

ZERO WASTE TO LANDFILL AND/OR LANDFILL BANS: false paths to a Circular Economy

In the framework of the negotiations on the Circular Economy it is often mentioned by a number of stakeholders that a way to close the loop is to ban landfilling.

Bans are a rather extreme tool that should be considered in cases where a strong justification for them exists, such as proven danger for human health.

This paper unveils the problems that are likely to arise from banning landfilling, as an “unwanted consequence” and that would go the opposite direction to the desired goal, and suggests other options which have proven to be more appropriate to achieve higher levels of reuse and recycling combined with lower levels of waste generation.

A Circular Economy is by its very nature a *zero waste* economy; the European Commission defined it is an “*economy that preserves the value added in products for as long as possible and virtually **eliminates waste**.*” However experience shows that a landfill ban, if strictly applied, does little, on its own, to advance towards a zero waste circular economy. It can simply shift waste from one form of ‘leakage’ to another.

Problems with focusing on phasing out landfill:

1. A landfill ban, in fact, drives incineration, and creates a “lock-in” effect

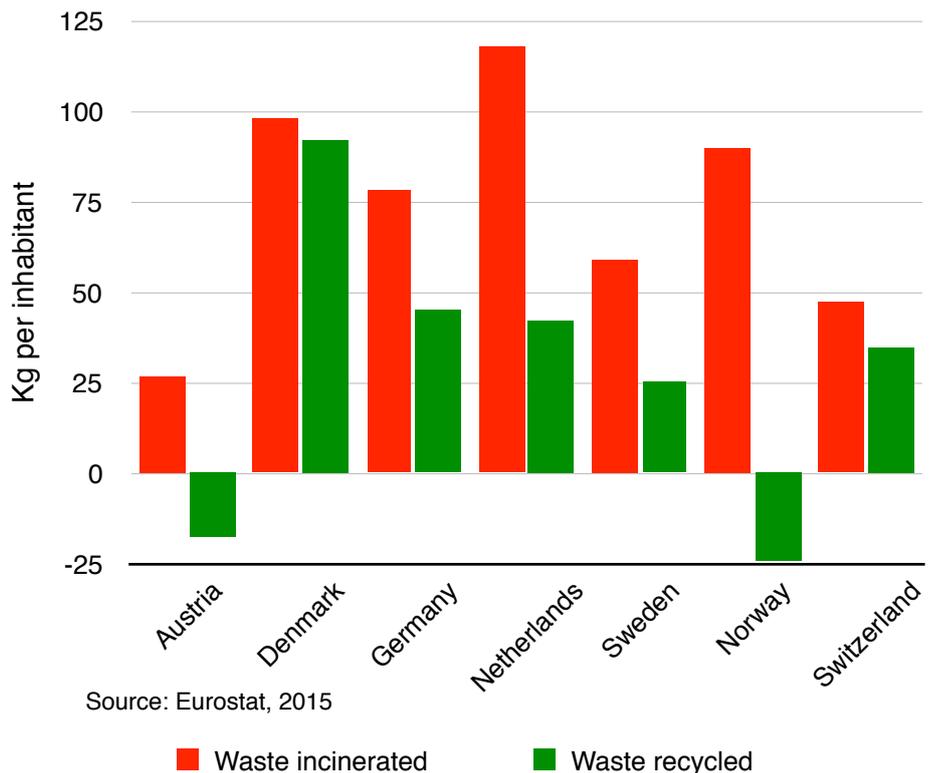
There is consistent evidence from countries where such a measure has been enacted that a landfill ban has driven and promoted waste-to-energy incineration. As a matter of fact, separate collection, while being continuously increased and optimised, may not get to 100% of any given waste fraction. Hence, unless the system is carefully designed the only way to comply with a landfill ban is by increasing incineration. So far, landfill bans have compelled national and local decision-makers to plan incinerators in order to abide by the “ban on landfilling”, and this has created a “lock-in” effect, i.e. the need to use incineration at the planned tonnage so as to ensure its pay-back. The consequence is that in the end of the story, a landfill ban works against its originally intended goal, as it hinders the possibility in local systems to continuously improve reduction, reuse and material recovery.

As the table and the graph below show, all 7 of the European countries with national landfill bans have experienced, since the introduction of the ban, an increase of the waste going to incineration well over the increase in recycling. In Denmark the increase in waste incineration has come along with an increase of waste generation of 37.5%. Germany and the Netherlands experienced increases in incineration close to twice and three times the increases of recycling, respectively. In Austria and Norway, the landfill ban even brought a decrease in recycling.

