taxes will vary across the environmental burdens and depend on how much pollution has been controlled by other instruments.

3.4 Distributional Considerations

Environmental taxes are eventually passed on to the final users of the goods and services that bear the taxes. Unless other taxes are reduced to compensate for the environmental taxes, this will imply a reduction in real income of the final users (households) and that of other agents in the economy. The benefits of course are the reduction in pollution, which benefits all households, but any loss of real income has an effect on living standards. Typically, these effects are small but not always: studies of energy and carbon taxes for example find notable effects on low-income households and some regressivity in the incidence of some (but not all) taxes (NBER, 2010; Vona, 2021; European Commission, 2023). Transport taxes in the form of higher gasoline taxes were found in the UK to fall most heavily on middle income groups when all households are considered but on low-income groups when only car-owning households are considered (Santos and Catchsides, 2005). They were also found to increase inequality in a Norwegian study (Aasness & Røed Larsen, 2003) but the same study also showed that higher taxes on air flights, taxis, automobiles together with lower taxes on bus, bicycles, and mopeds have positive environmental effects and can reduce inequality.

There is no evidence on the direct distributional effects of resource and pollution taxes, although there is some that the reduction in ambient air pollution is likely to benefit lower income households more,

as they tend to be more exposed to such pollution (Fecht et al. 2016). Note also that existing inequalities are further worsened by market failures not being probably addressed by sustainable fiscal systems. Groups of lower socio-economic status (the unemployed, those on low incomes or with lower levels of education) tend to be more negatively affected by environmental health hazards, as a result of their greater exposure and higher vulnerability (EEA, 2018). This includes having less capacity to avoid pollution by living somewhere else or take other protective action (often the lower income households need to trade off pollution impact with the amount of rent) - and in addition, less political clout to have "their pollution problems" addressed (environmental justice).

Where distributional factors are found to be significant, complementary measures in the form of targeted means-tested rebates can be introduced, using some of the revenues from the environmental tax to cover the costs.

3.5 Spillover effects

When environmental taxes are introduced, they create an incentive to reduce pollution from the source on which they are imposed. In some cases, this can shift the burden to other environmental burdens that are not so highly taxed or controlled. An example is an increased charge for solid waste collection resulting in an increase in fly tipping; or a levy on plastic products resulting in the use of other products that are also harmful to the environment, such as paper or glass with a high carbon footprint[5]. Where such effects exist, the tax has to be accompanied by an analysis of likely spill overs and measures have to be introduced (such as stricter control of illegal dumping) to avoid negative spillovers.

Tax interactions also arise when an increase in environmental taxes is accompanied by a change in other taxes. They are discussed next.

3.6 Tax interactions and theory of the Second Best

Over the early part of this century there was a considerable discussion on whether using environmental taxes to replace other taxes that distort economic choices, in particular employment taxes, could provide both an improvement in the environment as well as an increase in economic welfare. While this could be the case if there were no other distortions in the economy, it is less clear that such a “double dividend” actually exists when there are distortions, as the theory of the Second Best demonstrates. Studies undertaken some time ago established that the gain in economic welfare from the introduction of an environmental tax was very difficult to establish (Bovenberg and van Der Ploeg, 1994a, 1994b). There was, however, a likelihood that the shift could reduce involuntary unemployment where such existed. Empirical analysis looking at the introduction of an energy/carbon tax found a small reduction in unemployment and few competitiveness effects of a combination of carbon/energy taxes (Castellucci and Markandya 2013).

A more recent investigation based on modelling rather than historic data looks at the effects of a set of environmental taxes that seek to raise the extent to which external costs are internalized across the EU (Mottershead et al., 2021). It focuses on real Gross Domestic Product (GDP) and employment and finds that the use of revenues is a key driver of macroeconomic outcomes. In general, where revenues are used to repay government debt, GDP, employment and real household incomes are all negatively affected but not significantly. However, where revenues are used to reduce income tax, GDP, employment and real household incomes across the income distribution rise, although in some

[5] https://resource.co/article/plastic-alternatives-may-cause-greater-environmental-harm-says-new-report#:~:text=Although%20this%20may%20seem%20like,than%20the%20average%20plastic%20bag.

instances real income may increase slightly more in higher than lower income households. These effects are discussed further in the next section.

The scope for any shift in tax burden from conventional taxes to environmental ones is severely constrained by the fact that the latter amount to a very small amount compared to the former. This is even more the case if we are limited to pollution and resource taxes. As the 2023 Annual Report on Taxation notes, the "tiny proportion of other environmental taxes (pollution and resources) makes them less relevant for tax shifting purposes. This is mostly because these taxes have, by definition, very small tax bases when compared to the other taxes composing the tax system." The report also observes that the shift to environmental taxes relative to labour across MS is mixed. Between 2002 and 2019, 12 Member States experienced – in relative terms – some shift of the tax burden from labour to environmental taxation. However, in 15 Member States environmental tax revenues did not increase as much as labour tax revenues, indicating that labour tax revenues have become relatively more important.

4 Existing environmental fees and taxes in the EU

4.1 General observations

The Table in Annex 1, which is taken from the PINE OECD database lays out the information on the environmental fees and taxes across Member States. The summary hides a lot of differences in the way the instruments are applied. In particular, the following should be noted:

A. Nine of the 27 MS have charges on emissions to air and water that apply quite widely, while five have charges for non-compliant emissions. (OECD Pine database).

B. Fees for landfill disposal of solid waste are quite widespread: 23 MS have them, although rates vary and some states only impose charges for some forms of waste (e.g., construction or industrial). Ten countries have incineration taxes (BE, DK, ES, FR, IT, LV, NL, AT, PT, and SE)[6]. In some countries landfill taxes are complemented by bans on the landfill of specific substances (e.g., combustible waste, certain products), notably in Austria, Belgium (Flanders and Wallonia), Denmark, Finland, France, Hungary, Italy, Netherlands, and Sweden. Pay as You Throw (PAYT) schemes are relatively common in Europe and are often established at municipal level; only eight countries identified in the inventory have PAYT schemes at national level. A comprehensive review of economic instruments on waste and packaging in all member states is covered in a set of country reports made available online in 2023, which complements and updates the findings in the PINE database[7].

C. Nine MS have some form of aircraft noise/emissions charges.

D. An ozone depleting substances levy is applied in seven MS but this is a declining issue.

E. Product charges are quite widespread for some items. Packaging charges are in place in 13 states, and charges on plastics are also levied in the same number. Much less common are taxes on fertilizers (one MS) or pesticides (three MS). Other products taxed in some states include: aluminium sheets and strips, disposal cameras, paints, inks and solvents, types, collection and disposal of vehicles and non-deposit containers.

F. User charges are widespread for water abstraction (19 MS) and water disposal (17 MS). Three MS charge for visits to national parks and five impose fees for landscape protection. A hunting or fishing tax is in place in 14 MS.

G. Ten MS have a tax on mineral extraction. These are typically charged per volume (m^3) or weight (kg or tonnes) of materials extracted and cover the extraction of various natural resources, for example on gravel and sand (e.g., Bulgaria, Croatia, Estonia, Latvia, Lithuania, UK, and a proposal in France), coal, lignite or peat extraction (e.g., Belgium, Czech Republic, Denmark, France, Latvia, Lithuania, Sweden and Estonia).

[6] https://www.eea.europa.eu/data-and-maps/figures/overview-of-taxes-on-the. Sweden's incineration tax is identified in the PINE database and Eurostat's National tax List.

[7] See: https://www.eea.europa.eu/publications/many-eu-member-states/early-warning-assessment-related-to

H. Road pricing is difficult to gauge as an environmental fee. All MS have some charge on vehicles and on transport fuels but that does not constitute a tax directly linked to the use of roads. In a number of countries vehicle registration taxes have been designed to promote the purchase of low carbon vehicles, e.g., Ireland, the Netherlands, Portugal and Spain. In some countries annual circulation taxes are based on engine size or fuel consumption (e.g., Denmark). Infrastructure-related charges including toll charges and vignettes on private and/or heavy goods vehicles are in place in several European countries, while congestion charges are applied in some cities (e.g., London, Milan and Stockholm). Some countries also apply air passenger duties and charges (more details are given in Section 5.2.11). Pricing of road involves charging per kilometre of road used, which is rare (only two MS have this as a widespread charge).

4.2 Rates applied

Although Member States have developed similar environmental taxes which can be grouped into distinct categories, as has been done in Annex 1, these taxes vary quite a lot. Each Member State's tax covers specific, possibly different activities, or different tax bases proxying the pollution, with country specific tax rates, and exemptions.

A detailed view of the differing tax rates applied across Member States is provided in Annex 2. This table combines data from the European Commission's Taxes in Europe Database[8] which provides details for 40 Pollution and Resources taxes implemented in Europe. Six of the taxes from that database were not included in the table as they related to energy. However, data for a further three taxes (waste in Austria, water in Wallonia, Belgium, and air pollution in seven autonomous regions in Spain) have been identified and included in the table. The pollution taxes in France and Estonia are cross-sectoral, thus although in the table rates have been disaggregated it is important to note that these are not separate taxes. As can be seen in the Table in Annex 2, there are overlaps regarding activities, goods and services being taxed due to the environmental and climate impact by EU Member States. Furthermore, the conceptualizations and tax rates applied across Member States vary. The table does not cover all the taxes identified in Annex 1, only those included in the Taxes in Europe Database[5].

Rates applied for charges on emissions to air and water can vary considerably across states as can exemptions granted to some sources. For example, the tax rate on sulphur emissions in Sweden, Norway and Denmark is between EUR 1,300/tonne and EUR 1,600/tonne; while rates in Italy, France and Spain are lower than EUR 50/tonne. In several MS, the charges are only for emissions that are exceed compliance standards, while in others all emissions are charged (Withana et al, 2014). It is also important to distinguish between taxes on stationary sources and those on mobile ones. In the former case you have a tax on measures emissions whereas in the latter the tax is bases on the content in the fuel of the particular pollutant[9].

In the waste sector, Member States also apply different tax rates and apply them to different tax bases. For example, The Netherlands taxes waste at EUR 35.70/tonne for waste going to landfills or mixed waste incineration plants in and outside The Netherlands (Withana et al, 2014), while Finland taxes landfill waste at EUR 80/tonne of waste delivered to landfills, and Sweden taxes waste entering incineration plants at EUR 11.76/tonne. France taxes waste disposal at between EUR 6 to 61 per tonne, while Italy taxes different types of waste differently, with inert waste taxed at EUR 1 – 10/tonne, and

8 https://ec.europa.eu/taxation_customs/tedb/index.html

9 See: https://www2.mst.dk/udgiv/publications/2000/87-7909-568-2/html/kap06_eng.htm#6.2.2.%20Tax%20base.

both hazardous and non-hazardous waste treated in plants taxed at EUR 5.17 – 25.28/tonne. While the tax rates among these countries differs, they all tax waste based on weight. Slovenia, however, taxes its landfill waste differently, either at EUR 0.0022/ unit of soil load, or EUR 0.0125/ unit of air pollution.

The water sector also shows inter- and intra- country differences regarding the tax rates applied, which of course makes sense as the external costs will vary across states. In most cases these taxes provide exceptions for water used in irrigation and, in cases where it is taxed, it is generally at a lower rate (Berbel, et al., 2019). For example, Portugal applies an average EUR 0.00306/m^3 of water abstracted for use in irrigation, however irrigation users with less than 3.7kW pumping capacity are exempted. The country taxes urban water higher, at EUR 0.0181/m^3 abstracted (Berbel, et al., 2019). This is a similar figure to the one found in Denmark, which taxes urban water at EUR 0.01/ m^3 abstracted with this price being included in the price of urban water. France applies different tax rates based on origin (surface or groundwater), uses (irrigation, refrigeration, etc.) and zones (with extra charges in areas with scarce resources due to over exploitation). Currently, the tax ceiling for irrigation stands at EUR 0.072/m^3. But the final tax rate applied in each river basin is set by the Water Agency (Berbel, et al., 2019). In the Netherlands, tap-water is taxed at a rate of EUR 0.359/m^3, up to 300 m^3 per year (from 1 January 2015 water tax is only levied on the first 300 m^3 per year, i.e., those who use more do not pay tax on the water used above 300 cubic meters per year). However, water for agriculture or industrial uses is taxed at a lower rate of EUR 0.08/m^3, with this rate only applying to irrigation users abstracting over 40,000m^3 per year (Berbel, et al., 2019).

The use of plastics in packaging and bags is also taxed by various EU Member States; however, how these products are taxed differs between countries. For example, in Ireland plastic bags are taxed at a rate of EUR 0.22 for each bag, while in Portugal this tax is EUR 0.08 and EUR 0.28 in Sweden[10]. By contrast, countries such as Latvia or Denmark, tax plastic bags per kilogram not per unit. In Latvia the tax rate is EUR 4.8 or EUR 1.50 per kg of plastic bags (depending on thickness), while in Denmark the rate is EUR 9.36 per kg of plastic bags. Moreover, countries, such as Latvia and Sweden, tax thinner plastic bags at lower rates.

