

## **2. Lessons learned from the application of product-related economic instruments**

*This section provides an overview of the existing practices in OECD and EaP countries in the implementation of the four categories of product-related economic instruments. It considers the application of each instrument to various product types, its design and impact on public revenue.*

## 2.1 Environmentally related product taxes and tax differentiation

### 2.1.1 Revenue-generating potential

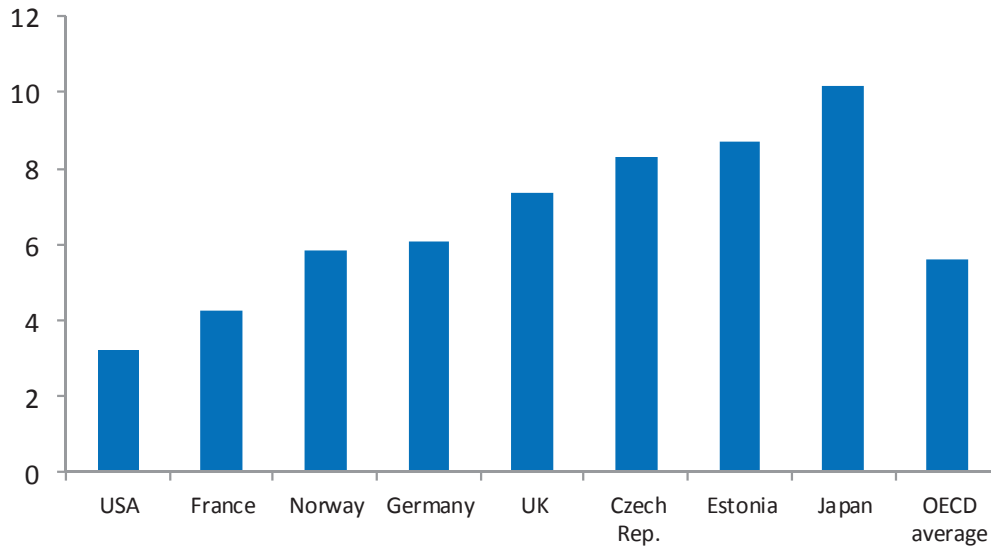
The level and pattern of revenues from environmentally related product taxes in OECD countries illustrates the revenue-generating potential of these taxes and gives a useful indication of the most significant areas of their application.

Across the OECD area as a whole, environmentally-related taxes contribute on average almost 6% of the total tax revenues (Figure 2.1.). The average amount collected in environmentally-related taxes is of the order of USD 550 per head of population, equivalent to some 1.65% of GDP in 2010.

While environmentally-related taxes contribute substantial revenues in most OECD countries, it is clear that the contribution is dominated by taxes on only two groups of products: energy products and motor vehicles (Figure 2.2.).

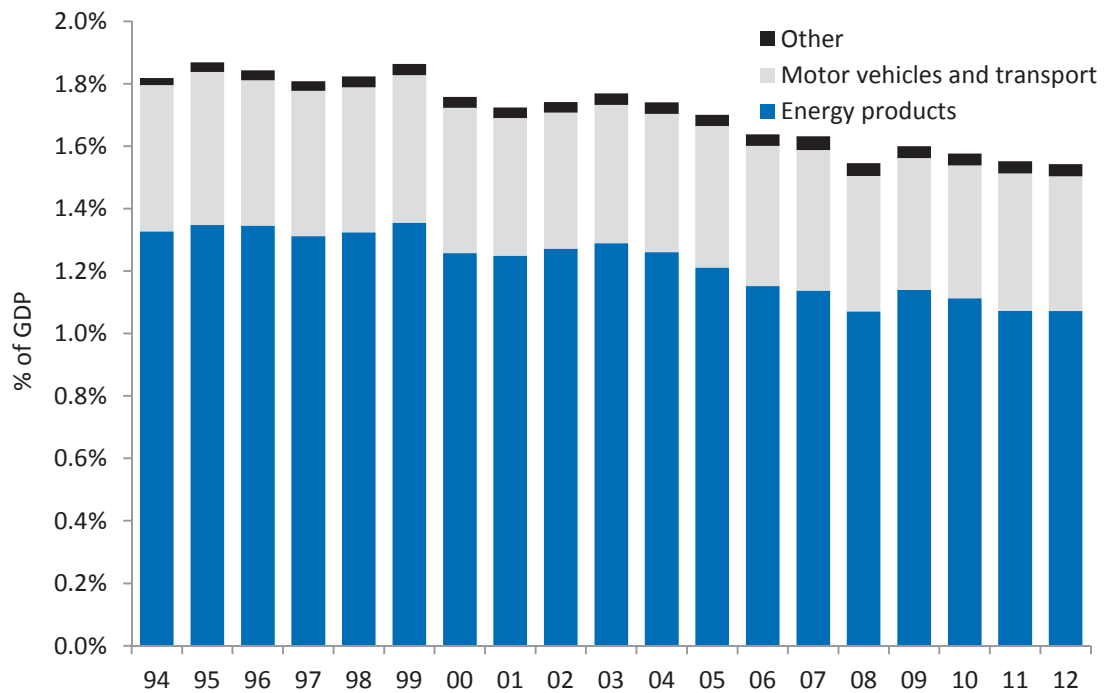
- Taxes on energy products contribute about two thirds of the revenue from environmentally related taxes in OECD countries. This contribution has, however, declined over the past two decades, from revenues equivalent to about 1.4% of GDP in the early 1990s to about 1.2% by 2010 despite the growing awareness of major environmental problems arising from energy consumption. A factor in this decline is almost certainly the steep rise in world oil prices and, consequently, in the pre-tax price of motor fuels, as shown in Figure 2.2. Rising motor fuel prices have discouraged some governments from raising motor fuel taxes in line with general inflation and, as a result, the real value of these taxes has been gradually eroded.
- Taxes on motor vehicles and transport constitute a further 30% of the total revenue from environmentally related taxes. Despite the great expansion of vehicle ownership and individual travel in recent years, this revenue contribution remained broadly static through the 1990s and 2000s.
- Barely 5% of the revenues is brought in by other environmentally-related taxes. Some of these are taxes levied directly on emissions from industrial activity or the consumption of environmental services (e.g. landfill taxes). The revenue contribution made by environmentally related taxes on products other than energy and motor vehicles is very small indeed, although, as documented below, some individual countries have implemented innovative policies using carefully targeted small-scale product taxes to address environmental objectives.