This effect was already observed after adoption e.g. of the German TAsi (Technical Guidelines on Household Waste) which required a threshold on Volatile Solids included in waste going to landfills (i.e. only ashes from incinerators were accepted at

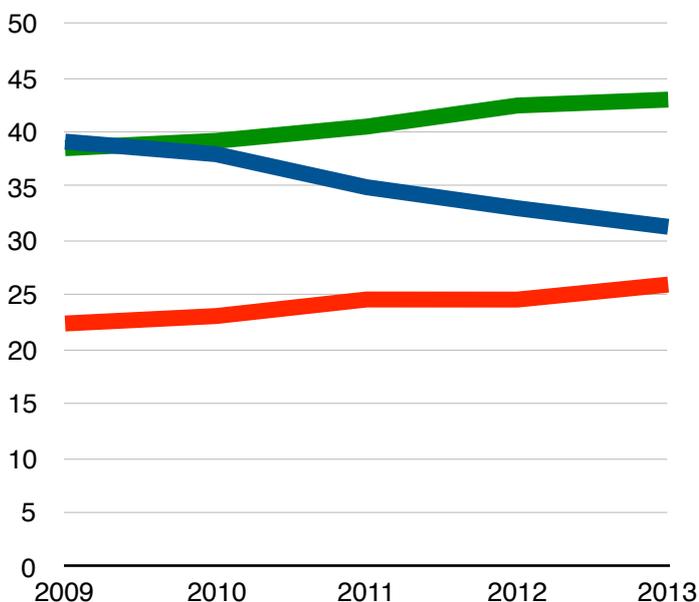
landfills). This was the primary reason for the current overcapacity of incinerators in Germany. Similar regulatory conditions have caused the overcapacity in Denmark, the Netherlands and Sweden. In many districts, the overcapacity has been the fundamental reason for weaker efforts on separate collection, and lower recycling rates¹ or a plateau in the recycling rates, with no effort on having them increased further. This is consistent with a desire not to make further efforts to reduce residual waste, an approach which contravenes the principles of Circular Economy.

Difference between waste incinerated and recycled a year before the introduction of the landfill ban and 2013



2. A landfill ban doesn't mean that more waste will be prevented, reused or recycled.

Treatment of Municipal Waste in the EU28



Source: Eurostat, 2015

— Landfilling — Incineration — Recycling & Composting

The effect of the Landfill Directive – which pushed biodegradable waste out of landfills without specifying where it should go, combined with the Waste Framework Directive –which opened a European market for incineration where facilities met the R1 criterion without an implementable waste hierarchy– resulted in a fever for building new incinerators without any noticeable increase in prevention or recycling figures.

From 2009 to 2013, landfilling has decreased by 8 points. However, only half of this waste has been diverted towards recycling, composting or preparation for reuse. The other half has gone to incineration.

¹ For example: Denmark has adopted the narrower definition of the calculation for the material recovery targets stipulated by article 14 of the WFD, i.e. they only consider paper, glass, plastics and metals (which are already covered by the more ambitious targets of the Packaging Directive), therefore leaving organics out of the calculation

3. Zero Waste to landfill is a misleading definition

Incineration is a technology which generates output streams which are wastes. There is a requirement for further treatment of the fly ash and bottom ash from the combustion process, as well as any metals which may be recovered from the bottom ash –these amount to 20 to 30% in weight of what is burned–. Some European countries such as Germany or Sweden claim to have *zero waste to landfill* policies but this is a misleading claim for what they actually have are *zero direct landfilling of untreated residual waste* because they send their waste to waste-to-energy incineration

(and, to a lesser extent, to MBT sites with production of RDF). As a result the ashes, or MBT rejects are no longer classed as MSW but in the majority of cases they remain waste (and are subsequently landfilled).

This accounting trick, which has already been disputed also by sectoral associations (e.g. FNADE, France), does little to help understand EU statistics and it also poses a serious threat if this approach is enshrined in the Circular Economy package.

4. Zero Waste to landfill is a measure that is “blind” to waste reduction

One of the main objections one can raise against the concept of “zero waste to landfill” or landfill ban is the fact that one can continue to run a perfect linear economy with it.

Indeed a landfill ban is “blind” to waste generation, and even, preparation for reuse and recycling: in other words, it is possible for a country to increase waste generation and waste incineration without any regard to

declining waste recycling and still be a zero waste to landfill country.

Unless all the treatment options which “break the loop” are considered, the consequence of banning or phasing out one of them will result in a transfer of waste to another. This will create unnecessary tensions which in no way help to move towards a circular economy.

A practical example: Zero Waste to landfill vs a real Zero Waste strategy

In the table below we compare two well-performing entities; the (genuine) Zero Waste best practice from the province of Treviso, Italy², with the “Zero Waste to landfill” example of Copenhagen.