The database also includes two pesticide taxes from Denmark and Sweden. In Sweden, the tax rate is more easily calculated as pesticides are taxed at EUR 3.20 per kg of active substance. In Denmark, the tax rate on pesticides is determined by considering both health and environmental factors. The health duty is computed as EUR 15.17 per kg/litre of pesticide, multiplied by the health impact per kg/litre of the substance. Similarly, the environmental impact duty is calculated as EUR 15.17 per kg/litre of active ingredient, multiplied by the environmental impact per kg/litre of the substance. Additionally, the environmental behaviour duty is taxed at EUR 15.17 per kg/litre of active ingredient, multiplied by the environmental behaviour impact per kg/litre of the substance. To this, an additional basic duty of EUR 7.09 per kg/litre of active ingredient is also added. Denmark also taxes its chemical biocides, with rates varying between 3%, 30% or 40% of taxable value depending on the product.

The extraction and exploitation of natural resources is another activity taxed by EU Member States. In Latvia, depending on the type of resource being exploited taxes vary from EUR 0.14 to 1.78 per m^3, EUR 0.18 – 0.90 per ton, or EUR 0.04 per kg of resources extracted. Although the Latvian tax is the most complete of the identified taxes covering natural resource use, Sweden, and France also tax

[10] Swedish plastic bag tax will be abolished in November 2024 - https://www.government.se/contentassets/b8507e3741374bf2be39cd98a807fbf3/from-the-budget-bill-for-2024-budget-statement.pdf and https://www.sustainableplastics.com/news/sweden-plans-abolish-plastic-bag-tax-2024. The Swedes argue that the abolition of the tax is because it has successfully changed technology and behaviours.

certain mining activities. In Sweden, a tax of EUR 1.6 per tonne of gravel is applied and in France mineral grains for the domestic market are taxed at EUR 0.21 per tonne.

Finally, recognizing the environmental impact and danger of certain materials used in the electronics industry, EU Member States have levied taxes on products such as batteries or specific consumer electronics given their use of potentially harmful chemicals. For example, in Latvia Ni-Cad and Fe-Ni batteries are taxed at EUR 4 per kg, while Denmark applies a EUR 0.81 tax per piece on Ni-Cad batteries. For its part, Sweden taxes household appliances at EUR 1.13 per kg and other electronics at EUR 17.03 per kg, up to a tax of EUR 46.76 per product.

For more details on the tax rates applied by selected environmental taxes used by EU member states to discourage environmental harmful activities and behaviours see the Table in Annex 2.

4.3 Revenues raised

Data from Eurostat National Tax Lists has been used to derive information on revenues from pollution and resource fees and charges as well as transport charges. The categories from Eurostat do not match entirely the OECD Pine database used for Annex 1 but it is the only source giving tax revenues in detail. Figure 4-1 shows the revenues as a percent of all tax revenues from 1995 to 2021. Two MS (Malta and Cyprus) stand out as having shares that started out at 8-9% but that declined sharply so by the end of the period they were 3.1% and 1.4% respectively. Among the other Member States Denmark, Netherlands and Ireland have relatively high shares, starting the period at 4-5% and ending at 2-3%. Other Member States have shares between 0.5% and 3%, the lowest being Czechia, Luxembourg, and Romania.

The tax share of these two categories is raised considerably by including transport taxes, many of which have a questionable impact on the environment. These include, for example, taxes on registration, on car insurance premiums, a road tax to allow use of the vehicle, etc. To be sure, congestion charges or charges related to use of roads are environmentally effective but some such as a city tax do not appear in these accounts. To look at the pollution and resource taxes in more detail, Figure 4-2 excludes all transport-related taxes.

As a percent of all taxes the revenues from the remaining categories range from a high of around 1.5% (Romania and the Netherlands to a low of less than 0.1% (Greece and Finland). Over time, there are few trends, except a decline in the share for some new Member States, such as Romania, Czechia and Poland. Within the category of pollution and resource taxes, the largest amounts are often from the taxes on water (including discharge of effluents into water) and waste (Belgium, Bulgaria, Czechia, Denmark, Estonia, Ireland, Netherlands, Austria, Slovakia, Slovenia, Finland, Sweden). In some countries hunting and fishing licenses raise a considerable share (Germany, Portugal, Finland). Taxes on natural resource extraction are important sources of revenue in Hungry, Croatia, Romania (albeit of a small amount collected in total. Air pollution taxes contribute a significant amount in Estonia, Denmark and Sweden.

4.4 Environmental impacts of environmental taxes

The impacts of environmental taxes, charges and levies varies across countries and are determined by a number of factors including design (i.e., point of application, breadth of coverage), level of taxes and charges (i.e., rate applied), implementation (i.e., evolution over time, exemptions granted and associated conditionalities), and use of revenues raised (including recycling mechanisms employed). It is difficult to separate out the impact of environmental taxes on the environmental burdens they seek to address, as other factors have also been changing over the time that these taxes have been in

place. Nevertheless, based on case studies and in-depth investigations a number of conclusions can be drawn.

1. Pesticide taxes introduced in Norway with seven tax bands based on the environmental and health related risks of the pesticides used helped link the pesticide tax more directly to pesticide use. This system was found to be effective in encouraging more conservative use of pesticides and provided an incentive to use less harmful products (Withana et al, 2014). In Denmark, since July 2013 the pesticide tax has been applied so that farmers are taxed according to the environment and health toxicity of pesticides used rather than their nominal value. A recent review of pesticide taxes in France, Denmark, Norway and Sweden finds that while the overall effectiveness of pesticide taxes is limited, when a tax on a specific pesticide is high enough, the application and the associated risks will be reduced significantly. Furthermore, in all countries, hoarding activities were observed before a tax introduction or increase. Therefore, short-term effects of taxes are substantially smaller than long-term effects. The authors find that differentiated taxes are superior to undifferentiated taxes because fewer accompanying measures are required to reach policy goals (Bocker and Finger, 2016).

2. Taxes on water supply on companies can be effective in reducing leakages when the tax is volumetric and specifically linked to leakages, as it is in Denmark, where suppliers are responsible for the water tax if leakages exceed 10%. The water supply tax has also encouraged water savings by households; Withana et al, 2014). A review of water taxes for the Netherlands found that they reduced emissions to water significantly but the same study also found that effects in other countries such as Germany were less clearly linked to the tax as to compliance requirements (ECOTEC, 2001). More recently, evidence from China has shown stronger incentive effects of water taxes. A paper examined the effect of raising tax rates on industrial water pollution, as part of China's environmental tax reform in 2018. as a quasi-natural experiment. Based on micro-level data covering more than19 thousand firms nationwide, it estimated that for every unit of tax rate increase, the emissions of water pollutants, Chemical Oxygen Demand (COD) and Ammonia Nitrogen (NH_3−N) have fallen by 8.63% and 3.79% (Zhang et al., 2023).

3. Taxes on landfill do have an effect on amounts of waste sent for landfill, with the size of the effect depending on the rates charged. Countries where landfill tax rates are low such as Bulgaria, France and Portugal have seen rather modest reductions of waste generation; while countries with higher landfill taxes in place such as the Netherlands and the UK have seen much higher reductions (Withana et al., 2014). In 1996, the UK introduced a landfill tax, with the proceeds being used to reduce employer contributions. In 2010, the tax generated €1.2 billion and the amount of landfilled waste had been halved (Cambridge Econometrics 2013). The relationship between the tax rates applied for waste disposed in a landfill and the percent of all waste that ends up in a landfill is shown in Figure 4-3. There is a strong fall in waste disposed as taxes go up. At the same time, however, as the EEA 2023 country reports note11, bans on disposal of some wastes have also played an important part in driving the reduction of waste landfilled.

[11] https://www.eea.europa.eu/publications/many-eu-member-states/early-warning-assessment-related-to

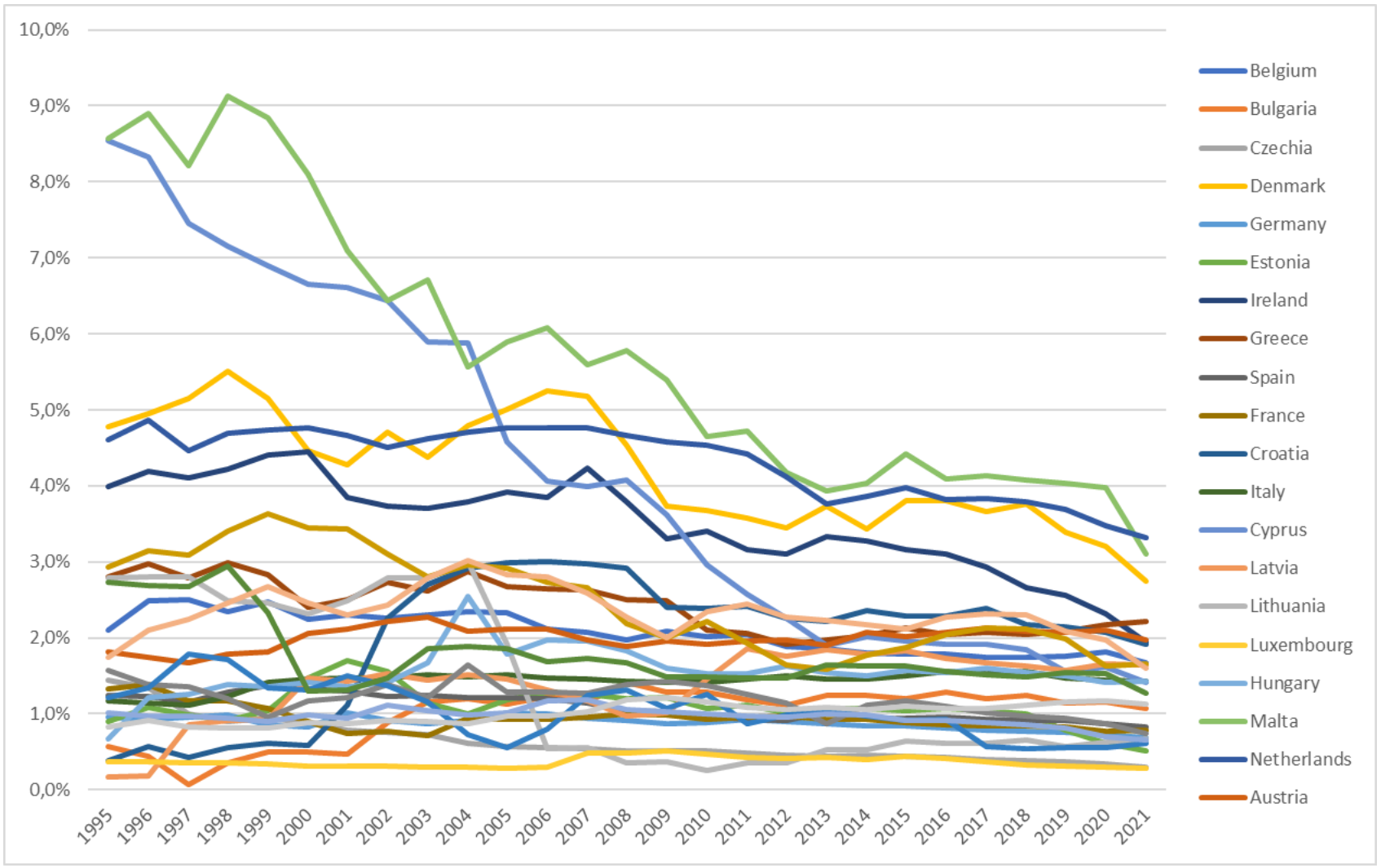

Figure 4-1: Pollution Resource and Transport Taxes as a Percent of All Taxes: 1995-2021 - Source: Eurostat, National Tax List data https://ec.europa.eu/eurostat/statistics-explained/images/2/2e/National_tax_lists_2022_2023-10-31.xlsx