**Figure 2.1. Revenue from environmentally related taxes as a percentage of total tax revenue in selected OECD countries**



Source: OECD/EEA database on instruments used for environmental policy and natural resources management, <http://www2.oecd.org/ecoinst/queries/>

**Figure 2.2. Revenue from environmentally-related taxes as a percentage of GDP in OECD countries, 1994-2012**



Source: OECD/EEA database on instruments used for environmental policy and natural resources management, <http://www2.oecd.org/ecoinst/queries/>

All EaP countries impose taxes on environmentally harmful products (such as motor fuels and imported vehicles), but only several of them have product taxes mandated by environmental legislation. A few countries differentiate the tax rates for motor fuels based on their quality. Armenia and Moldova have the most advanced systems of taxes (sometimes also referred to as charges) on environmentally harmful products. For example, Armenia imposes taxes on 29 categories of imported products and 26 categories of domestically produced ones (Armenia does not produce cars, so it only taxes imported ones), but the revenue of all its environmentally-related taxes in 2011 amounted only 0.3% of GDP.

In interpreting the revenue data shown in Figures 2.1. and 2.2. one should bear in mind that the revenue contribution of environmentally-related taxes may be a poor indication of their environmental effectiveness. Some of the most significant tax measures have achieved their environmental effects through the differentiation of an existing product tax, so that the structure of tax rates is more closely related to the environmental characteristics of the product. In this way, existing taxes have been restructured so as to introduce or sharpen environmental incentives, as for example by differentiating motor vehicle taxes according to vehicle emissions, rather than applying a uniform rate to all cars. This effect has been achieved either by increasing the tax rate on more polluting specifications of the product, or by cutting the tax rate on less polluting specifications (as with the tax reduction favouring unleaded petrol in many EU countries in the 1990s). In the latter case, the tax change may have environmental benefits, while contributing less revenue than before.

### **2.1.2 Taxes on motor fuels**

Motor fuels are typically subject to higher taxes than other goods and services. In EU countries motor fuels – petrol and diesel – are subject to special excise taxes as well as the standard value-added tax (VAT). Motor fuel excises are levied on the basis of fuel volume (i.e. per litre) at an average rate of EUR 0.54 per litre of petrol and EUR 0.42 per litre of diesel. These excise taxes are levied before VAT is applied, so VAT applies to the price of fuel including the excise, magnifying the effect of the excise tax.

Nearly all EU Member States tax diesel at a lower rate than petrol, with only the UK taxing the two fuels at the same rate. The origin of the differential in favour of diesel can be traced back to an attempt to distinguish indirectly between motor fuels used by private motorists and by industry, and diesel was taxed less heavily because it was assumed that it was primarily used for trucks and other commercial transport. However, the differential in favour of diesel has over time encouraged the development of diesel powered private cars, which benefit from a substantial fuel tax saving. Some member states attempt to offset the lower fuel tax on diesel cars by higher taxation on the purchase or annual registration of diesel-powered cars, but this can only slightly mitigate the effects of differential fuel taxation.

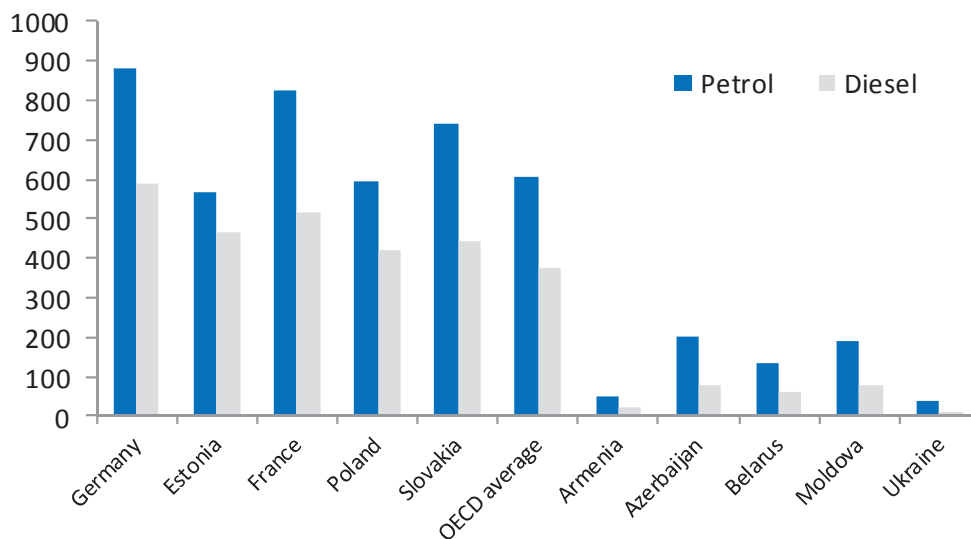
In many countries, the high taxes on motor fuels are seen as a way to discourage CO<sub>2</sub> emissions as well as traffic congestion and other road transport-related environmental problems. However, the level of taxation of motor fuel is not set in any member state on the basis of an explicit assessment of the environmental damage caused by fuel consumption or road transport more generally. In some high-tax member states there appears to be evidence that motor fuel excises are set at a level somewhat higher than the total environmental damage and congestion cost caused by vehicle use. However, a fuel tax does not distinguish between vehicle use in different contexts, and it seems likely that

vehicle use on uncongested roads is significantly overtaxed in European member states, while vehicle use on congested road-space, especially in city centres, should be taxed more heavily than at present. These effects cannot be achieved through fuel taxes, and some countries have considered the possible use of congestion charges as a better-targeted alternative instrument than heavy motor fuel taxation.