	Copenhagen Denmark	Treviso province Italy
MSW generation per person/year	425kg	350kg
Separate collection rate	33%	85%
Residual waste per person/year	289kg	50kg

Sources: Copenhagen: City of Copenhagen, Technical and Environmental Administration, Statistics Denmark, 2012; Treviso: Contarina Spa, 2014

Because of the infrastructure built to incinerate waste with energy recovery in Copenhagen, there has been no incentive to reduce waste generation or increase recycling, yet it can claim to have a ban on landfilling.

On the other hand, a strategy focused on reducing residual waste –be it sent to incineration or landfill– implemented in Contarina provides a better driver to advance towards a Circular Economy since, paradoxically, the final waste to landfill is an amount smaller than what a “zero waste to landfill strategy” can bring. Also, in a context where no incinerator has been sited, it avoids any lock-in effect, and it may thus keep working towards further minimisation of residuals (next target has been set at 10 kgs/person/year by 2023).

² <http://www.zerowasteurope.eu/downloads/case-study-4-the-story-of-contarina/>

Conclusion

A zero waste to incineration policy, provided it is complemented with other components such as prevention policies, products and process redesign, optimised source separation, pay as you throw, etc, brings us closer to zero waste to landfill than a landfill ban, whilst simultaneously generating more jobs, less waste and a lower cost.

Recommendations

- A compulsory and sufficiently high tax on landfill **and waste to energy incineration** combined with a lower tax on the landfilling of stabilised waste is more effective in diverting waste towards prevention, preparation for re-use and recycling than a landfill ban.
- If the aim is to **eliminate waste** a better approach for closing the loop is **focusing on the constant reduction of residual waste** via product and process redesign, **flexible waste treatment facilities** and **optimisation of separate collection schemes** – all of which is the operational translation of the overarching principles of the Circular Economy.



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Zero Waste Europe is an umbrella organisation empowering communities to rethink their relationship with resources. It brings together local Zero Waste groups and municipalities present in 20 EU countries. Beyond recycling, the Zero Waste network aims at reducing waste generation, close the material loop whilst increasing employment and designing waste out of the system.

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A new EPR is needed for a circular economy

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REDESIGNING PRODUCER RESPONSIBILITY

A new EPR is needed
for a circular economy

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1. Introduction: EPR as a tool for Zero Waste

A major cornerstone of waste management policies in the last two decades has been the establishment of extended producer responsibility EPR schemes where producers are responsible for the collection and management of their products once they become waste.

Although having been an important step forward in environment policies, EPR schemes have tended to focus mainly on the end of the pipeline, i.e. once a product has become waste, and efforts of industry and administration have been put in the development of collection strategies and in the development of technologies for sorting and recycling of waste.

In recent years, the emergence of new paradigms such as the circular economy or zero waste has highlighted the need for revising the current approach to EPR. Waste needs to not be seen as a problem to be solved, but instead as a resource with energy and materials embedded in products that need to be kept in the economic process for as long as possible and at the higher level of quality.

This approach is at the root of the Zero Waste concept defined as “a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use”.

It means “designing and managing products and processes to **systematically avoid and eliminate the volume and toxicity of waste and materials**, conserve and recover all resources, and not burn or bury them”.

In the process to achieve this goal, the small fraction of waste that is not reusable, recyclable, or compostable should be reduced as much as possible but kept very visible to continuously

drive efforts towards phasing it out. **If a product can't be reused, repaired, rebuilt, refurbished, refinished, resold, recycled or composted, then it should be restricted, redesigned, or removed from production.**

In order to achieve this goal, work should be done at the front-end of the production process to design waste out of the system, and reinforced Extended Producer Responsibility (EPR) has to part of the bridge between waste and products policies.

The rationale behind implementing sound EPR schemes is that, with the extension of producer responsibility to all the phases of the life-cycle of its products, producers introduce up-stream measures especially through design that make their products more suitable for reuse, recycling, reducing the use of toxic and hazardous substances, and designing for easy disassembly and recycling.

In parallel, end-of-life measures mean the design of efficient collection systems that increase current separate collection rates, enhance reuse and recycling and promote the most environmentally sound treatment of product waste.

1.2. EPR goals within Zero Waste

A general target of Zero Waste is that the production system should not produce anything that cannot be reused, recycled or composted.

A prerequisite to achieve this target is that public budget should not be used to cover the costs of collection and treatment of products through mixed waste flow that fall within the scope of EPR schemes. Otherwise, public administration is de facto subsidizing companies and PRO that produce non-reusable or recyclable products and have inefficient collection system.

In order to avoid hidden subsidies a clear delimitation of the public and private management spheres is needed. EPR should be an environmental policy instrument that helps steer this process.

Finally, the idea that the polluter-pays needs to be seen not as a right to pollute but as an instrument to promote changes in the productive system.