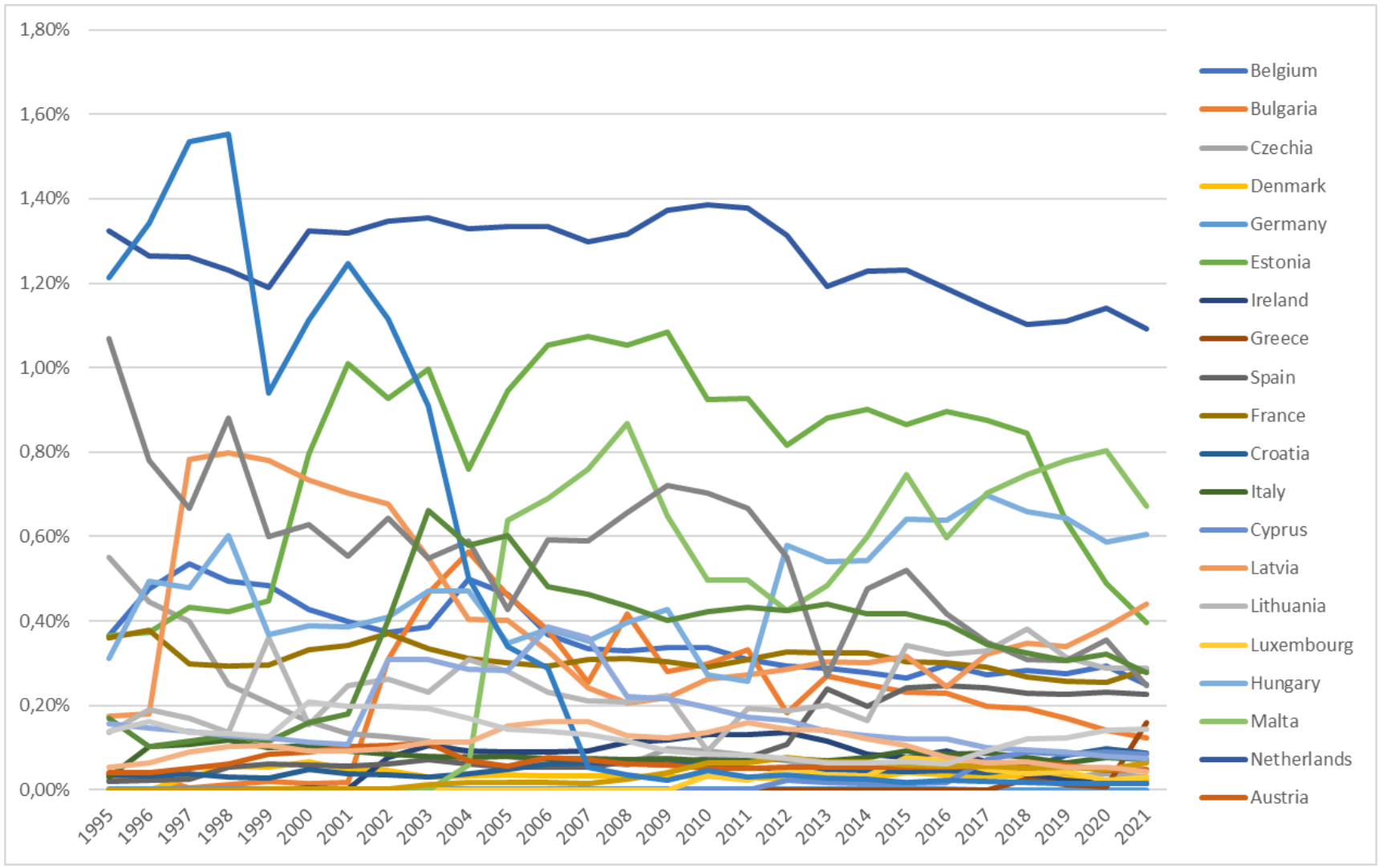

Figure 4-2: Pollution Resource as a Percent of All Taxes: 1995-2021 – Source: Eurostat Tax List data

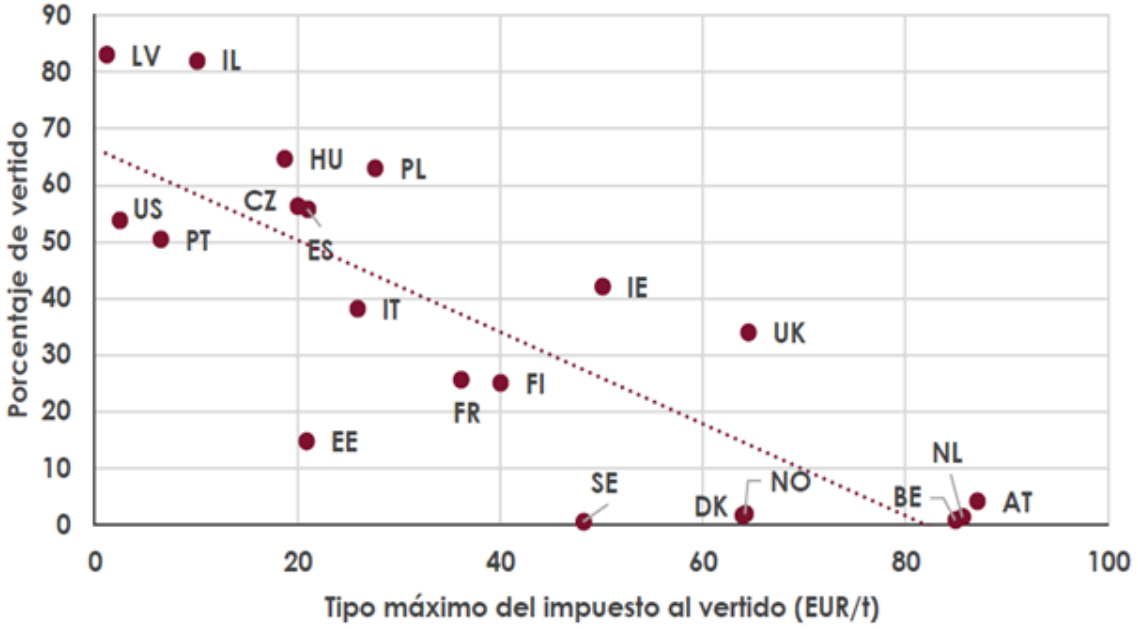

Figure 4-3: Share of waste that ends up in landfill (vertical axis) against tax rates (horizontal axis)

Source AIREF, 2023

4. Where charge rates on emissions are high relative to abatement costs, they can have a significant impact. In Sweden, for example, NO_x and SO_2 charges appear to have driven reductions of SO_2 emissions of 85 per cent and of NO_x and particulate emissions by 40 per cent between 1986 and 2002 and in the Czech Republic when rates were initially high SO_2 emissions decreased by 68 per cent and NO_x emissions by 50 per cent between 1987 and 1997. Over time however, rates did not keep up with inflation emissions reductions stagnated till 2010.

5. In cases where tax rates were low and unchanged for a number of years, the environmental impact is small and declines over time. Examples include natural resources taxes in Latvia and other MS that joined the EU in early 2000s. (Withana et al., 2014; Söderholm, 2006).

6. Some taxes have been spectacularly successful in reducing the environmental impact they target. A case in point is the plastic bags levy applied across the EU and now covered by the Plastic Bags Directive. Early applications demonstrated sharp reductions in use of plastic bags. In the UK it catalysed wider waste awareness among the British public, which was seen as facilitate the introduction of other policies to eliminate avoidable single-use plastics and packaging. (Owen et al., 2019).

4.5 Other impacts of environmental taxes

The impacts of environmental taxes in terms of employment, economic welfare and competitiveness were discussed briefly in Section 3.6 where an *ex-post* evaluation of energy/carbon taxes in the EU was shown to have a minor fall in unemployment and little competitiveness impact. Two more comprehensive *ex ante* assessment of a range of taxes have been carried out using a modelling approach in which a well-known economy-wide macroeconomic model (E3ME) has been used to investigate the effects of introducing a range of EU wide taxes that aimed to increase the extent to which the external costs of a range of economic activities were internalized. The first is in Mottershead et al. (2021), a study undertaken for the European Commission – DG Environment.

The taxes and charges chosen for the analysis were the following:

1. Air Pollution: a tax on NO_x
2. An indirect tax on domestic biomass fuel and coal
3. A landfill tax
4. A Pay As You Throw Tax (PAYT)
5. A pesticide tax
6. A fertilizer levy
7. A waste water pollution tax
8. An intensive agriculture tax
9. A forest felling charge

These taxes are set at levels that internalise the external costs to the extent possible in selected countries that do not have such a tax or, if they do, it is not at a high enough level. In addition, the average rate of taxes is also applied in the remaining countries to all countries that do not have such taxes[12]. Thus, the rates at which the taxes are applied across the EU does not fully internalize externalities. However, they increase the level of internalization, especially in the listed of selected countries. The modelling assumes a gradual introduction of the taxes from now to 2030.

The first observation is that the introduction of such taxes at the EU-wide level raises a relatively modest €30 billion per year by 2030 across the EU, which remains well below the externality cost of the pollutants they concern, and would increase the share of environmental taxation in the EU from approximately 6% today to just 6.5% by 2030. This reflects a design choice to initially set instrument rates at relatively low levels which could subsequently be increased over time, an approach which has been found to be important for an effective environmental tax reform (Mottershead et al., 2021).

The second finding is that the impacts on employment and GDP depend on the way the revenues are deployed. Using the €30 billion of revenues to reduce income tax generates a net positive GDP impact of €35 billion, offsetting the initial negative impacts of environmental taxation, and creating 140,000 additional jobs. By 2030, the EU's GDP is projected to be around 0.2% higher than GDP in the baseline, while employment is projected to be around 0.1% percent higher employment than in the baseline. If, however, where revenues are used to repay government debt, GDP, employment and real household incomes are all negatively affected. In both scenarios the trade and competitiveness impacts are very small, as is the impact on inflation.

The third finding relates to distributional impacts. The modelling suggests these are small and can vary from being slightly progressive to slightly regressive, depending on the country and the way in which the taxes are recycled. In some Member States – Finland, Greece, Portugal, Austria, Luxembourg, Denmark and Germany, for example – the impact is slightly progressive, with the real income of the lowest income quintile increasing by a higher proportion than that of the highest income quintile; in other Member States –Bulgaria, Czech Republic, Lithuania, France and Italy – the highest and lowest income quintiles see equivalent proportional income rises; finally in some –Estonia, Latvia, Slovenia, Hungary and Poland – the impact is slightly regressive, with the income of the lowest income quintile increasing by a smaller proportion than that of the highest income quintile. While the findings on distribution are helpful, they do not pick up all the impacts of the taxes that could cause hardship

[12] The selected countries where detailed rates are proposed to be introduced are: air pollution (Austria, Germany, Netherlands); domestic biomass and coal (Bulgaria, Hungary, Poland and Slovakia); landfill tax (Cyprus, Greece and Lithuania); PAYT (Cyprus, Estonia, Greece, Latvia, Malta, Romania, Slovakia); pesticide tax (Austria, Belgium, Luxembourg, Slovenia and Sweden); fertilizer levy (Czech Republic, Denmark, Estonia, France); waste water pollution taxes (Ireland, Romania); water consumption charge (Bulgaria, Cyprus, Czech Republic, Germany, Greece, Italy, Malta, Poland, Portugal, Spain); intensive agriculture tax (France, Ireland, Netherlands, Portugal); forest felling charge (Latvia).

to select small groups in particular locations. It is often these that cause objections to the introduction of the kinds of taxes considered. Hence, they need to be identified and addressed in addition to the broader effects.

The second *ex ante* assessment (The Ex'tax Project (et al.), 2022)) also used the E3ME model to investigate the impacts of EU-wide taxes on the following:

1. A 'smart' kilometre charge differentiated by type of vehicle, weight and fuel use. Part of the revenue is invested in public transport. Annual vehicle tax is abolished.
2. An aviation tax based on 1) the abolition of aviation fuel duty exemption and 2) imposition of climate costs.
3. A shipping tax based on part of the external costs of CO2 and NO_x emissions.
4. A carbon price floor for ETS sectors of €60/tCO2
5. A carbon tax for non-ETS sectors of €60/tCO2.
6. A tax on industrial air pollution (nitrogen oxides (NO_x), sulphur dioxides (SO2) and particulate matter (PM2.5)), based on the external costs.
7. A tax on ammonia emissions to air by the agricultural sector at 50% of the external costs
8. An increase in water taxation raising the price of water by 25%
9. A tax on non-energy fossil-fuels (i.e., a tax on feedstocks to the chemical industry)
10. An increase in incineration and landfill taxes.

The imposition of these taxes (more details on actual rates is not given) is matched by a reduction in personal income taxes, employment taxes but a harmonization of VAT at a standard rate of 22% and harmonized reduced rate of 12% for selected goods and services. In addition, income support to the lowest two quintiles is raised as are excise duties on tobacco products. These changes are introduced gradually over 2021 to 2025.

The effects relative to Business as Usual are quite significant. There is a shift in taxes of €560 billion from labour to pollution, given a total tax burden of around €6,700 billion this amounts to a shift of around 8%. The largest share of taxes from natural resource us is traffic charges (34%). GDP is raised by 2025 by 1.6% and employment rises by 3%. CO2 emissions fall by 7.1%. Employment increases occur in all states and with the exception of Malta all countries also see an increase in GDP. No significant distributional effects are reported. Thus, the analysis makes a strong case for a major shift in taxation and complements the more focused changes in the study by Mottershead et al. (2021).