A significant fiscal development in a number of EU Member States is sharper differentiation between the taxation of fuels according to their environmental properties. In the 1980s, most European countries used a tax differential favouring unleaded petrol in order to phase out the use of leaded petrol and to accelerate the introduction of pollution-reducing catalytic converters on private cars. More recently, a number of member states have introduced lower taxes on less-damaging fuels, including low-sulphur motor fuel and biodiesel.

All EaP countries have excise taxes on motor fuels. The excise taxes on petrol are higher than those on diesel fuel in every country, as they are in the vast majority of OECD countries, but the absolute tax rates are much lower than the OECD average (Figure 2.3.)<sup>1</sup>. A few countries further differentiate the tax rates based on the quality (linked to the environmental characteristics) of motor fuels: for example, motor fuels that conform to Euro-4 and Euro-5 quality standards are taxed at lower rates than those fuels that do not.

**Figure 2.3. Excise taxes on motor fuels in selected OECD and EaP countries, EUR per tonne**



Source: EC (2013)

In addition, several countries in the region have special fuel taxes labelled as “charges on air emissions from mobile sources”. These are essentially taxes that are levied on companies that produce or import motor fuels. For example, in Azerbaijan, the rate for diesel is seven times lower than for petrol. In Ukraine, these charges (differentiated for diesel based on sulphur content) were incorporated into the excise tax as of 1 January 2015.

### **2.1.3 Taxes on other energy products**

Most OECD countries levy VAT on the sale of some other energy products besides motor fuels, including energy supplied to households and industry, although often at the reduced rate.

Given the way in which VAT operates, the VAT charged on energy supplies to industry does not provide any incentive for firms to reduce their energy use or energy-related emissions. The reason for this is that a firm which pays VAT on its production inputs, including VAT on energy supplies, can offset this VAT against the VAT bill that it has to pay on its sales. An increase in the VAT paid on the firm's purchases of energy use is thus offset by a reduction in the VAT charged on their own sales, leaving the firm indifferent to how much VAT it pays on its inputs.

In addition, many OECD countries levy excise taxes on some energy products sold to industry or households, especially heating oil. However, these are generally much lower than motor fuel excises, and are very rarely linked to the environmental aspects of energy consumption, except in the small number of countries (in Scandinavia as well as the Netherlands and Ireland) which have introduced carbon taxes.

### **2.1.4 Taxes on motor vehicles**

Taxes levied on the sale of motor vehicles and annual taxes levied on motor vehicle ownership and use can both make a significant contribution to reducing the various adverse environmental effects associated with road transport, including local and global pollution, and also traffic congestion. The environmental impact of taxes on the sale and ownership of motor vehicles can arise in two main ways.

First, any level of taxation on cars and other motor vehicles will act to discourage vehicle ownership. Given that people with cars tend to use them for journeys that could easily be made by public transport, reducing car ownership is one of the ways in which a shift towards less-environmentally damaging public transport could be encouraged by the tax system. About three quarters of EU Member States levy an additional tax on the initial sale of motor vehicles (as well as the standard VAT), and a similar proportion levy an annual tax on vehicle ownership or use. However, these taxes on the sale and ownership of cars and other motor vehicles have until recently been rather blunt instruments for reducing adverse environmental effects. In some countries the taxes have simply been a percentage of the selling price, or an annual lump sum amount. While they may have led to some reduction in the number of vehicles purchased or used, they would have had relatively little impact on the characteristics of the vehicle stock, and in particular those characteristics affecting the environment.

Second, many of the taxes levied on the sale of motor vehicles, and annual taxes levied on motor vehicle ownership, are now structured so as to favour smaller or less-polluting vehicles. In particular, over the past decade there has been a significant increase in the number of EU countries which base these taxes, at least in part, on the CO<sub>2</sub> emissions from individual vehicles. Some examples are given in Box 2.1., illustrating possible models for the structure of these taxes. These incentives within the structure of motor vehicle taxes can have a much stronger environmental impact than lump-sum taxes on vehicles, or taxes based on the selling price. To the extent that they encourage vehicle purchasers to choose a car with low emissions, this impact will be felt throughout the life of the vehicle.

The environmental differentiation of car taxes in the EU has almost entirely been introduced over the last decade. It is primarily based on official measures of the emissions performance of different models of cars, and these taxes can be straightforwardly levied and enforced based on the registration of the make, model and age of the vehicle. Where some countries base their taxes on the fuel consumption of cars, this again is based on official measures for each model.

### **Box 2.1. Emission-based taxes on the sale or annual use of motor vehicles in selected EU countries**

**Austria.** Supplementary taxes levied on the sale of private cars are differentiated to reflect various emissions characteristics. The starting point is a fuel consumption tax levied when a new car is first registered, which is based on the purchase price and fuel consumption. This is then supplemented by a “bonus-malus” system, in which vehicles with low CO<sub>2</sub> emissions receive a bonus which reduces the tax payable, while high CO<sub>2</sub> emission vehicles pay an additional surcharge on the fuel consumption tax. A bonus is also paid to vehicles using alternative fuels. Further penalties apply to emissions of particulate matter and nitrogen oxides from diesel cars, both of which are associated with ill health in urban areas, and there are bonuses for petrol cars with low emissions of nitrogen oxides.

**Finland.** Both the registration tax charged on a new car and the circulation tax charged on cars each year are based on emissions of CO<sub>2</sub>. The rates at which the registration tax is charged vary between 5% and 50%, depending on emissions.

**Germany.** The annual circulation tax for private cars has recently been modified and now comprises a component based on cylinder capacity (EUR 2 per 100 cc for petrol engines, and EUR 9.50 per 100 cc for diesel engines) and a CO<sub>2</sub> emissions-related component, calculated at EUR 2 per g/km in excess of 110 g/km (to fall to 95 g/km for cars registered from the start of 2014).