From the end-of-life side, EPR schemes need to provide (Lindhqvist & Van Rossem, 2013):

- **Effective collection:** A primary goal with an EPR policy is to ensure a high collection rate of the product in focus in order to avoid littering and abandoned products in nature. A related goal is to divert selected discarded products from the general waste stream in order to facilitate a more proper end-of-life treatment and utilisation of the product and its material.
- **High reutilisation of products and materials** through prioritisation of reuse and high quality recycling. Any EPR implementation

should secure that products or their components can be reused, and that their materials are recovered and used for substituting the use of virgin materials.

- **Environmentally sound treatment of collected products:** before being further processed many products need a pre-treatment in the form of dismantling and/or sorting. The aim of this can be to secure special treatment of hazardous components and materials, and to improve the possibilities for re-use and recycling.

Outcomes of a comprehensive EPR within Zero Waste would include:

- reduction in the use of resources
- better reparability or reuse of products
- weight reduction for packaging (quantitative prevention),
- hazardousness reduction (qualitative prevention)
- improvements in the dismantlability and recyclability of products.
- removal of unsustainable products.

2. Current EPR in selected cities: a far less than optimal situation

In order to determine the scope of current EPR implementation in different European countries, the authors have chosen to assess municipal waste production and composition in 15 European cities (table 1) as well as the performance in terms of separate collection of the existing EPR schemes.

Also, for each city a qualitative depiction of the main existing EPR schemes has been done in order to help to understand possible differences in the indicators.

The analysed cities represent 14 different member states and have a total of 33 million inhabitants (6.5% of the EU population). We believe that the assessment allow us to provide a trustworthy set of indicators on EPR.

2.1. Quantitative analysis of the current extent of EPR

2.1.1. Municipal waste production and composition

The analysed cities have an average production of municipal waste of 435 kg/inh/year (Chart 1), some 20 kg below national reported amounts in European statistics¹. A possible explanation to this difference is that urban areas tend to have lower waste production than more rural or suburban areas due a lower presence of green waste.

Despite all of the waste composition reports that have been consulted having different methodologies and breakdowns to report the amounts of the different waste streams, all of

Table 1: Main data of the analysed European cities

	inhabitants	kg/inh/year	Products
Barcelona	1,611,822	437.7	70.00%
Berlin	3,375,000	412.2	69.65%
Brussels	1,185,268	430.6	67.50%
Bucharest	1,883,425	492.7	70.04%
Copenhagen*	539,542	407.0	67.62%
London	8,416,535	396.7	64.82%
Madrid	3,296,861	384.1	72.37%
Oslo**	624,000	366.9	82.52%
Paris	2,274,880	489.4	86.41%
Roma	3,995,250	568.1	69.36%
Sofia	1,296,714	310.1	67.30%
Stockholm	914,909	508.2	77.29%
Tallinn	435,245	476.4	78.57%
Warsaw	1,740,119	432.5	61.90%
Zagreb	1,621,220	406.4	64.74%
Total	33,210,790	434.6	71.34%

* Copenhagen data doesn't include commercial waste

**non-EU city

1. <http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&code=tsdpc240>

them report reliable information on the bio-waste share (green waste and kitchen waste) of the municipal waste. Subtracting the amount of biowaste from the total amount of municipal waste, we have been able to calculate that an average of 70% is product waste. This means that every European produces yearly 311 kg of waste of industrial products. The remaining 30%

is mostly waste of agricultural products (kitchen waste) or biomass waste (garden waste).

The share of product waste shows a rather homogeneous distribution among European cities (Chart 2) with a higher rate of product waste being found in Paris with 85% of municipal waste and the minimum occurring in Warsaw (60%).