5 Selecting Environmental Taxes for EU-wide Application

5.1 Assessment of taxes and inclusion in the list of candidates to start an Environmental Tax Reform

As the review of existing taxes has shown there is considerable variation in the way environmental taxes are applied across MS. The aim here is to examine the potential for the adoption of common rules across the EU for the imposition of such taxes and if so, which taxes are likely to be most suitable for a harmonized approach? We note here that it will generally not be possible, or desirable, to impose common rates of taxation across all MS for any environmental pollution. One reason is that rates should reflect the damages caused by the emissions and these will vary across countries (and even within countries). Other reasons include political feasibility and issues of competitiveness (discussed further below). Nevertheless, some agreement on the way in which rates are calculated should be possible and minimum rates or bands within which tax rates are applied could be agreed. For some sources of emissions, reaching agreement on band rates could also serve to avoid competitiveness issues. An example is a tax on air passengers, which if imposed unilaterally can lead to diversion of traffic to nearby airports in contiguous countries that do not have a tax (Withana et al., 2014).

In selecting taxes for harmonisation, the following criteria are considered:

A. Is there currently a wide application of the tax and if not, will it be possible to extend it widely across MS?
B. Has the experience with the application of the tax resulted in significant environmental benefits?
C. Has the experience with the application of the tax resulted in any notable distributional impacts in some MS that could cause difficulties in reaching agreement? If so, can these be mitigated through agreed complementary policies?
D. Has the experience with the application of the tax resulted in any notable competitiveness or trade impacts in some MS that could cause difficulties in reaching agreement? If so, can these be mitigated through agreed complementary policies, which, if taken at the EU level, may reduce competitiveness concerns?
E. Are the revenues from the tax likely to be significant relative to taxes in general? If so, is there any scope for the tax substituting other distortionary taxes?
F. Could the revenues from the tax be an important source of finance for the sector concerned?
G. Is there agreement in principle on how the tax should be calculated, including determining the tax base and calculating the rate? If not, can such agreement be reached?
H. Is the responsibility for the tax of a particular source of pollution at the national level, or is it local? If the latter, can it be guided by the EU?

5.2 Candidates

We undertook a prescreening of the taxes currently implemented as well as some potential ones to select a shortlist that could be investigated in greater detail. This prescreening was based on the 8 criteria above as well as looking through the literature to find out which tax options had been

investigated and for which information was available for possible impacts. A more detailed application of the eight criteria has been made in an appraisal of the following taxes[13]:

1. A tax on NO_x.
2. A tax on domestic use of biomass and coal.
3. A landfill tax
4. A Pay As You Throw Charge (PAYT)
5. A pesticide tax
6. A fertilizer levy
7. A waste water pollution tax
8. An extension of the directive on plastic bags to other single use plastics
9. An intensive agriculture tax
10. A forest felling charge
11. An air passenger tax
12. A tax on vehicle use, in high pollution zones based on vehicle emissions
13. A horizontal category of Extended Producer Responsibility
14. A mineral extraction tax.

A summary of the assessment of these taxes is given in Table 1, with references to sources in footnotes to the table.

5.2.1 A tax on NO_x

The aim is to apply the tax to NO_x emissions from fuel combustion (coal, oil and gas), accounting for around three quarters of overall NO_x emissions. The main sources of NO_x emissions from fuel combustion are road transport, power generation, and smaller amount from combustion in industry and households, but the tax will be levied upstream at the level of the fuel suppliers. Consequently, it will not distinguish between stationary and mobile sources: to do that it would have to be levied further downstream, which can be explored at a later stage. Existing rates in countries that have a tax range from 160€/ton in Latvia to €670€/ton in Denmark. Research suggests however, that these are well below the rates that correspond to the external cost, which is estimated to range from 5,100€/ton NO_x in Latvia to 11,300€/ton in Denmark (Mottershead et al., 2021).

Evidence indicates that rates proposed by Mottershead et al. (2021) would reduce emissions significantly. In Norway petroleum companies make a payment of around 1,400€/ton NO_x; in their assessment emissions have fallen by 28% from 2000 to 2020. Hence taxes at rates corresponding to external costs would make even larger reductions in harmful NO_x emissions.

The distributional effects of the tax arise mainly from the fact that it will result in higher electricity and transport fuel prices for households. The analysis carried out in the Mottershead et al. (2021) paper on taxes set at rates corresponding to external costs found the impact to on real income to be small in general. While the effect depended on how tax revenues were used there was little evidence of a regressive effect.

[13] A possible area for tax reform that has environmental implications is the taxation of agricultural land (Sainteny and Dupuis (2021). They note that current tax measures related to agricultural land and its income have multiple flaws when it comes to biodiversity and It seems timely to review the taxation of agricultural land, especially in the context of the Green Deal, the European and national strategies for biodiversity, the efforts to mitigate and adapt to climate change, and the government-set objectives to control land artificialization. As there is no detailed analysis of the impacts of any reforms, we have not included in the list to be considered at this stage.

The trade and competitiveness effects of the tax were also found to be very small.

As far as revenues are concerned, current rates of taxes on NO_x yield small amounts relative to other taxes in general and even relative to other environmental taxes. However, application at rates proposed (which are more than an order of magnitude higher) would raise considerably more – enough it would appear from the modelling to offer an alternative source of revenue to other taxes in the system.

The NO_x tax is not viewed as a tax that will be recycled to make existing fuel use more efficient; rather it is seen as an incentive to switch to cleaner fuels.

The calculation of the external costs and ways in which the tax can be levied are areas where there is wide agreement from a technical perspective.

Finally, the tax is seen as one that is national with no regional variations on rates. Variations across countries would be determined based on an agreed methodology to calculate the external cost.

5.2.2 A tax on domestic use of coal and biomass

The use of coal and biomass is a major source of air pollution in several MS (Chafe et al., 2016), particularly due to associated $PM_{2.5}$ emissions[14]. As the name applies, the tax would be imposed on households. Currently taxes on the use of coal, although not specified if used for heating, are applied in eight countries (Bulgaria, Czechia, Denmark, the Netherlands, Poland, Slovenia, Slovakia, and Norway) and are very low (Excises rates for heat from coal used at homes are generally close to the minimum rate (~1€/MWh)), the exceptions to this are Slovenia (8.42 €/MWh) and Denmark (39.26 €/MWh)[15]. Biomass is currently treated as a renewable energy source and is not subject to taxation, although this is being reviewed as part of the Energy Taxation Directive.

Based on estimates of external costs, the Mottershead et al. (2021) analysis evaluated taxes on wood and pellets in the range of 0.1-0.2€/Ton and for coal and lignite in the range 0.2-0.5€/Ton. These were initially proposed for Bulgaria, Hungary, Poland and Slovakia but an EU wide assessment was also carried out.

The Mottershead et al. (2021) evaluation did not report on the environmental impacts of the tax. The analysis notes, however, the distributional effects, which tend to affect lower income households more. Direct discussions with stakeholders in some countries revealed significant concerns about these effects, particularly among low-income rural households. Thus, some form of support for switching to efficient combustion of biomass or to the use of other renewable sources will be needed. The report finds that when tax revenues are used to provide lump sum payments across households (bespoke revenue recycling), this could alleviate the negative distribution impacts as well as provide stimulus to the economy. Experience with such recycling in practice, however, is limited. The trade and competitiveness effects of the tax are minor. Amounts raised from the tax are not likely to be large as the base is small. The technical base for calculating the tax is ranked as medium: while the principles for estimating external costs is well set out, they will vary considerably according to where the fuel is combusted (i.e., the location) as well as what type of appliance is used so setting a single tax will involve compromises which could be complex. In general discussions on such a tax are partly at the national level but schemes being implemented are more regional (e.g., in Lombardy in Italy).

[14] Small-scale combustion accounts for over 60% of EU total $PM_{2.5}$ emissions in 2021, https://www.eea.europa.eu/data-and-maps/dashboards/necd-directive-data-viewer-7

[15] Taxes in Europe Database. Available at: https://ec.europa.eu/taxation_customs/tedb/index.html

5.2.3 A landfill tax

As noted, the tax is applied widely in MS but with a range of different rates, depending on the type of waste. Landfill and waste incineration rates differ within a country and across countries, as do rates for hazardous and non-hazardous waste. Rates for other waste types also vary in some countries (e.g., inert waste). Most countries apply rates based on weight but there are exceptions (e.g., Slovenia). As noted in Section 4.4 landfill and incineration taxes that proved highly effective where used. In the EC's "Early Warning Reports" to Member States, they are recommended as a good way of meeting waste targets. Furthermore, Directive 2018/850 includes the target "By 2035, the amount of municipal waste sent to landfill sites should be reduced to 10 per cent or less of the total amount of municipal waste generated (by weight)." Probably the best way is to introduce them gradually (e.g., €5 increase per ton each year).

The proposed rates for a landfill tax in the Mottershead et al. (2021) review start at 30-35€/tonne in 2020 rising to 70€/tonne in 2030. This is higher than current rates in most MS but not all (e.g., Ireland has a rate of 75€/ton). Previous studies have shown that where rates are in the range proposed the environmental impacts will be significant (Withana et al., 2014). The EC (2021) study finds very low distributional, trade and competitiveness effects of such a tax. The revenues raised are moderate contribution to pollution and resource taxes but are an important source of revenue for the waste management sector. As observed, there is not much agreement on how the tax should be applied and even at the technical level, estimates of external costs are subject to problems in estimation.[16] The issue of waste taxation is generally addressed at the national level.

5.2.4 PAYT

Pay As You Throw (PAYT) is a charge made on households and businesses based on either the weight or volume of waste. Studies have shown that weight-based charges are more effective in reducing the amount generated (Mottershead et al., 2021). Eight countries have PAYT schemes at national level. Subsequently, the scheme began to spread to almost all European countries. The instrument is applied at the municipal level in a number of cities in MS. Although the exact number is not, it is widespread in Switzerland, Germany, Italy, Denmark, and the Netherlands. Some examples of European cities that have introduced these schemes are Berlin, Brussels, Munich, Vienna and Dublin. In most cases, PAYT has been implemented in the context of selective door-to-door collection.

The proposed program in Mottershead et al. (2021) review was for a charge of 0.16-0.22€/kg, with the initial application in Latvia (at the lower rate) as well as Cyprus, Greece, Estonia, Malta and Slovakia (at the higher rate). In the scenario 80% of revenues from the PAYT are recycled back into the economy (the rest used to defray the costs of the program). For the first five years, these revenues are used to invest in waste management facilities. After five years, revenues are used to reduce employer's social security contributions. The modelling indicates the tax does reduce real incomes by a small amount, but these impacts can be cancelled if the tax is used to reduce other tax rates or increase investment in other parts of the economy. Overall, the PAYT results in small negative effects on real incomes in the selected countries, in all scenario variants. In most countries, the effect in percentage terms is higher for upper quintiles, since these groups are likely to generate more waste. Only in Greece is the effect in percentage terms largest for the lowest quintile, but the variance between the quintiles is minor. The review notes that such a tax raises the risk of fly tipping, so more resources will need to be allocated to prevent that.

[16] See BIO Intelligence Service (2011)

Determining the appropriate tax rate is not something on which there is wide agreement and rates are likely to vary across municipalities, making a national program more difficult to set up.

5.2.5 A pesticide tax

The tax is currently applied in three countries at rates that vary. They are calculated in a complex way in Denmark (which combines elements of human health and eco-toxicity components). The rate is simpler in Sweden where it is applied at 3.2€/kg of active substance. The proposed program in the Mottershead et al. (2021) review does not give the rates, which are broadly based on the Danish model to derive a national rate for each country. Under the program analyzed, the tax would initially be introduced in Austria, Belgium, Luxemburg, Slovenia and Sweden. The revenues raised from the tax are significant, at least initially, but they decline as the modelling indicates that the rates of application will fall quite a lot. All revenues are recycled back to the agriculture sector[17].

The main impacts come from the agriculture industry, which passes on the costs to consumers, leading to higher domestic and export food prices. Households faced with higher food prices see their real disposable income fall while higher export prices cause negative competitiveness impacts. Domestic chemical companies, which produce pesticides, as well as imports of chemicals, are expected to see reduction in demand. The modelling indicates, however, that changes in GDP or employment, although variable across countries, are very small (less than 0.02% in all cases). The pesticide tax is also projected to have very small net effects on the competitiveness (i.e., trade balance) of the selected countries.