**United Kingdom.** The annual Vehicle Excise Duty has been based on CO<sub>2</sub> emissions since 2001. The rates range from zero for cars with emissions below 100g/km to GBP 475 (EUR 555) for cars with emissions above 255 g/km. There is no supplementary tax on new cars, but since 2010 the vehicle excise duty has been charged at a higher rate in the first year of registration.

*Source: Information from ACEA (2013)*

In addition to the role of emissions in “standard” motor vehicle taxes, a number of countries have introduced special incentives for electric vehicles, or other innovative low-emission vehicles. Some of these incentives are delivered in the form of an exemption or substantial reduction in sale or annual use taxes, while others may achieve the same effect through direct payment of a subsidy to vehicle sellers. For example, electric vehicles are exempt from the registration tax charged on new vehicles in Belgium (Flanders), Denmark, Greece, Ireland (up to a maximum of EUR 5 000), and Latvia. Both electric and hybrid vehicles are exempt from the registration tax in Greece and Romania. Electric vehicles are exempt from both the registration tax charged on new vehicles and the annual tax in Austria, the Netherlands and Portugal.

Most EaP countries have taxes on motor vehicles, in the form of either an excise tax, a registration tax, a “transport tax” or a “road tax”. However, their design is different. In Ukraine, the excise tax is differentiated based on the vehicle type, age, engine type and cylinder volume. In Moldova and Azerbaijan, the road tax is also levied on the engine

volume on a progressive scale, but is annual (a similar tax in Russia is regional, and the rates increase steeply with increasing horsepower). In Armenia, there is an annual registration fee diversified by vehicle weight and the type of the vehicle's catalytic converter. Georgia uses an excise tax and an import tax, both based on the volume of the engine and the age of the vehicle and paid at the time of the vehicle's registration. In none of those countries does taxation depend on emission levels.

It should be noted that taxes on motor vehicles are limited in their potential to reduce the environmental damage caused by vehicle use. They can reduce the extent of car ownership and alter the characteristics of the vehicle stock, but they are likely to have limited effects on the cost of using a vehicle for any particular journey. Indeed, if one of the effects of environmental vehicle taxes is to encourage people to buy cars with better fuel efficiency, they may have the effect of reducing the cost of each journey, and could actually encourage more journeys rather than less.

For this reason, some policy analysts advocate measures to “diversify” car costs as much as possible: to reduce the lump-sum, one-off expenditures that car owners incur and replace them with equivalent charges per journey. It is sometimes suggested that motor vehicle insurance policies could be adjusted by making the premium depend on the number of kilometres driven, so that every journey increases the insurance premium. However, the most straightforward way of increasing the variable component in vehicle costs would be to shift away from vehicle taxes towards higher motor fuel taxes.

### 2.1.5 Other environmentally related product levies and taxes

A number of countries levy other environmentally-related product taxes: on batteries, tyres, pesticides and other commodities (Table 2.1.).

**Table 2.1. Consumer products subject to environmentally related taxes in OECD countries**

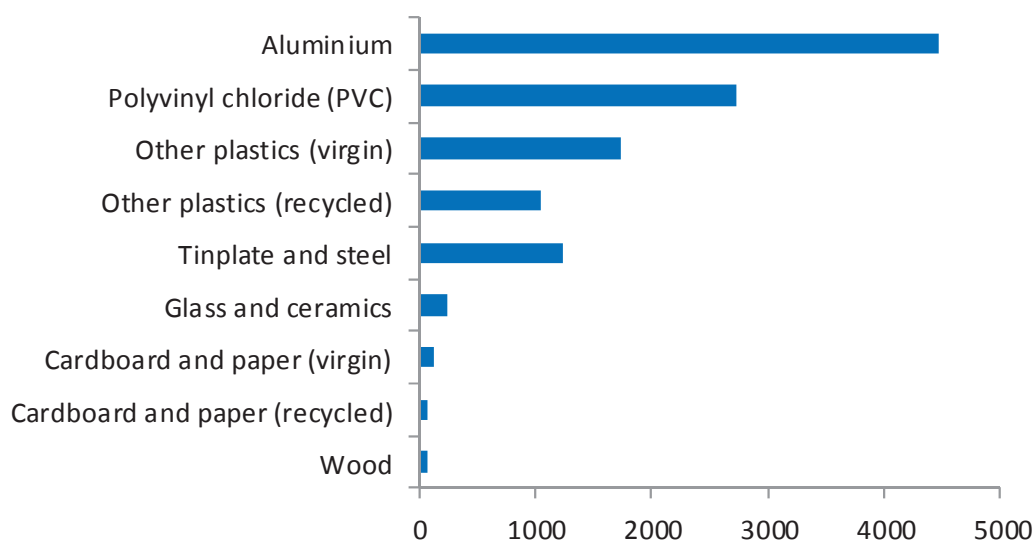
Product	Countries applying environmental tax
Household batteries	Croatia, Denmark, Hungary, Iceland, Italy, Poland, Portugal, Slovakia, Sweden
Disposable tableware	Belgium, Denmark, Latvia
Disposable cameras	Belgium
Aluminium foil	Belgium
Plastic carrier bags	Belgium, Denmark, Hungary, Ireland
Electric light bulbs	Denmark, Latvia, Slovakia
Motor vehicle batteries	Bulgaria, Iceland, Latvia, Lithuania, Poland, Portugal, Sweden
Car tyres	Bulgaria, Canada, Croatia, Denmark, Finland, Hungary, Latvia, Lithuania, Malta, Portugal, Slovakia
Paint, other solvent-containing products	Belgium, Canada
Ozone-depleting substances	Czech Republic, Poland
Pesticides	Canada, Denmark, Norway
Vehicle oils and lubricants	Canada, Croatia, Finland, Norway
Textiles	France, Denmark
Consumer electrical products	Canada, Hungary, Italy, Malta, Poland, Portugal, Slovakia

Source: OECD/EEA Economic Instruments Database, <http://www2.oecd.org/econinst/queries/>



In Denmark, a packaging tax has been levied since 1978. In its current form, the tax charged on drinks containers is volume-based, while the tax charged on other packaging products is based on weight and the environmental impact of different materials, as assessed by life-cycle analysis. Figure 2.4. shows the rates of tax levied on the principal packaging materials. The tax is paid on an equivalent basis by businesses that use packaging materials for their own products and by importers. Exports are tax-exempt to avoid damaging the international competitiveness of Danish producers. The tax, levied by the regional tax and customs administration, has proved difficult to administer because of the large number of producers involved and the complexity of its definition.