Chart 1: Total waste and product waste produced in selected European cities

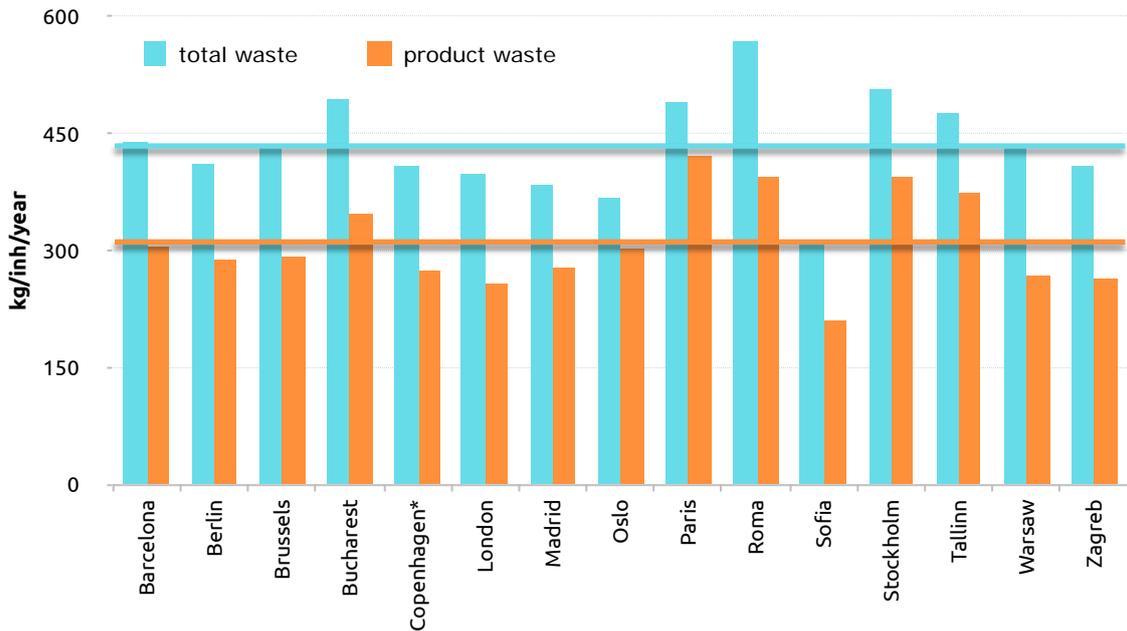
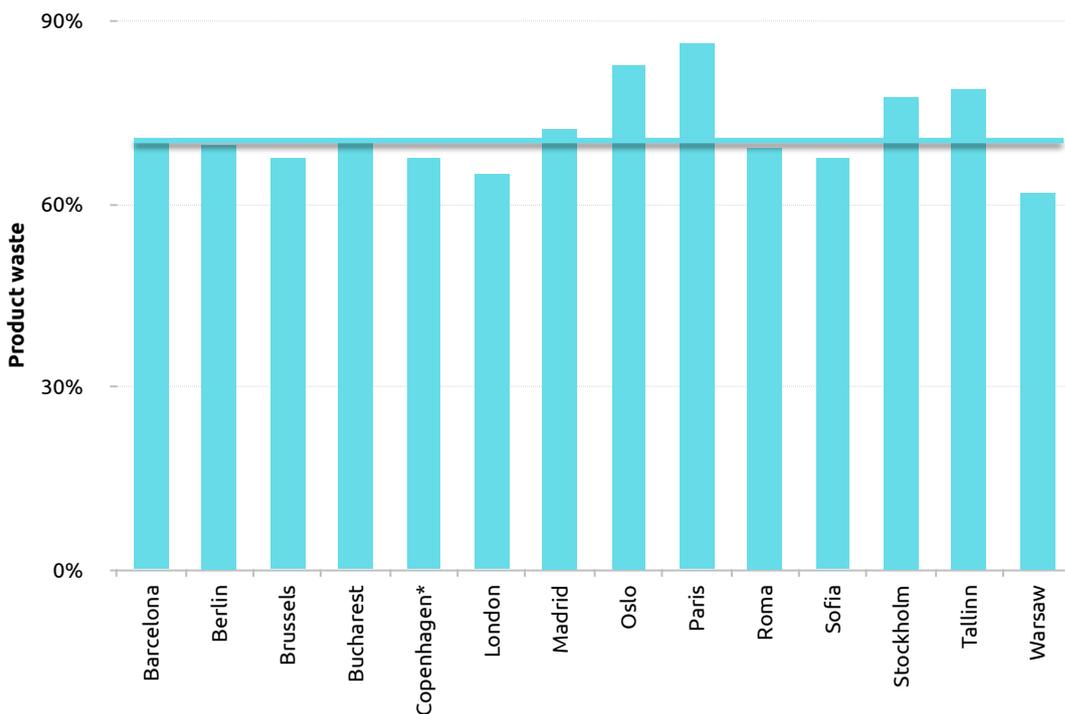


Chart 2: Percentage of product waste in municipal waste stream



2.1.2. Theoretical EPR coverage

In the cities assessed, an average of only 45% of total product waste falls within the scope of an EPR scheme (Chart 3). That is what we have called “EPR scheme theoretical coverage” meaning that PROs cover 45% of the total products –in terms of weight– that become waste.

When comparing this with the total municipal waste production, this means that less than one third of total municipal waste is covered by direct producer responsibility schemes (Chart 4).