As noted, the revenues would be significant to start with but decline over time. For example, the modeling suggests that in Austria they would amount to 750€ million in the first year but decline to 320€ million by 2030. The calculation of the tax is complex, but the principles are clear and it should be possible to reach agreement on the method. It will be important to differentiate between different active substances according to their hazard or risk for human health and the environment. Given that some pesticides are applied at rates of several kg per hectare, and others at a few grammes per hectare, using the same metrics across all active substances has limits. In particular, low risk substances (such as baking powder), often used in organic farming, are applied at high dosage. Therefore, there is a risk of that an un-differentiated pesticide tax could incentivize a shift towards high-risk substances, which would be a perverse outcome. A national approach is appropriate, allowing for regional differences if necessary.

5.2.6 A fertilizer levy

According to the OECD PINE database, a fertilizer tax is currently levied only in Denmark although Austria, Finland and Sweden have had such taxes in the past at rates ranging from 10-72% of the price of fertilizer depending on their environmental impacts (Rougoor et al, 2001). The same study reports a price elasticity of between 0.1 to 0.5, implying a moderate response in terms of reduced usage as a

[17] In Denmark, in order to gain acceptance for the new tax, revenues were given back to farmers in the form of reduced land taxes on farms. They were also used to give compensation to potato farmers, who — because of the nature of the crop — applied higher loads of pesticides but had less scope for substitution to pay a lower tax. As Mottershead et al. (2021) note, while the incentive to reduce pesticide use remains, revenues are not available for other possible tax reduction or investments. Their model also suggests that recycling the revenues of pesticide taxes in the agriculture sector in Sweden and Slovenia would result in less favourable employment outcomes than in the absence of the tax, as farmers tend to invest primarily in technological innovation, which results in lower levels of employment in agriculture.

result of the tax. In another review The Swedish tax is estimated to have reduced Nitrogen by about 6%[18].

Mottershead et al. (2021) propose tax rates initially in the Czech Republic, Estonia, Denmark and France (actual rates are not given). An EU-wide application is also analyzed. The proposed reforms generate significant revenues: for example, in France the amount raised in the first year is 3.6€ billion, while in Denmark it is 483€ million. As with the pesticide tax the revenues decline as demand responds to the increase in price. All revenues are recycled to the agriculture sector.

Also similar to a pesticide tax the main impacts from a fertiliser levy without revenue recycling come from the agriculture industry, which passes on the costs leading to higher domestic and export food prices. Households faced with higher food prices see their real disposable income fall while a higher export price causes negative competitiveness impacts. Domestic chemical companies, which produce fertilisers, as well as imports of chemicals, are expected to see a reduction in demand.

The modelling carried out by the study finds the magnitude of these effects to be small. In fact, the fertiliser levy brings about a small net increase in GDP relative to the baseline (0.1 t 0.3% of GDP), in each country analysed and in each scenario. Real incomes change very slightly for most quintiles and the distributional effects are very small. Although the levy reduces real income, consumption and exports as a result of higher agriculture prices, the reduction in chemical imports outweighs the negative effects. In terms of employment, some scenarios show a net loss but the maximum is 0.2% of the baseline by 2025. While there is shift in employment out of agriculture, this is mostly compensated by a gain in other sectors.

The agriculture sector benefits in all countries except Estonia through higher output. In the case of Estonia, an increase in crop production output (+0.5%) and fisheries output (+0.5%) is offset by a decrease in forestry economic output (-1.1%) in the bespoke revenue recycling scenario.

The tax would raise a large amount of revenue to being with but, as noted, this declines over time. The revenues can also be a game changer when it comes to finance for agricultural investment in more efficient and cleaner practices. The principles for calculating the tax should command wide agreement and national schemes should be feasible.

5.2.7 A wastewater pollution tax

Wastewater taxes are levied in 17 MS, based on amounts of one or more of BOD load, pesticides or other pollutants. Rates vary widely and comparisons are difficult to make as MS apply them in different combinations of environmental loads. Current revenues from such taxes are a significant part of pollution and resource taxes in several countries. Their impact on waste burdens has been found to be mixed. In an EU study of such taxes in the Netherlands the reduction in loading to water was large but the effects in other countries (Germany and Denmark) were less clear and not so much attributed to the tax as compliance requirements (ECOTEC, 2001).

Mottershead et al. (2021) proposed a water pollution tax and analyzed its impacts when implemented in Ireland and Romania (followed by an EU-wide implementation). This is not a charge for sewage services but a tax on the pollution that remains after such services have been carried out. However, as some Member States are not charging for sewerage services in line with the WFD, there needs first to be an increase in charge to meet that Directive.The rate varies by pollutant and country (actual rates are not given). More information is needed on what the tax base should be. It will not be the same in all Member States, the tax rates are modelled as additional cost to industries that discharge effluents such as the chemical, electricity, textiles, and food manufacturing sectors as well as

[18] https://ieep.eu/wp-content/uploads/2022/12/SE-Fertilizer-tax-final_REV.pdf

households that discharge waste water. Revenues are projected initially in the range of 180€ million in Ireland and 106€ million in Romania. As with pesticide and fertilizer charges, revenues decline as firms and households respond by reducing waste loads.

The negative impacts from taxing waste water pollution without recycling the revenue come from higher costs to industries that discharge effluents. The tax can also lead to an inflationary effect for the whole economy, which erodes real incomes and harms competitiveness. Households also lose out from the charges that they must pay directly, hence a reduction in overall consumer spending is expected. The magnitude of the effects, however, is found to be small, especially so when the revenues are recycled through reductions in social security payments or income taxes. But even without such recycling the negative effect on GDP is less than 0.02% and less than 0.01% on employment. Looking across household quintiles changes in real income show hardly any change in incidence (i.e., they are neither regressive nor progressive). Overall, the impact on trade or competitiveness is very small.

The tax is an important source of tax revenue both in terms of all pollution and resource taxes as well as part of the revenue of the wastewater management sector. Agreement on calculating the taxes is high and a national approach can be adopted.

5.2.8 A tax on plastic products

The implementation of a charge for plastic bags has been a success in reducing the use of such bags. The Plastic Bags Directive required the adoption of instruments ensuring that, by 31 December 2018, lightweight plastic carrier bags were not provided free of charge at the point of sale of goods or products, unless equally effective instruments were implemented. So far, no evidence has been found to suggest that levies at rates currently applied cause any serious hardship to bag users or any economic effects.

Based on this experience it should be possible to consider a tax on other plastic products such as straws, wrappers etc. Such single use items cause considerable damage to the environment and better alternatives could be promoted through a tax. For estimation of damages caused by different plastic items lifecycle assessment methodologies have been developed and could be applied to make the necessary calculations (UNEP, 2014 provides guidelines and Rebel Group Int. (2021) gives a user guide to calculating the external costs). Guidelines for the introduction of EU levy ranges could include information programs on the costs of plastic waste. The methodology has wide technical agreement but would need to be explained to policy makers. It can be applied at the national level.

An alternative way forward could be for Member States to pay into the EU budget based on the amount of plastic waste they generate that is not recycled. By directly linking financial contributions to waste generation, Member States may have a fiscal incentive to enact more robust waste management policies, invest in recycling infrastructure, or innovate in waste reduction at the source. The practical implementation of such a policy would require agreement on measurement standards, auditing processes, and equitable enforcement mechanisms to ensure fairness and effectiveness. The EU would have to use the generated revenues to support the development of recycling infrastructure in Member States needing assistance, research into recycling technologies and alternative solutions to plastics.

5.2.9 An intensive agriculture tax

At present there is no such tax in the EU. In general, agricultural land is lightly taxed. Taxes imposed include: (a) land tax as an annual tax independent of the income from agricultural land and constituting a near-fixed charge calculated by the hectare; (b) income from leasing agricultural land, (c) inheritance tax, with advantageous fiscal measures for agricultural land and (d) property transfer

tax with advantageous fiscal measures for agricultural land, (e) a wealth tax and (f) a capital gains tax. Many of these taxes are not imposed at all in some member states and where they are imposed rates vary a lot (Sainteny and Dupuis, 2021).

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These current tax measures for agricultural land do not steer towards using the best practices for biodiversity conservation, carbon storage or for reconciling crop production with biodiversity conservation in open areas prone to biodiversity loss. They can even sometimes incite land artificialization to the detriment of biodiversity, climate change mitigation, the landscape and agriculture itself. The structure of present agricultural land taxation is essentially based on economic and social considerations (Sainteny and Dupuis, 2021).

A proposal for a tax that addresses environmental issues was made in Mottershead et al. (2021). The proposal considered was to apply it to grazing livestock based on livestock densities per hectare, to incentivize a lower low stocking densities at which damage to biodiversity through overgrazing would be reduced. Because grazing at low stocking densities is frequently beneficial, there should be a stocking density threshold below which no tax is paid. Revenue from taxing farmers with high stocking densities could also be paid to other farmers with low ones, to reflect the fact that farming at very low stocking densities is often a marginally economic activity.

The scheme was initially proposed for France, Ireland and Portugal with rates of 20€/LSU in Ireland and 70€/LSU in France and Portugal[19]. In the scenario with bespoke revenue recycling, tax revenues were to be used to invest back into the agriculture sector; in the one without revenue recycling (which may be unrealistic) the agriculture industry bears the costs leading to higher domestic and export food prices. Households faced with higher food prices see their real disposable income fall while higher export prices cause negative competitiveness impacts.

The modelling of the impacts suggests that the intensive agriculture tax would not have a significant macroeconomic impact. In terms of employment, the model projects very small negative effects in France and Portugal in the scenario with bespoke revenue recycling. This is because investments in the agriculture sector tend to lead to the adoption of new technologies, with less labour required as a result. They could also include investments in the green transition, organic farming, integrating more landscape features etc. Adoption of these would be incentivised to some extent by the tax.

The tax would also lead to reductions in real income for all income groups in all scenarios. The negative effects on real incomes are driven mainly by the increase in food prices for households. The magnitude of the effect, however, is small for all income quintiles: less than 0.1% in all countries. Effects on trade are also expected to be minimal.

As such a tax has not been implemented, considerable work will be needed to design the instrument in detail and obtain agreement on its implementation. There is likely to be opposition from farmers practicing intensive agriculture, which would need to be addressed.

5.2.10A forest felling charge

According to the OECD database forest felling charges[20] are currently imposed in seven EU Member States countries (Austria, Croatia, Hungary, Italy, Latvia, Lithuania and Sweden). The justification is the loss of biodiversity and other terrestrial ecosystem services that result from tree felling in natural forests. The Mottershead et al. (2021) review notes that the range of site-specific estimates of the economic value of forests makes it impossible to propose a single figure for the external cost per

[19] Presumably the rates are applied where densities are above a threshold, but the details are not given in the report.

[20] Referred to in the Annex 1 as Charges for Logging or Tree Removal.

hectare of forestry. However, it concludes that the costs are likely to be in the hundreds if not thousands of euros/ha., while current felling charges in states that have them (Croatia, Hungary and Lithuania) are less than 30€/ha.

The same report proposes a felling charge introduced in Latvia at the much higher rate of €2,850 per hectare, payable by the timber industry. In the scenario with bespoke revenue recycling, revenues are used toward public spending on nature conservation. With such revenue recycling the model projects a gain in GDP of around 0.5% and of employment of around 0.3% by 2030 relative to the baseline. In terms of distribution, the effects are least favourable in the lowest income group, suggesting the tax could have a regressive distributional effect but the magnitude of the effect is small. Other macro effects (on trade and competitiveness are very small). Revenues collected could be significant from taxes at the rates proposed, making an important contribution to conservation of biodiversity and protection of ecosystems.

There is limited agreement on the basis for calculating such a tax (although guidance on this is available[21]) but it is not relevant in all countries so an EU-wide tax could be difficult to agree on.

5.2.11An air passenger tax

A tax ~~charge~~ on aircraft, based on emissions/noise is levied in 9 Member States. Rates typically applied, however, are relatively low, for example, in Bulgaria noise charges are between €0.19-1.36, while in Denmark NO_x charges are €2.25 per kg emitted. Such charges offer limited incentive for aircraft to adopt low NO_x and low noise methods of operation (European Commission, 2019).

Several Member States have an aviation tax per passenger, with rates varying from 23€ per person in Italy to less than 2€ in Croatia[22]. As noted earlier the imposition of such a tax can have major impacts when neighboring states do not impose such taxes so decisions on such taxes benefit from cooperation between contiguous Member States. The purpose of the tax can be seen as an attempt to internalize the cost of air transport although the full extent of the externality is not estimated.

There is also discussion on a harmonized air fuel tax and/or an air ticket tax for intra-EEA flights. The topic has been subject to a study by DG TAXUD, which concludes that implementing a tax on fuel loaded for intra-EEA flights would have noticeable impacts on CO_2 emissions in the long-term, with reductions of between 6% and 15% for intra-EEA flights, relative to the baseline, for tax rates from €0.17 to €0.50 per litre. The impacts of the fuel tax and the consequent changes in demand reduce total GDP in the EU27 by approximately €9 billion (about 0.05%) by 2050, under the assumption that revenues collected are used for deficit reduction purposes. Should the revenues be recycled, for example to fund reduction in other taxes, the negative impact on GDP would be smaller. (Riccardo, 2021). The other option is to tax passengers to internalize the externality. The study considers various alternatives for this, including a 'flat rate', a 'stepped rate' (with higher tax rates for longer distances, reflecting higher environmental impacts) and an 'inverse stepped rate' (with higher tax rates for shorter flights, as an incentive to use alternative transport options where available). No firm conclusions are offered as to which is the better alternative.