**Figure 2.4. Taxes on packaging materials in Denmark, EUR per tonne**



Source: Hill, J. J. Hislop and A. –E. Bégin (2008)

In Finland, a tax has been levied on drinks containers since the 1970s. In the 1990s, a differential tax applied, depending on whether the containers were to be refilled (zero tax), recycled (EUR 0.17 per litre) or discarded (EUR 0.67 per litre). In the current version of the scheme, both refillable and non-refillable containers are exempt from the tax if the producer participates in an approved deposit-refund scheme. The tax rates are high enough to have had a real incentive effect: Finland's packaging waste has been significantly below the EU average, though the removal of the tax advantage to refillables is likely to increase volumes of single-use containers.

In 2002, Ireland introduced a 15 cent tax (raised to 22 cents in 2007) on plastic shopping bags given free to customers by supermarkets and other retailers. The tax sought to reduce littering and to halt a very visible and unpopular waste of resources. Estimates of the impact on plastic bag use suggest that it had a large impact on consumer and retailer behaviour, with a dramatic 90% fall in the number of bags given free to shoppers (Convery *et al*, 2007). The response from the public and the retail industry was generally positive, with one survey in 2003 finding that the tax was supported by 91% of the population. In practical terms, the tax proved inexpensive to operate, with administrative costs absorbing only some 3% of revenues, mainly because it used the existing reporting and collection arrangements for VAT.

As mentioned earlier, Armenia and Moldova use environmentally related taxes on harmful products most extensively among EaP countries. In Armenia, the list of taxable product categories contains oil and oil products (except gasoline and diesel fuel, subject to excise taxes), batteries, asbestos-containing materials, detergents, plastic packaging, tyres and ozone-depleting substances, etc. However, it contains several inconsistencies and lacks clear definitions. In Moldova, the taxes apply only to imports of environmentally harmful products, as almost none of these products is manufactured domestically. The list of product categories was meant to be exhaustive and includes even cigarettes and chewing gum, which are not subject to environmental regulation anywhere else in the world. Toxic products (e.g. containing asbestos and lead, organic chemicals) are also part of the list, although in OECD countries they are not usually regulated through taxation (Box 2.2.).

### **Box 2.2. OECD recommendations on streamlining environmentally related product taxes in Moldova**

The Government of Moldova should establish an Environmental Tax Reform Commission that would include the Ministry of Environment, the Ministry of Finance, the Ministry of Economy, the Customs Service, the Producers and Importers Association, etc.

The Ministry of Environment should re-evaluate the environmental rationale of each environmentally related product tax and confine the taxes to those products where the price signal can lead to behavioural change and reduced consumption and production of the taxed product. In particular, it is advisable to:

- Retain environmental taxes on the following product groups: motor fuel, fertilisers, pesticides, paints, and surface treatment agents (with appropriate tax differentiation between more and less environmentally harmful alternatives).
- Temporarily retain environmental taxes on all kinds of packaging, motor vehicles, tyres, batteries and electric bulbs. These product categories should be subject to extended producer responsibility (EPR) schemes according to the draft Law on Waste and in line with Moldova's commitment to harmonise its environmental legislation with EU Directives. However, while the EPR schemes for these products are being developed, the taxes should remain in place. Once the respective EPR schemes are fully operational, the taxes should be phased out.
- The tax on motor vehicles, currently applicable to used imported vehicles only, should be extended to new vehicles. The differentiation of excise taxes on motor vehicles based on age and/or the level of carbon dioxide emissions (and not just the engine type and size, as is currently the case) should be considered in the future.
- Eliminate environmental taxes on the following product groups: chewing gum and tobacco products and audio/video recording media (these should not be subject to environmental taxation), ozone depleting and asbestos and lead containing products (those should be banned or heavily restricted by law).

As a first step in reforming the environmental tax rates, the Government of Moldova should increase the tax rates for the retained product categories to 5% of the selling price of the least environmentally harmful alternative in the product category and to 10% of the selling price of the most environmentally harmful alternative in the product category.

*Source: OECD (2015)*

The major difference with OECD countries is in the way the tax rates are set. In Armenia and Moldova (with the exception of Moldova's tax on plastic packaging), these

are *ad valorem* taxes (a percentage of the price), which is partly explained by their primary application to imported goods. In OECD countries they are usually set *ad quantum*: per kilogramme (or litre) or sometimes per item (e.g. for tyres or batteries)<sup>2</sup>. Therefore, it is difficult to compare most of the rates without more in-depth analysis of product prices.

### 2.1.6 Environmental differentiation of general product taxes

Most general sales taxes, such as VAT, operate with multiple rates. In some countries, an environmental incentive has been introduced by reclassifying polluting products to a higher-taxed category or by moving “green” products to a reduced-rate category. In the Czech Republic, a reduced rate of VAT is applied to environmentally friendly goods and services, including entrance to zoological and botanical gardens, natural reserves and national parks; public ground and water transport; municipal waste management, water supply and sewage treatment services; and fuel wood.