Chart 3: Amount of product waste within EPR schemes

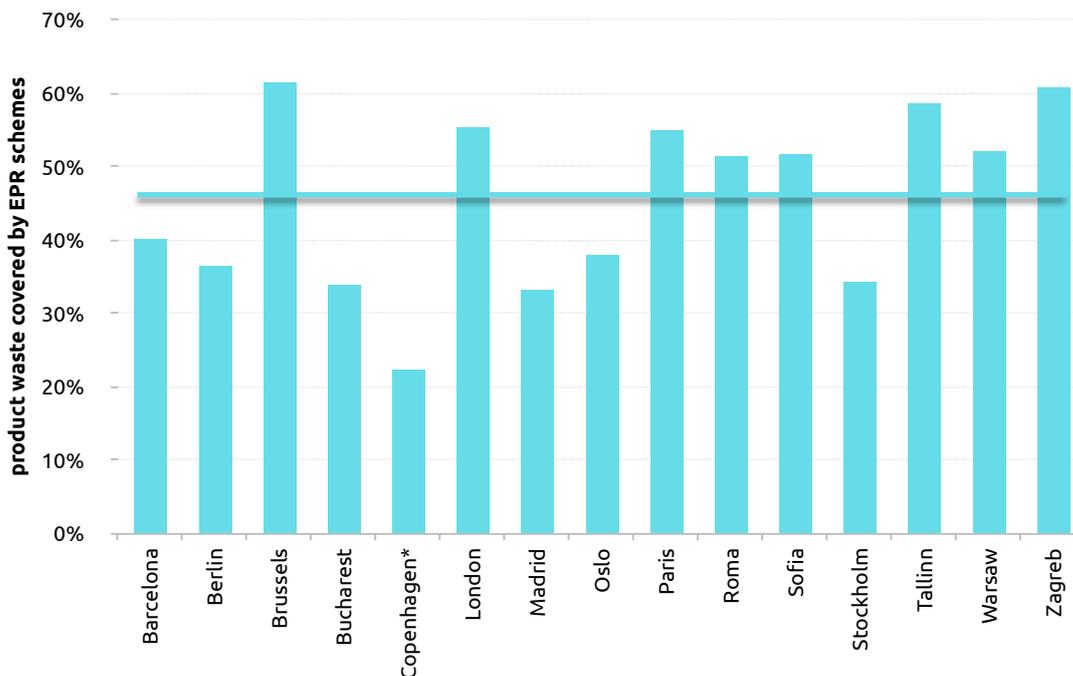
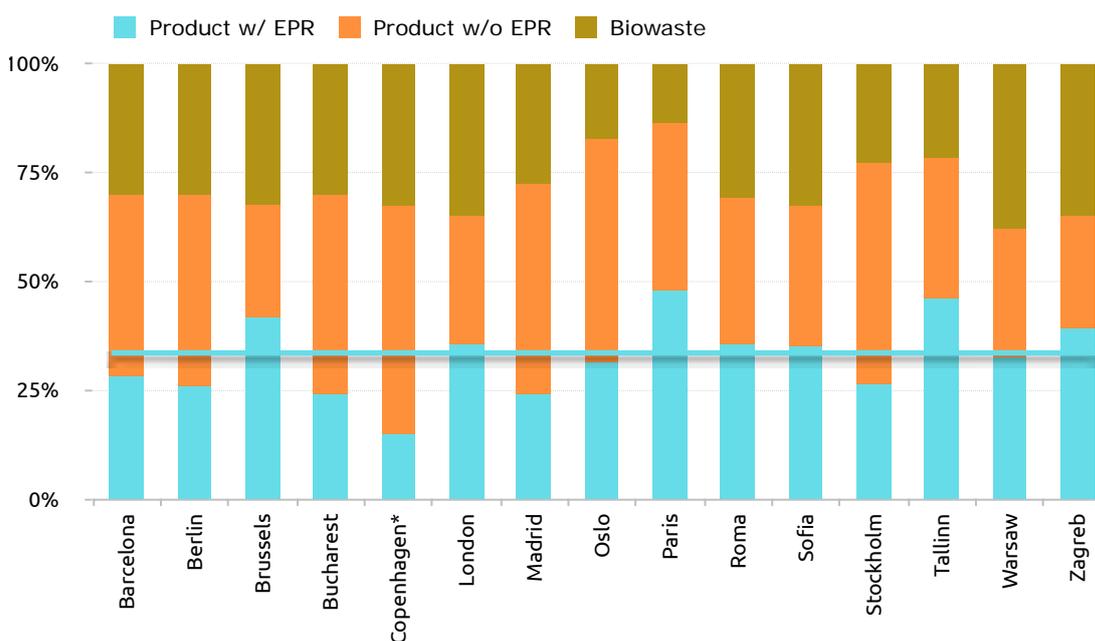


Chart 4: Waste composition according to EPR



2.1.3. Real EPR coverage

A final indicator compares the amount of products that is put into the market through a PRO and the amount of these products that are being captured through separate collection systems, regardless of whether it comes through take-back schemes, recycling yards, kerbside collection or deposit systems.