As a large part of the externalities relate to energy and climate change, the use of a tax on air fuel could be considered as outside the scope of this study. A tax on NO_x emissions could be covered by a

[21] For approaches to monetize forest ecosystem services see: guidance-dev-public-private-payment-schemes-forest_en.pdf (europa.eu).

[22] https://www.statista.com/statistics/1094975/aviation-taxes-in-europe/#:~:text=The%20United%20Kingdom%2C%20Italy%2C%20and,exempting%20aircraft%20fuel%20from%20taxation.

NO_x tax (see 5.2.1) and one on noise could be imposed as is the case in some MS. There is little agreement on the method of estimating such a tax.

5.2.12A charge on high pollution vehicles in polluted zones

Under transport we do not cover issues of harmonization on general taxes related to circulation and registration as these are mostly not linked to the environment.

A number of European cities have a congestion or vehicle user charge to drive in city centers that have significant environmental impacts (London, Milan, Stockholm). The rate of the charge can vary by the type of vehicle, with more polluting vehicles paying a higher charge and less polluting ones paying a lower charge or none at all (London). Studies of the environmental effects of congestion charging show mixed results, but nevertheless significant reductions in air pollutants were found in Milan (CO2 -35% and PM10 -18%), London (CO2 and PM10 -12%) and Stockholm (PM10 -18%)[23].

Alternatively, some controls are set for Low Emissions Zones (LEZs), where polluting vehicles are either banned or only allowed to enter on payment of a higher charge (e.g., the London Ultra Low Emissions Zone). Several cities in Europe have such controls. A recent study on the impacts of the zones on air quality projects appreciable reductions (36 to 45 percent) in NO_x concentrations by 2027 as a result of the use of such zones in Madrid, Paris, Brussels, Milan, Warsaw and London (Logika, 2023). Company Tomtom's blogpost on LEZs[24] from February 2022 evaluates the effectiveness of LEZs by using Tomtom's traffic data. It estimates effectiveness of LEZs in Paris, Berlin and London for reducing CO_2 (0.3…0.4% reduction), NO_x (7…8% reduction) and PM (27…35% reduction). The article emphasises that 'most low emission zones focus on pollutants (NO_x and PM), which heavily penalizes diesel vehicles, and commercial vehicles such as trucks and vans in particular'. There is no estimate of economic and employment impacts.

On the economic and employment effects a few observations can found in the literature. The Urban Access Regulations website[25], maintained by Sadler Consultants Europe GmbH, notes that few negative business impacts have been reported. This is despite many impacts being forecast by trade bodies, including job losses. Germany and the Netherlands have 'hardship' exemptions. Hardship exemptions were granted if the vehicle operator could prove that they could not afford to change their vehicle to comply with the LEZ. Few of these exemptions have been applied for. It notes that Gothenburg undertook a survey of hauliers and suppliers on their LEZ, which was fairly positive. 21% of respondents gave the LEZ a good 'overall rating', 28% gave it fairly good, and only 20% gave it a negative rating, despite the LEZ affecting their business operation.'

On social justice aspects of LEZs and Zero Emissions Zones (ZESs) Transport & Environment (T&E) in its 2019 publication[26] highlights the need to 'help worse off families to purchase clean cars', where absolutely needed (e.g., shift workers). T&E also discusses the possibility of special rules for certain categories of drivers (e.g., residents or disabled people). An example of trying to cater for social justice aspects is the Barcelona LEZ which, following a number of protests and the annulment of the LEZ by a Regional Court on environmental justice reasons, includes various exemptions (e.g., low-income citizens; self-employed carriers close to retirement; 24 daily exceptions allowed per year, exemptions

[23] https://www.epomm.eu/newsletter/v2/content/2015/0415/doc/eupdate_en.pdf

[24] Tomtom website post: Do low emission zones work? TomTom Traffic Index has the answer. Available at: https://www.tomtom.com/newsroom/explainers-and-insights/do-low-emission-zones-work/

[25] https://urbanaccessregulations.eu/low-emission-zones-main/impact-of-low-emission-zones

[26] T&E (2019). Low-Emission Zones are a success - but they must now move to zero-emission mobility Evidence shows well-designed Low-Emission Zones reduce toxic air pollution. But EU air quality and climate targets require shifting up a gear. Available at: https://www.transportenvironment.org/wp-content/uploads/2021/07/2019_09_Briefing_LEZ-ZEZ_final.pdf

related to temporarily used replacement vehicle)[27]. Prieto-Rodriguez et al. (2021)[28] in their article on London LEZ vaguely refer to 'undesired fleet turnover or negative economic impacts on small- and medium-sized enterprises in the city centre' as costs of restrictive traffic policy. However, they do not provide quantitative estimate of such costs. Poulhès et al. (2021)[29] analysed the Paris Region LEZ and concluded that 'the impact of LEZ implementation in the Paris region would be smallest for those populations that are most sensitive to pollution problems, the youngest and oldest. The wealthiest would be the big winners from the LEZ, but were also the most exposed.' Furthermore, 'cross-referencing with the previous results, the poorest populations and the unemployed, who are the biggest polluted populations at present, benefit least from the different LEZs studied here. There is therefore no evening out between the populations but, on the contrary, a widening of inequalities.' It is not entirely clear what the authors mean by this – their argument seems to be based on the finding that the benefits of LEZ are unevenly distributed, with the least advantaged population benefiting the least from the LEZ. The authors define beneficiaries as those who will benefit most from the implementation of the LEZ, as they consider that all residents are beneficiaries in terms of air quality but to different degrees, but thus excluding the analysis of the distribution of costs of LEZs. The authors imply that the parts of population that stay close to their residence during the day (the unemployed, the retired and the very young) do not benefit from LEZ as much as the most mobile parts of the population – a conclusion that seems a bit simplistic and prone to criticism.

In all the studies reviewed we do not find a comparison of the effectiveness of direct regulations against charges as a means of managing LEZs.

Given the limited evidence on this topic, further research is needed to evaluate the use of a charge as opposed to urban access restrictions (such as LEZ) as the instrument for regulation. Although charges offer more alternatives for individuals to respond than bans, a priori, in practice, there can be less difference between the two approaches. Bans tend to have more exceptions (charges can be graduated) and defying the ban means receiving a fine (which can, however, be much higher than the externality). Charges provide a gradual incentive to drivers to switch to cleaner vehicles (and can be accompanied with a subsidy to phase out polluting vehicles) and can be less costly than a direct ban, which provides an incentive to switch but is a more extreme in its impact. At the same time, charges are seen as regressive, as the most polluting means of transportation are often owned by lower-income households (although bans also are likely to fall more on such households and also will be regressive).

5.2.13A horizontal category of Extended Producer Responsibility

Extended Producer Responsibility (EPR) is an environmental policy approach that extends the — financial and sometimes organisational — responsibility of producers for their products beyond the traditional point of sale and throughout the product's lifecycle, particularly focusing on the post-consumer stage.[30] This encourages producers to consider the entire lifecycle of their products, and

[27] ElDiario.es: Barcelona eximirá de la Zona de Bajas Emisiones a las personas con las rentas más bajas (4.10.2022). Available at : https://www.eldiario.es/catalunya/barcelona-eximira-zona-bajas-emisiones-personas-rentas-bajas_1_9594377.html

[28] Prieto Rodríguez, Juan and Pérez Villadóniga, María José and Russo, Ana and Salas, Rafael, The Impact of London Traffic Restrictions: Effective but Insufficient (February 22, 2021).

[29] Poulhès, A., Proulhac, L. (2021). The Paris Region low emission zone, a benefit shared with residents outside the zone, Transportation Research Part D: Transport and Environment, Volume 98, 102977. ISSN 1361-9209. https://doi.org/10.1016/j.trd.2021.102977.

[30] See Article 3(21) of Directive 2008/98/EC on waste as amended by Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018. *https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02008L0098-20180705*

design products that use materials with lower environmental impacts, that are easier to reuse, recycle, or dispose of in an environmentally friendly manner.

The 2008 Waste Framework Directive set general requirements for EPR. Member States, through their respective legislation, are responsible for the implementation of EPR schemes and, at least initially, these were designed and implemented in a heterogeneous manner across Member States (BIO Intelligence Service, 2014).[31] The 2018 revision of the Waste Framework Directive introduced general minimum requirements (Article 8a) to increase effectiveness and performance of EPR schemes across the EU. Although Member States have discretion over whether to establish EPR schemes for many products and materials, they are required to establish producer responsibility arrangements in the following areas:

- All packaging;
- Waste electrical and electronic equipment (WEEE);
- Batteries and accumulators;
- End of life vehicles (ELV);
- Fishing gear and single-use plastic products.[32]

In addition, the proposed 2023 targeted revision of the Waste Framework Directive extends EPR to textile, textile-related and footwear products,[33] and the proposed revision of the Urban Wastewater Directive[34] extends the application of EPR to micropollutants of urban wastewater deriving from medicinal products for human use and cosmetic products.

Producers can fulfil their EPR obligations via individual producer responsibility systems, where producers take responsibility for their own products, or in collective producer responsibility systems, where producers of the same product type collaborate and pay an EPR fee to a Producer Responsibility Organisation (PRO) (Laubinger et al. 2021).[35] However, some Member States collect EPR fees to a central fund. For example, Hungary and Croatia are collecting EPR fees for WEEE via a state fee/tax. Denmark has opted for a tax-based internalisation of packaging waste management costs rather than setting up an industry-run funding system (Adelphi, 2021).[36]

Fees paid by producers to PROs are set based on measurable product characteristics. The sophistication of fee modulation varies from basic to advanced. A basic fee scheme applies simple

[31] BIO Intelligence Service (2014). *Development of Guidance on Extended Producer Responsibility (EPR).* https://ec.europa.eu/environment/pdf/waste/target_review/Guidance%20on%20EPR%20-%20Final%20Report.pdf

[32] More precisely, food containers, packets and wrappers, beverage containers, cups for beverages, lightweight plastic carrier bags, wet wipes, balloons, tobacco products with filters, as for Article 8 of Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0904

[33] Proposal for a Directive of the European Parliament and of the Council amending Directive 2008/98/EC on waste. COM(2023) 420 final. Article 22. https://environment.ec.europa.eu/system/files/2023-07/Proposal%20for%20a%20DIRECTIVE%20OF%20THE%20EUROPEAN%20PARLIAMENT%20AND%20OF%20THE%20COUNCIL%20amending%20Directive%20200898EC%20on%20waste%20COM_2023_420.pdf

[34] Proposal for a Directive of the European Parliament and of the Council concerning urban wastewater treatment (recast). Brussels, 26.10.2022. COM(2022) 541 final. Article 9.

[35] Laubinger, F. et al. (2021). Modulated fees for Extended Producer Responsibility schemes (EPR). *OECD Environment Working Papers*, No. 184, OECD Publishing, Paris, https://dx.doi.org/10.1787/2a42f54b-en. https://www.oecd-ilibrary.org/docserver/2a42f54b-en.pdf?expires=1702649156&id=id&accname=guest&checksum=C3FEFE0FE9232FFD226E0C5B9F3F5315

[36] Adelphi (2021). *Analysis of Extended Producer Responsibility Schemes.* https://erp-recycling.org/wp-content/uploads/2021/07/adelphi_study_Analysis_of_EPR_Schemes_July_2021.pdf

averages per material (weight) or product type, based on measurable end-of-life (EoL) cost differences, whereas an advanced fee scheme increases the specificity of fees through a more granular EoL cost allocation (higher and lower fees) or a system of bonus/malus adjustments. The greater specificity provided by advanced EPR fee modulation should in theory strengthen the incentives for Design for Environment that considers the whole lifecycle of a product, going beyond the EoL phase, but could result in increased complexity and administrative burden (Laubinger et al. 2021).