However, the scope for such environmental differentiation in the EU countries is limited by EU rules governing the VAT structure. One recent example has been the decision in the UK to apply reduced rates of VAT to work done by contractors to install certain energy saving materials and equipment in private housing. Environmental campaigners had pressed for this measure for a number of years, arguing that taxing energy at the reduced rate of 5% while energy-saving home improvements were taxed at the much-higher standard VAT rate created a significant tax bias against energy-saving measures. From an environmental point of view, this tax reform may have had a clear logic, but it was challenged by the European Commission because it went beyond the list of products to which a reduced-rate VAT may be applied in EU Member States.

## 2.2 Deposit-refund systems

The products most frequently subject to DRS are bottles, cans and other drinks containers, and a significant number of countries employ DRS for batteries. A handful of countries use DRS for motor vehicles and vehicle tyres, and some other products.

Deposit-refund systems for drinks containers, especially glass bottles, were once widespread across Europe and frequently operated on a voluntary basis by producers without any regulatory underpinning. In many countries these voluntary systems have largely disappeared, as many sellers (especially importers) have switched to single-use containers, and firms operating DRS have found them too costly to maintain in the face of intensified product market competition. In other countries, deposit-refund systems are maintained for environmental reasons, backed up by legislation to require compliance. A more recent development has been the application of DRS to single-use drinks containers, to ensure that these are collected for recycling rather than discarded as litter. Box 2.3. shows the DRS systems operated by some EU Member States, illustrating some of the models that have been employed.

In contrast, only a few deposit-refund schemes remain in place in EaP countries from the Soviet era. In Belarus and Ukraine, they are focused exclusively on glass bottles. The old system still functions in Belarus, where there are over 700 collection points for glass bottles, usually in supermarkets. In Ukraine, there is a deposit of 15 kopeks (about 1 euro cent) for 0.25 or 0.33 litre beer bottles and 20 kopeks for 0.5 litre bottles. However, a few beer producers accepting glass bottles from consumers set their own prices and do not necessarily fully refund the deposit (to increase their profit).

### Box 2.3. Deposit-refund systems for drinks containers in selected EU Member States

**Denmark.** Legislation requires deposits to be charged on bottles and cans used for beer, soft drinks, etc. Different arrangements apply for reusable bottles and single-use packaging. Individual breweries may operate their own collection arrangements so long as they achieve a reuse rate of at least 98%. Single-use bottles and cans are collected for recycling through a deposit-refund system organised by a non-profit company, financed by charges levied on producers in proportion to their sales volume. A large number of retailers and other outlets collect items and refund deposits, including products that they themselves have not sold. The system achieved an 89% return rate for single-use packaging in 2010.

**Finland.** Industry-run arrangements for DRS were set up in response to the threat that a packaging tax would otherwise be introduced. There are a number of “closed” systems run by producers or retailers which collect and recycle bottles and cans from their own customers. In addition, four separate agencies run “open” deposit-refund systems for particular container types, accepting containers used by all producers.

**Germany.** Various producer-run systems collect reusable beer and carbonated water bottles. In addition, a universal DRS for single-use containers was established in 2003. Retailers selling drinks in disposable containers are required to take back packaging of the same material as they sell, though for smaller retailers this obligation is limited to the brands they sell themselves. The system has achieved high rates of return and recycling, of the order of 98%, but does not appear to have slowed the steady trend away from refillable bottles.

**Norway.** A deposit-refund system for single-use plastic bottles and cans is run by an industry-owned non-profit company. A reduced excise tax is applied if higher rates of return are achieved. About 95% of bottles and 94% of cans are collected through this system.

*Source : Hill, J., J. Hislop and A.-E. Bégin (2008); EEA (2011)*

Deposit-refund arrangements are used by some countries to ensure that batteries are scrapped through approved channels. Denmark introduced a DRS for nickel-cadmium (NiCd) batteries in 1996. The focus on NiCd batteries alone reflects the particularly damaging character of NiCd batteries compared with alternatives, especially their contribution to cadmium pollution, and the fact that lead batteries were already covered by an effective voluntary agreement promoting recycling. An earlier voluntary agreement on recovery of NiCd batteries had achieved inadequate rates of recovery. The NiCd battery deposit-refund system is distinctive in that it operates at the producer level, and households do not receive individual refunds. A tax is levied by the Customs and Excise Department on registered producers and importers of NiCd batteries at the rate of EUR 0.80 per battery, whether sold separately or included in a product. Refunds are made by the Danish Environmental Protection Agency to the 20 or so approved enterprises that collect used NiCd batteries at the rate of EUR 16 per kilogramme – roughly equivalent to the original tax. The system collects around 50-60% of NiCd batteries, significantly higher than the 35% collected before its introduction, when the voluntary agreement was in force. At the time of its introduction, the use of NiCd batteries had been growing at around 20% per annum, and the Danish Environmental Protection Agency believes the DRS has been effective at halting this growth.

For more than 20 years Sweden operated a deposit-refund system for motor vehicles with statutory backing. Under the 1975 Vehicle Scrapping Act a Vehicle Disposal Charge was levied when a new motor was first registered. When at the end of its life the vehicle was delivered to a vehicle dismantler for scrapping, a refund (“scrapping premium”) was paid to the vehicle owner. This provided an incentive for vehicles to be scrapped through

approved channels rather than dumped in the countryside or placed in the hands of unlicensed scrap merchants. For cars, the scrapping premium paid on delivery to a scrapyards was higher for older vehicles, so the refund did not always correspond to the disposal charge initially paid. The legally-mandated DRS for end-of-life vehicles was discontinued following the 1997 introduction of EPR legislation which placed a more general obligation on producers to recover vehicles and recycle materials and components, leaving them free to determine how these requirements would be achieved.

### 2.3 Extended Producer Responsibility

EPR schemes have spread remarkably rapidly across many countries since the early 1990s. A recent review of EPR policies commissioned by the OECD (Kaffine and O'Reilly, 2013) shows that in 1990 there were only about 20 examples across the OECD area of policy measures that involved elements of EPR. This had grown to about 100 EPR schemes by 2000, and now more than 350 schemes are in operation.