This indicator shows that, on average, less than 40% of the waste within the scope of an EPR scheme is being separately collected. Separate collection shows levels as high as almost 70% in Brussels or as low as less than 10% in Bucharest and Zagreb (Chart 5).

If we compare this average with the total amount of waste produced we see that, on average less than 18% of total waste is collected separately through an EPR scheme (Chart 6).

Chart 5: Average separate collection rate of EPR covered products

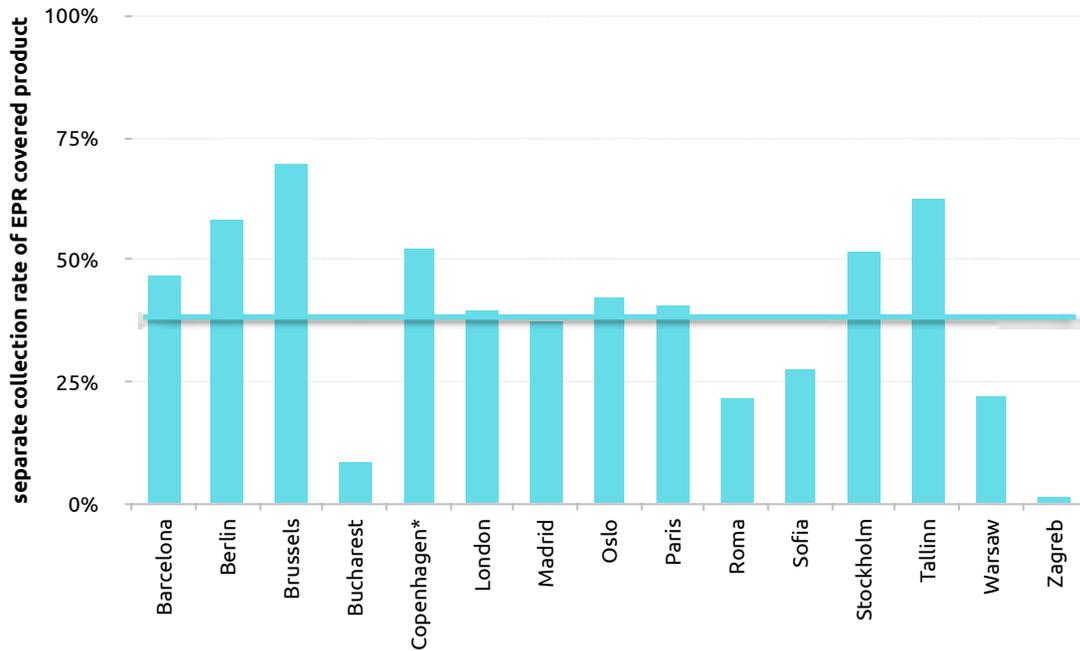
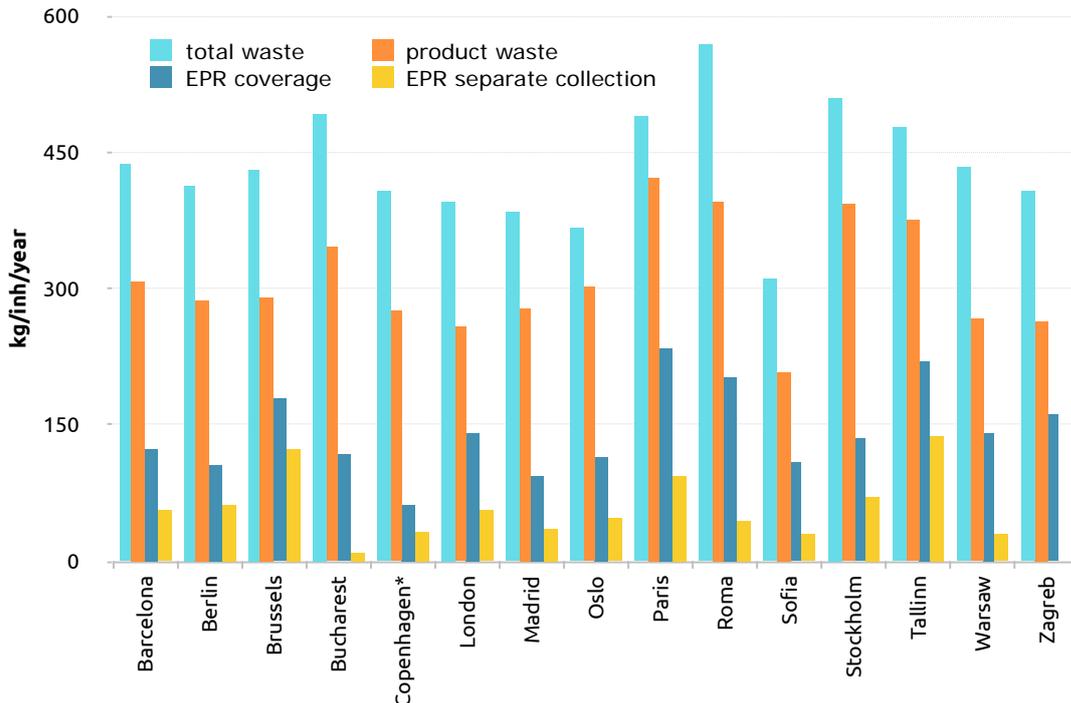