Although there is evidence that EPR implementation has resulted in increased rates of separate collection of waste that can be problematic in the general waste streams (e.g., batteries), increased recycling rates and reduced landfilling or incineration of covered products and materials, there is little evidence that EPR schemes have worked successfully as a tool for Design for Environment (Braun et al. 2023).[37] This is due to the fact that upstream processes to facilitate the transition to a circular economy and waste prevention, such as design for reusability, reparability, and durability, are hardly used in the modulation of EPR fees in Member States. Presently, EPR fees do not differentiate between products and packaging, which are designed for reuse, remanufacturing, repair or recycling. Hence, there is no incentive for a producer to make upstream design changes, specifically focusing on waste prevention. Furthermore, EPR fee structures rarely take into account the social and environmental costs associated with the products. The size of modulated fees is a crucial factor to improve product eco-design and it should vary depending on whether products are designed towards complying with the top levels of the waste hierarchy. For instance, products designed to promote waste prevention and preparation for reuse should incur lower fees than those designed only for improving recyclability (Ecologic Institute, 2021).[38]

Laubinger et al. (2021) define a classification for fee modulation (by criteria and methodology) and discuss several issues that need to be considered when implementing advanced fee modulation. They also provide several policy insights and good practices of applying advanced fee modulation based on a few EPR schemes that have started using it. The European Commission requested a study to support preparation of the guidance on the implementation of the general minimum requirements for extended producer responsibility schemes set out in Article 8a, which was carried out by Eunomia (2020). The study includes an overview of the different types of approaches to fee modulation across a number of Member States, considerations for fee modulation principles, and criteria for fee modulation for packaging, electrical and electronic equipment (EEE) and batteries.

Some countries have already implemented voluntary or mandatory EPR schemes for other waste streams, including schemes for tyres, waste oil, graphic papers, farm plastics, medicines and medical products, plastic bags, photo-chemicals and chemicals, newspapers, refrigerants, pesticides and herbicides, lamps, light bulbs and fittings, textiles, construction materials, and more (Eunomia, 2020). For example, Belgium, Italy and Spain have adopted mandatory EPR programmes for cooking oils, and the Netherlands, Sweden, and France have implemented mandatory EPR schemes for textiles (Braun et al. 2023).

In France, for example, there are more than twenty sectors with EPR schemes, the implementation of which is taking place gradually. Before the anti-waste law for circular economy (AGEC Law)[39], there

[37] Braun, A., Laubinger, F., Börkey, P. (2023). New Aspects of EPR: Extending producer responsibility to additional product groups and challenges throughout the product lifecycle. *OECD Environment Working Papers*, No. 184, OECD Publishing, Paris, https://dx.doi.org/10.1787/cfdc1bdc-en. https://www.oecd-ilibrary.org/environment/new-aspects-of-epr-extending-producer-responsibility-to-additional-product-groups-and-challenges-throughout-the-product-lifecycle_cfdc1bdc-en

[38] Ecologic Institute (2021). *Extended Producer Responsibility and Ecomodulation of Fees.* https://www.ecologic.eu/sites/default/files/publication/2021/50052-Extended-Producer-Responsibility-and-ecomodulation-of-fees-web.pdf

[39] Legifrance (2020). LOI n° 2020-105 du 10 février 2020 relative à la lutte contre le gaspillage et à l'économie circulaire (1). https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000041553759

were EPR schemes on batteries and accumulators, EEE, ELV, household packaging, unused medicines, tires, household graphic papers, textiles and shoes, household chemicals, furniture, gas cylinders, out-of-use boats, perforating objects for self-treatment patients, and refrigerants. The new AGEC Law, adopted in February 2020, has significantly modified the system of organisation of the sectors. It has added eleven new sectors and extended other EPR schemes. In addition, the objective is no longer only to treat the waste generated, but also to prevent it. The obligation now involves acting across the entire life cycle of products, in particular by encouraging eco-design and extending the lifespan of these products, as well as by promoting repair and reuse (Notre-Environnement, 2023).[40] The eleven new sectors created by AGEC Law and the year of introduction are:

- Tobacco (2021);
- Building construction products or materials (2022);
- Toys (2022);
- Sporting goods (2022);
- DIY and gardening articles (2022);
- Drain oils (2022);
- Mineral or synthetic, lubricating or industrial oils (2022)
- Non-biodegradable synthetic chewing gums (2024);
- Single-use sanitary textiles and pre-soaked wipes for personal and domestic use (2024);
- Professional packaging (2025);
- Fishing gear containing plastic (2025) (Service Economie Circulaire et Déchets, 2021).[41]

In 2021, 9.4 Mt of waste was collected separately (out of a deposit of 16.3 Mt) in France. PROs, called eco-organisations in France, received €2 billion in revenue (including €1.8 billion in fees), of which 830 million euros were passed on to local authorities responsible for a large part of the collection and sorting of waste. The remainder directly financed operational collection and processing costs of €738 million and other expenses of €403 million (Notre-Environnement, 2023). This shows that EPR schemes can be an effective instrument to collect funds for the waste management of certain products.

Braun et al. (2023) discuss the application of EPR schemes to additional product groups, such as plastic products beyond packaging, textiles, construction materials, and food waste, and to environmental impacts that occur throughout the life cycle of a product, such as design considerations, pollution, and littering. The authors evaluate the successes and challenges that early adopters of EPR schemes to new product groups or additional environmental impact categories have experienced. Both Eunomia (2020) and Braun et al. (2023) note that while EPR schemes provide opportunities to encourage improved design and management of products and packaging in line with the waste hierarchy, EPR is just one of several tools available to policymakers. Hence, consideration should also be given to the role of other supporting instruments in delivering improvements in the application of the waste hierarchy, such as taxes, charges, and product standards. Indeed, EPR may not always be the best policy option, and other tools may be better adapted to serve a certain purpose. A consideration before the establishment of an EPR should be whether producers have sufficient leverage and the specialised expertise required to reduce environmental impacts of their products, or whether they could play a role in coordinating such expertise across the value chain to reduce EoL impacts. In some instances, consumer behaviour has a primary role in the environmental impact, whereas in other cases, mitigation of EoL impacts lies beyond the expertise of the producers to benefit from their

[40] Notre-Environnement (August 10, 2023). *Les filières à responsabilité élargie du producteur.* https://www.notre-environnement.gouv.fr/themes/economie/les-dechets-ressources/article/les-filieres-a-responsabilite-elargie-du-producteur-486

[41] Service Economie Circulaire et Déchets (2021). *Les filières à Responsabilité Elargie du Producteur (REP). Les nouvelles mesures issues de la Loi relative à la lutte contre le gaspillage et à l'économie circulaire.* https://www.ordeec.org/fileadmin/user_upload/20210506-cadre_reglementaire_REP_loi_AGEC_VF.pdf

involvement. If consumer behaviour is the main source of environmental impacts, other policies, such as more systematically enforced fines for littering, may be more effective in incentivising behaviour change. Where EPR becomes just a funding instrument, a waste charge or an earmarked tax that implements the PPP may be more advantageous (OECD, 2023).

Hence, although Member States can benefit from EPR schemes in collecting the necessary funds to manage the EoL of certain product groups or packaging, the expansion of application of EPR to other products needs to be well investigated to ensure that the most suitable policy instrument and most suitable design for that specific product group is implemented.

5.2.14A mineral extraction tax

A mineral tax is currently applied to ten member states. In addition, in 2024, Finland is going to introduce a mineral extraction tax. Countries charge rates by volume (m^3) or weight (kg or tonnes) of materials extracted and cover the extraction of various natural resources, such as gravel sand, coal, lignite, or peat. For example, Finland's taxes will be on metal ores at 0.6% of the metals taxable value, while non-metal minerals will be taxed at a rate of 0.20€ per tonne of mined ore or industrial mineral (VERO). Tax rates in Estonia range from 0.6€/m^3 to 3.34€/m^3, and 2.03 €/t to 3.03€/t of material extracted, depending on the resource (Nõmmann, 2022). By contrast, in Sweden, which governs its mining sector using a concessionary system, mining companies must pay an annual mineral fee of 0.02% of the total value of annual production with two thirds of this going to the land owner (in cases when the concession is in an area which is owned by a party other than the concession holder) and one third to the state (Tarras-Wahlberg, 2023).

The Swedish fiscal regime around mining activities has faced considerable criticism for being overly advantageous to mining companies. The criticisms directed towards it respond to two of the main principles of environmental taxes: that they should be used as instruments to correct market failures (i.e., the negative externalities of extractive activities not reflected in the market price of the minerals) and ensure that polluters pay (EEA, 2008; Tarras-Wahlberg, 2023). In general it is considered that other EU MSs have structured their mineral extraction taxes in such a way as to penalize the sectors' negative environmental and social externalities and protect natural landscapes and ecosystems from the expansion of extractive activities (EEA, 2008).

The European extractive sector finds itself at an inflexion point of several global phenomenon, including increased climate and environmental consciousness. This situation provides significant new opportunities for the reimagining and greening of the sector's fiscal regime, into one in which the negative impacts of extractive activities are recognized and paid for (Readhead, Tarus, Lassourd, Madzivanyika, & Schlenther, 2023).

An example of how current mineral extraction taxes could be reimagined and expanded is based on the introduction of a royalty system and a resource rent tax in Sweden that would have significant revenue benefits for the government. The introduction of a 4% royalty system would increase government revenue by 12%, while the combination of a royalty system and a resource rent tax would result in a 45% increase in government revenue (Tarras-Wahlberg, 2023).

However, given the limited data on this topic, further research is needed to properly evaluate the implementation of mineral extraction taxes, their impacts, both physical and economic, and the best practices to be replicated across member states.

5.3 Recommended areas for an EU-wide application of environmental taxes

Taking forward any of the taxes identified above would require consideration of the external costs, distributional impacts, competitiveness impacts and level of application i.e. local versus national.

The exact rates of tax or charge can be expected to vary across MS. There would need to be consideration of the method for setting the tax or charge, for example if based on external costs, and the approach to be adopted in calculating that cost. Some calculations have been provided in the review for selected MS. The design of the tax would also involve consideration of complementary regulatory policies, including support for households and enterprises that are unduly affected by the tax. In this regard, one option could be to have a flexible menu linked to a minimum total share of green taxes. This could be supported by an indication of the most relevant and attractive taxes that Member States should review and consider, drawing on the options presented here.

Table 5-1: Candidates for Possible Harmonized Environmental Taxes in the EU								
Tax	**Current Use**	**Environmental Benefits**	**Distributional Impacts**	**Competitiveness/ Trade Impacts**	**Revenues Raised as % of Tax**	**Revenues Raised as % of Sector**	**Agreement on Tax Calculation**	**Local Vs National[42]**
NO_x Tax	11 MS	High (2)	Low (1)	Very Low (1)	Current Low (3) Potential High (1)	Not Known	High	National
Domestic Biofuels/Coal	Few MS	High (1) (4)	Potentially High Negative	Very Low	Low	Not Known	Medium	National
Landfill	23 MS	High (5)	Low (1)	Very Low	Medium (3)	High	Low	Mixed
PAYT	8 MS plus some cities	High when based on weight (1)	Low (1)	Very Low (1)	Low	Low	Medium	Local
Pesticide	3 MS	High (1) (5)	Low (1)	Very Low (1)	Low Now (3). Potential High but declining over time (1)	Not Known	Medium	National
Fertilizer	1 MS now but more in the past	Medium (6)	Low (1)	Low (1)		Moderate	High	National
Waste Water	17 MS	Mixed (7)	Very Low	Very Low	Medium to High	Medium to High	~~High~~Medium	National
Plastics (including packaging)	18 MS	High	Very Low	Very Low	Low	Low	Medium	National
Intensive Ag.	None	High (1)	Low	Very Low	Medium to High	Not Known	Low	National
Forest Felling	3 MS	High (1)	Small Negative	Very Low	Low	Medium	Low	National
Air Passengers	9 MS	Low (8)	Low	Depends	Low	Low	Low	National
High Pollution Zones Vehicle	Some Cities	High (9) but from mixture of bans and charges	Potentially High Negative	Not Known	Not Known	Not Known	Low	Local

Notes:
(1) Mottershead et al. (2021)
(2) Evidence from Norway. https://www.norskpetroleum.no/en/environment-and-technology/emissions-to-air/
(3) Eurostat (2023)
(4) Chafe Z. et al. (2016)
(5) Witana et al. (2014)
(6) Rougoor et al, 2001
(7) ECOTEC (2001)
(8) Civil Aviation Authority (2013)
(9) Logika (2023)

[42] Where policy is declared as national, this may not hold in some member states, where such decisions are taken at the local level.