Most EPR schemes relate to groups of products, and many countries have more than one scheme in operation, each covering a different product group. More than half of the schemes cover two product groups: electronic goods (35% of schemes) and packaging (17%). Many of the remaining schemes cover motor vehicles, or various vehicle components such as tyres and batteries.

Within the EU, EPR principles have been embodied in four EU directives – relating to packaging waste, batteries, waste electrical and electronic goods and end-of-life vehicles – and subsequently transposed into the corresponding national legislation. These national EPR schemes vary widely in structure and operation. Extensive details of the operating arrangements for the various EPR schemes operated in EU Member States have recently been collected as part of an EU-funded research programme on Sustainable Management of Resources.<sup>3</sup>

The first EU directive to reflect EPR principles was the EU Packaging Directive (94/62/EC, amended by 2004/12/EC), which required member states to set up systems for the recovery and recycling of *packaging waste*. The development of this directive drew heavily on the experience of Germany's path-breaking Packaging Ordinance of 1991, which required retailers and manufacturers to take back product packaging and achieve targets for recovery and recycling of different packaging materials. Many systems implemented across the EU have drawn on elements of the German model, in particular the assignment of operational responsibility to one or more PROs financed by output-related fees charged to participating firms (Box 2.4.). A small number of member states use alternative arrangements to achieve similar outcomes: the UK uses a system of tradable packaging recovery credits, while Denmark, Hungary and the Netherlands apply taxes and deposit-refund systems rather than producer-financed EPR (EC, 2012).

Separate recovery of *batteries* has been a priority for waste management policy, because of the potential harmful effect of the inclusion of batteries in landfilled or incinerated waste streams. The EU Directive on Batteries and Accumulators (2006/66/EC) requires member states to introduce measures to facilitate the separate collection of used batteries (consumer batteries and vehicle batteries) and places an obligation on manufacturers and importers to finance the costs of collection and recycling activities in proportion to their market share. Most member states now have operational EPR schemes for batteries.

The EU Waste Electrical and Electronic Equipment Directive (2002/96/EC) required manufacturers and importers of *electrical and electronic goods* to establish arrangements



for the recovery and recycling of products sold after 2005 at no charge to the consumer. The directive also set weight-based collection and recycling targets for electrical goods, including a 2009 target for a minimum annual recovery rate of four kilograms of WEEE waste per head of population. Most EU countries have implemented the directive's requirements through arrangements under which recovery systems for post-2005 WEEE are producer financed, while mechanisms for financing the recovery and processing pre-2005 waste vary. The new WEEE Directive (2012/19/EC) set more ambitious collection (85%) and recycling targets and gave EU Member States the tools to fight illegal export of waste more effectively.

The EU End-of-Life Vehicles Directive (2000/53/EC) requires member states to implement EPR-based mechanisms for the recovery and recycling of *end-of-life vehicles* (ELVs). The majority of the schemes in member states is financed by producer contributions and levies no charge on consumers disposing of an ELV, though in some member states charges levied on vehicle sale or ownership contribute revenues to recovery and recycling operations.

There are also many examples of EPR outside the EU, including significant and varied applications in the United States, Canada and Japan, illustrating that a broad range of products can in principle be covered by EPR, including such diverse products as waste motor oil, carpets, etc.

In Canada and the United States, a wide variety of schemes for EPR – or the related concept of “product stewardship” – has been implemented, mainly at province/state level, either as a result of legislation or as an outcome of voluntary agreements at the industry level. In Canada, the products covered by EPR schemes in one or more provinces include used tyres, beverage containers, used oil (Box 2.4.), vehicle batteries, electronic waste, pharmaceuticals, paint, mercury-based thermostats and lamps, packaging and printed materials. National-level EPR schemes apply to batteries, ozone-depleting substances, obsolete pesticides and pesticide containers (Environment Canada, 2013). The schemes are generally tightly focused, with straightforward and clear mechanisms and allocation of responsibilities.

Japan's EPR scheme represents an interesting example with its principle of shared responsibility for the scheme's costs between the government, businesses and consumers. The collection of used products is undertaken by retailers, and recycling is handled by manufacturers. One distinctive feature of the scheme is the encouragement of competing industry consortia (e.g. groupings of vehicle and home appliance manufacturers) which undertake recycling and research designed to reduce long-term waste management costs. Consumers are required to pay significant fees at the time of disposal as contributions towards the costs of collection, transportation and recycling. Recovery targets are set for each category of waste, and have generally been exceeded in practice (Ogushi and Kandlikar, 2007).

International experience demonstrates a considerable diversity of practice in the organisation and financing of PROs that lie at the heart of EPR schemes. In EU countries, PROs have tended to be industry-run bodies, often set up under the auspices of an industry association, and there has been an increasing tendency in recent years for countries to encourage the development of multiple PROs handling the wastes in a particular product area, with the aim of securing greater efficiency in PRO operations through competition. In some cases, new PROs have been set up by a group of firms which have seen the opportunity for greater efficiency, and hence for a lower financial burden, if they leave the existing PRO.

### Box 2.4. Examples of EPR schemes in OECD countries

**EPR for packaging in Germany.** The main scheme (introduced in 1991) covers only household packaging (glass, tinplate, aluminium and paper/cardboard – single-use beverage containers are covered by a separate DRS), but not industrial packaging. Since 2003, companies that bring packaging to the market can choose from several PROs. Producers pay fees to the PRO per amount of packaging material put on the market, the PRO then pays for the collection, recovery and recycling, and use of municipal space for collection containers. In 2011, the household packaging recovery rate for all materials was 80%, and the recycling rate was 75%. The scheme has high consumer acceptance due to the convenient collection infrastructure, active environmental education campaigns, and financial incentives for households (who save on waste collection fees by reducing the volume of non-recoverable waste).