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Annex 1: Environmental Taxes and Charges in EU Member States

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE
Emissions Charges																											
Aircraft Noise and Emissions Charge					x					x		x					x		x	x		x				x	x
Emissions to Water – BOD	x	x	x	x		x			x					x	x		x		x		x		x		x		
Emissions to Water – Pesticides	x	x				x				x				x	x		x				x		x				
Emissions to Water - Other	x	x	x	x		x			x					x	x		x		x		x		x	x	x		x
Emissions to Air – NO_x		x	x	x		x			x	x	x	x		x											x		x
Emissions to Air – Particles/ Dust		x	x			x				x	x			x			x				x		x				
Emissions to Air – Sox, Sulphur		x	x	x		x			x	x	x	x		x			x				x		x		x		x
Emissions to Air - Other		x	x			x			x	x	x			x			x				x		x	x	x		
Solid Waste Disposal to Landfill Fee	x		x	x	x	x	x	x	x	x	x	x		x	x		x	x	x	x	x	x		x	x	x	x
Ozone Depleting Substances Levy			x	x								x		x			x				x				x		
Manure Tax	x																		x								
Product charges																											
Green Vehicle Tax Differentiation	x		x	x	x		x			x		x							x							x	
Oil Recycling/ Treatment Levy											x															x	
Levies on Pesticides				x								x															x
Levies on Fertilizers				x																							
Collection/ Disposal of Batteries	x			x								x					x			x	x	x			x		x
Collection/ Disposal of Electric/ Electronic Products												x									x	x		x	x		
Levies on Plastics (including packaging)	x			x	x	x	x	x	x			x		x	x		x	x	x		x	x		x		x	x
Levies on Aluminium Sheets & Strips	x				x												x								x		
Levies on Disposal Cameras	x																										
Levies on Paints, Inks & Solvents	x			x																							
Levies on Tyres		x		x							x						x	x			x	x		x	x	x	

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE
Levies n Collection & Disposal of Vehicles				x																				x		x	x
Tax on Non-Deposit Containers				x																							
User charges																											
Charges for Visits to National Parks								x			x						x				x						
Fee for Landscape & Nature Protection		x				x					x		x							x							
Charge for tree Protection															x					x							
Hunting & Fishing Tax		x		x		x		x	x		x					x		x		x	x	x	x			x	x
Volumetric Charge for Water Abstraction	x	x	x	x	x	x			x	x	x		x	x		x	x		x	x	x		x	x	x		
Volumetric Charge for Water Disposal	x		x		x	x			x	x	x	x		x	x	x	x	x		x			x	x		x	
Charge on Waste Producers Based on Quantity				x						x		x							x	x				x		x	x
Charges for Mineral Extraction						x					x		x	x	x						x		x	x	x		x
Charges for Logging or Tree Removal											x									x	x						
Road Pricing	x											x								x							x
Source: OECD PINE Database and National Tax List																											

Annex 2: Tax rates

Table A2-1: Tax Rates of Identified Environmental Taxes and Charges in EU Member States		
Member State	**Name**	**Tax Rate Applied**
Air pollution		
Italy	Tax on emissions of sulphur dioxide (SO_2) and nitrogen oxides (NO_2)	EUR 106 per t/year of sulphur dioxide EUR 209 per t/year of nitrogen oxide
Denmark	Excise duty - Sulphur	Between DKK 12.3 – 24.6 (EUR 1.7 – 3.3) per kg of SO2 or between 6.2 – 49.3 (EUR 0.8 – 6.6) per ton of material consumed
	Excise duty - Nitrogen	DKK 5 (EUR 0.67) per kg of nitrogen
	Excise duty - CFC, HFC, PFC, and SF6	Between DKK 1 – 751 (EUR 0.13 – 100.95) per kg emitted
Sweden	Excise duty - Sulphur tax	SEK 30 (EUR 2.82) per kg of sulphur in solid or gaseous fuel or SEK 27 (EUR 2.54) per m3 of oil for each tenth of a per cent by weight of the sulphur content
France	Pollution tax	Between EUR 5.34 – 1,088.1 per tonne of atmospheric emissions from polluting substances
Galicia, Spain	SO2 and NO emissions tax	Tax rates applied are: 0 – 100 tonnes emitted annually: 0 EUR/t 100.01 – 1,000 tonnes emitted annually: 36 EUR/t 1,000.01 – 3,000 tonnes emitted annually: 50 EUR/t 3,000.01 – 7,000 tonnes emitted annually: 70 EUR/t 7,000.01 – 15,000 tonnes emitted annually: 95 EUR/t 15,000.01 – 40,000 tonnes emitted annually: 120 EUR/t 40,000.01 – 80,000 tonnes emitted annually: 150 EUR/t >80,000tonnes emitted annually: 200 EUR/t
Latvia	Natural resources tax	CO: EUR 7.83 per ton emitted NH_3, H_2S & other non-organic compounds: EUR 90 per ton emitted SO_2 and NO_X: EUR 160 per ton emitted Volatile organic compounds and other hydrocarbons EUR 85.37 per ton emitted Heavy metals EUR 1,138.30 per ton emitted PM_{10} EUR 135 per ton emitted or EUR 2,700 per ton if from bulk handling at open terminals or other open areas Ozone depleting substances EUR 2.22 per kg per ozone depletion potential
Estonia	Pollution charge	SO_2 or other inorganic Sulphur compounds: EUR 145.46 per ton of pollutant CO: EUR 7.7 per ton of pollutant Particles, except heavy metals: EUR 146.16 per ton of pollutant NO_X and other inorganic nitrogen compounds: EUR 122.32 per ton of pollutant Volatile organic compounds (except mercaptans and CH_4): EUR 122.32 per ton of pollutant Mercaptans: EUR 31,785 per ton of pollutant Heavy metals: EUR 1,278 per ton of pollutant
Packaging and plastic bags		
Ireland	Plastic bag levy	EUR 0.22 for each plastic bag

Table A2-1: Tax Rates of Identified Environmental Taxes and Charges in EU Member States		
Member State	**Name**	**Tax Rate Applied**
Finland	Excise duty - Beverage packages	EUR 0.51 per litre of packaged product
Denmark	Excise duty - Tax on certain packaging, disposable tableware, and PVC film wrapping and certain bags of paper or plastic etc.	Card or laminate packaging between DKK 0.08 – 1.05 (EUR 0.01 – 0.14) per item Other material containers between 0.14 – 1.69 (EUR 0.02 – 0.23) per item Packaging of beer, water, lemonade, and other similar beverages between DKK 0.05 – 0.68 (EUR 0.01 – 0.09) per item Paper bags DKK 31.65 per kg (EUR 4.25) Plastic bags DKK 69.63 per kg (EUR 9.36)
	Excise duty - PVC and phthalates tax	When containing phthalates between DKK 0.25 – 3.60 (EUR 0.03 – 0.48) per kg, between DKK 0.05 – 0.33 (EUR 0.01 – 0.04) per item or DKK 1.7 (EUR 0.23) per m^2
Sweden	Tax on plastic carrier bags	SEK 3 (EUR 0.28) per bag or SEK 0.3 (EUR 0.03) per bag if volume below 7l and thickness <15 µm
Portugal	Contribution on low density plastic bags	EUR 0.08 per bag
Latvia	Natural resources tax	EUR 1.22 per kg of plastic packaging, disposable tableware, and accessories EUR 4.80 per kg of lightweight plastic bags, and EUR 1.50 for plastic bags with thickness >50 µ
Waste		
Ireland	Landfill levy	EUR 75 per tonne of waste disposed
Italy	Regional special tax on landfill dumping	Fixed by regional law at between EUR 0.001 – 0.01 per kg of waste delivered of inert waste and between EUR 0.00517 – 0.02582 per kg of waste like hazardous and non-hazardous waste
Finland	Landfill tax	EUR 80.00 per tonne of waste delivered to a landfill
Sweden	Tax on waste incineration	SEK 125 (EUR 11.76) per tonne
Slovenia	Tax on waste pollution	Landfill: EUR 0.0022 per one unit of soil load, EUR 0.0125 per one unit of air pollution Wastewater: EUR 26.4125 per unit of wastewater load Waste electronics: yearly reimbursement EUR 33.38, and EUR 0.0083 Waste pneumatic tyres: yearly reimbursement EUR 33.38, and EUR 0.0054 Packaging waste: yearly reimbursement EUR 33.38, and EUR 0.0017
Estonia	Pollution charge	Hazardous and non-hazardous waste: EUR 29.84 per ton Waste building material containing asbestos: EUR 0.63 per ton Cement production waste: EUR 2.98 per ton Mineral waste: EUR 1.31 per ton
Austria	Landfill Tax	Inert waste and soil excavation: EUR 9.20 per tonne Residual waste: EUR 20.60 per tonne Mass or hazardous waste: EUR 29.80 per tonne Untreated municipal solid waste: EUR 87 per tonne Incineration: EUR 8 per tonne
France	Pollution tax	Between EUR 6 - 61 per tonne of waste disposed
Latvia	Natural resources tax	EUR 95 per tonne of non-hazardous waste disposed EUR 100 per tonne of hazardous waste disposed

Table A2-1: Tax Rates of Identified Environmental Taxes and Charges in EU Member States		
Member State	**Name**	**Tax Rate Applied**
Water		
Denmark	Excise duty - Wastewater	DKK 31.65 (EUR 4.25) per kg of nitrate in wastewater DKK 174.07 (EUR 23.40) per kg of phosphate in wastewater DKK 17.41 (EUR 2.34) per kg of organic material in wastewater Waste water treatment plants, where at least 15% of the wastewater is from the households pay between DKK 0.79 – 6.01 (EUR 0.11 – 0.81) per m^2 depending on water treatment
	Excise duty - Water in pipelines	DKK 6.37 (EUR 0.86) per m^3 of water
The Netherlands	Tax on tap-water	EUR 0.359 per m^3 of tap water delivered up to 300 m^3
Estonia	Pollution charge	Charges for emission of pollutants into water bodies or groundwater: Organic matter: EUR 1,435 per ton of pollutant Phosphorous compounds: EUR 12,014 per ton of pollutant Nitrogen oxides: EUR 2,826 per ton of pollutant Suspended solids: EUR 552.89 per ton of pollutant Sulphates: EUR 7.09 per ton of pollutant Monophenols: EUR 24,326 per ton of pollutants Oil, its derivatives, liquid products obtained from the thermal treatment of solid fuel or other organic matter: EUR 4,582 per ton of pollutant Other hazardous waste: EUR 21,056 per ton of pollutant
Wallonia, Belgium	Tax on environmental impacts from farming	EUR 10 per environmental load unit
France	Pollution tax	Between EUR 46.02 – 330.48 per ton of soap powders and fabric softeners for the domestic market, depending on phosphate strength
Latvia	Natural resources tax	Between EUR 0.02 – 1.85 per m^3 of water extracted
		Between EUR 0.02 – 1.85 per m^3 of water extracted Between EUR 5.5 – 71,143.59 per ton of pollutant in water
Pesticides		
Denmark	Excise duty - Pesticides	Pesticides rates are the sum of following parts: Health duty: DKK 112.88 (EUR 15.17) per kg/ litre of pesticide times the health affect per kg/ litre of substance Environmental impact duty: DKK 112.88 (EUR 15.17) per kg/ litre of active ingredient times the environmental impact per kg/ litre of substance Environmental behaviour duty: DKK 112.88 (EUR 15.17) per kg/ litre of active ingredient times the environmental behaviour affects per kg/ litre of substance Basic duty: DKK 52.75 (EUR 7.09) per kg/ litre of active ingredient Chemical biocides rate: between 3% and 40% of the taxable value, excluding VAT, depending on product
Sweden	Tax on pesticides	SEK 34 (EUR 3.2) per kg of active substance

Table A2-1: Tax Rates of Identified Environmental Taxes and Charges in EU Member States		
Member State	**Name**	**Tax Rate Applied**
Resource Use		
Latvia	Natural resources tax	Between EUR 0.14 – 1.78 per m^3, EUR 0.18 – 0.90 per ton or EUR 0.04 per kg of resource extracted Between EUR 0.02 – 1.85 per m^3 of water extracted
Sweden	Excise duty - Tax on natural gravel	SEK 17 (EUR 1.6) per metric ton of gravel
France	Pollution tax	EUR 0.21 per tonne of natural mineral grain released to the domestic market
Electronics and other harmful goods		
Latvia	Natural resources tax	Lead batteries EUR 0.74 per kg Ni-Cd and Fe-Ni batteries EUR 4 per kg Galvanic elements and galvanic pile EUR 11 per kg Other batteries EUR 17.03 per kg
Denmark	Excise duty - Sealed NiCad-batteries	NiCad loose round cells, single or assembled button cells or gasket DKK 6 (EUR 0.81) per piece Assembled NiCad round cells DKK 36 (EUR 4.84) per parcel, min. DKK 6 (EUR 0.81) per piece Used goods: same rate as for a corresponding new good but no less than DKK 120 (EUR 16.13) per NiCad - accumulator
Sweden	Tax on chemicals in certain electronics	SEK 12 (EUR 1.13) per kg for household appliances, and SEK 181 (EUR 17.03) per kg for other electronics, with a max of SEK 497 (46.76) per product

Source: Taxes in Europe Database
Notes: Exchange rates for Denmark and Sweden are taken for 2022 from the European Central Bank data portal: https://data.ecb.europa.eu/data/data-categories/ecbeurosystem-policy-and-exchange-rates/exchange-rates/reference-rates

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