**EPR for packaging in the UK.** The scheme, introduced in 1997, requires producers collectively to meet a target for the percentage of packaging waste to be recovered and recycled, which is translated into targets for each individual company. Companies have the option of meeting their target through their own actions or by signing up to one of several registered “compliance schemes” which undertake recovery and recycling on behalf of their member companies. Compliance is demonstrated by “Packaging Waste Recovery Notes” (PRNs) – certificates for each ton of packaging material recycled. PRNs are tradable, allowing compliance schemes and companies to meet their recycling targets either through their own collection and recycling operations or through the purchase of certificates from others who have exceeded their targets. The overall recycling rate for packaging waste was 62% in 2011.

**EPR for packaging in the Czech Republic.** EKO-KOM is the PRO for packaging waste, although producers can choose individual producer responsibility. EKO-KOM collects producer contributions of EUR 20 per ton of packaging put on the market, reimburses municipalities for the collection of household packaging waste, and contracts waste management companies to ensure proper treatment and recycling of the collected packaging. Producers of industrial packaging are responsible for collection and treatment. The recycling targets are differentiated by material (e.g. 70% for glass and 37% for plastic) and are increased every year. The 91% overall collection rate and 71% recycling rate were achieved in 2012.

**EPR for batteries in Austria.** Four PROs (one for-profit and three non-profit organisations) are responsible for arranging the take-back and treatment of waste portable batteries, and all of them are also part of the WEEE scheme. A fifth PRO covers only automotive batteries. A producer not participating in a PRO scheme may get a fine of double the amount they would have to pay to a PRO. Portable batteries are collected at municipal collection facilities or at the point of sale. A collection rate of about 50% has been reached for portable batteries.

**EPR for WEEE in Sweden.** The WEEE collection system is based on two schemes: (1) an agreement between Swedish municipalities and El-Kretsen, an organisation of producers of electronic products, that the municipalities will bear all costs of collecting electric waste while El-Kretsen will pay for their treatment and recycling; and (2) a collection scheme operated by the Association for Recycling Electronic Products with collection points in its members’ stores. Several producers have individual schemes. Producers adhering to a PRO must pay an annual fee based on the number of products sold and their recycling costs.

**EPR for waste oils in Canada.** The Western Canada Used Oil Program (operating in four provinces) employs EPR to ensure recovery and safe disposal of used motor oil as a way to prevent damaging discharges into sewers, watercourses and groundwater. Sales and imports of oil are subject to a fee, or “environmental handling charge”, which is then used to finance a “return incentive” paid to authorised collectors when used oil is collected and recycled (e.g. into heating oil). The scheme has close similarities with a conventional DRS, with the significant exception that refunds are paid not to consumers but the enterprises that collect used oil, providing them with an incentive to maximise the amount collected.

*Source: EC (2014); Salmons, R. (2002); Walls, M. (2004)*

EaP countries are increasingly interested in developing EPR schemes. An EPR scheme has recently been introduced in Belarus while some EPR elements exist in Ukraine (Box 2.5.). These schemes cover an ambitiously wide range of products and envisage the establishment of a single state-owned PRO, but the fees levied on producers and importers are insufficient to cover the collection, treatment and recycling costs. As a result, in practice these schemes so far appear to be ineffective. In Moldova, an EPR scheme is being designed at the time of the writing for five priority waste streams: WEEE, ELVs, used oil, batteries and packaging waste<sup>4</sup>.

### Box 2.5. Emerging EPR schemes in EaP countries

**Belarus.** The EPR scheme was introduced in 2012 and covers 17 product categories, including packaging, used oil, tyres, household appliances, electrical and electronic equipment, electric bulbs, batteries, etc. Producers and importers can organise their own collection, processing and recycling systems that would have to meet the 30% recycling target for packaging, used oil, tyres and disposable tableware, and the 10% recycling target for the other product categories covered by the EPR. Alternatively, they must sign a contract for these services with the single nationwide, state-owned, non-profit operator for those services and pay it a fee that is set either as a percentage of the sale price of electrical and electronic equipment, batteries, electric bulbs and lubricating oils, or as a fixed charge, different for different kinds of packaging materials (plastic, cardboard and glass).

**Ukraine.** A 2001 Government Resolution on the collection, processing and reuse of *packaging waste* created a state-owned Ukrecoresursy company and put it in charge of managing the scheme. It set fees (per kg) for the collection and processing of paper, cardboard, plastic, glass, tin and aluminium packaging, revenues from which should be collected on a special treasury account and managed by the government. In practice, only importers paid a nominal fee to Ukrecoresursy (domestic producers remain unaffected), which, however, undertook very little recycling activity. In March 2015, the Government repealed its resolution and abolished Ukrecoresursy. As of June 2015, a new draft Law on Packaging and Packaging Waste has been developed by the Ministry of Ecology and Natural Resources which would establish an industry-owned PRO to ensure compliance with packaging recovery rates stipulated by the government.

A 2012 Government Resolution targeted the collection, processing and disposal of *used industrial oils*, setting the same obligation for enterprises and a minimum fee of 7 euro cents per litre. It also approved special rules for the collection, processing and disposal of used oils, establishing such terms as “authorised enterprise” (a state-owned entity managing the scheme) and “specialised enterprise” (performing the technical operations). It set a mandatory recycling target of 40% of the volume of oil used, but the system to-date remains dysfunctional.

An EPR scheme for *tyres* introduced in 2011 is not operational either due to the lack of regulations on the collection, processing and reuse of old tyres, and associated fees for producers and importers.



## Notes

- <sup>1</sup> In case of tax differentiation between quality grades of petrol in EaP countries, the highest tax rate was used.
- <sup>2</sup> There are very few examples of ad valorem product taxes, including the tax on pesticides in Denmark and the tax on plastic packaging in Poland.
- <sup>3</sup> <https://sites.google.com/a/eu-smr.eu/guidance-on-epr/documents>
- <sup>4</sup> The principal alternatives considered are either (a) to give producers a right to establish their organisations and systems for the collection, processing, and recycling of products; or (b) to introduce fees for producers and importers, with revenues channelled into a state-managed fund, which would in turn contract waste management companies (following the Czech example, Box 2.4.).

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