Chart 6: Waste per inhabitant and year according to EPR performance



2.2. Qualitative analysis of the current extent of EPR

2.2.1. Type of EPR schemes for main flows

There are three waste streams that fall fully within the scope of municipal solid waste in the European legislation: packaging waste, WEEE and batteries². In all the cities studied they are covered by PRO that have organizational tasks, including communication and financial responsibility; the only exception occurs in Denmark where PROs for packaging and batteries have mainly a financial responsibility.

Belgium, Denmark, France and Sweden have also an EPR scheme for graphic paper, and France only have EPR schemes for textiles and furniture.

Table 2: Existing EPR schemes and products covered

EPR schemes and products covered

City	Member state	Packaging	WEEE	Batteries	Graphic paper	Furniture	Textile	Sanitary textiles
Barcelona	Spain							
Berlin	Germany							
Brussels	Belgium							
Bucharest	Romania							
Copenhagen*	Denmark	fee		fee				
London	United Kingdom							
Madrid	Spain							
Oslo	Norway							
Paris	France							
Roma	Italy							
Sofia	Bulgaria							
Stockholm	Sweden							
Tallinn	Estonia							
Warsaw	Poland							
Zagreb	Croatia							

² End-of-life vehicles and tyres are also part of the basic European legislation but due to not being considered as municipal waste streams are excluded from the present analysis.

Some of the waste streams have economic instruments to either incentivise higher collection rates, in the case of deposit systems for packaging in many Nordic and central European countries, or to penalise bad designs through bonus-malus systems.

Table 3: Economic instruments in existing EPR schemes

EPR schemes and products covered

City	Member state	Packaging	WEEE	Batteries	Graphic paper	Furniture	Textile
Barcelona	Spain						
Berlin	Germany						
Brussels	Belgium						
Bucharest	Romania						
Copenhagen*	Denmark	fee		fee			
London	United Kingdom						
Madrid	Spain						
Oslo	Norway						
Paris	France						
Roma	Italy						
Sofia	Bulgaria						
Stockholm	Sweden						
Tallinn	Estonia						
Warsaw	Poland						
Zagreb	Croatia						

* Countries with deposit scheme for one-way packaging
 +/- EPR schemes with bonus-malus for products/materials

3. A new approach to EPR is needed for a circular economy

The role of EPR within a circular economy approach needs to be redesigned to provide a strong regulatory framework that delivers the expected outcome.

3.1. A broader definition of EPR is needed

The current definition of EPR is not clear enough and it differs both in scope and goals in different pieces of European and member states legislation. In order to advance towards zero waste, Extended Producer Responsibility should recover the spirit of the original definition by Lindqvist seeing it more as “an environmental protection strategy to reach an environmental objective of a decreased total environmental impact from a product” than only its implementation through EPR schemes.

Making the manufacturer of the product responsible for the entire life-cycle of the product and especially for the take-back, recycling and final disposal of the product individually or through

PROs should only be one in a set of political tools, although perhaps the most important.

The Extended Producer Responsibility should be strengthened through the implementation of more economic instruments, although administrative and informative instruments should also be improved. The final target is to continually incorporate incentive mechanisms for industries to continuously improve their products and processes; the composition of these instruments determines the precise form of the Extended Producer Responsibility.

The current definition of EPR has different approaches in different pieces of European legislation (see Box 1), The most common one being the one included in the Waste Framework Directive (WFD) 2008/98³ complemented by the economic responsibility of collected waste⁴. Additionally, different member states have different interpretations of the basic principles of EPR as well as the goals of its implementation. The approach to EPR followed in European legisla-

3. 1. In order to strengthen the re-use and the prevention, recycling and other recovery of waste, Member States may take legislative or non-legislative measures to ensure that any natural or legal person who professionally develops, manufactures, processes, treats, sells or imports products (producer of the product) has extended producer responsibility.

Such measures may include an acceptance of returned products and of the waste that remains after those products have been used, as well as the subsequent management of the waste and financial responsibility for such activities. These measures may include the obligation to provide publicly available information as to the extent to which the product is re-usable and recyclable.

2. Member States may take appropriate measures to encourage the design of products in order to reduce their environmental impacts and the generation of waste in the course of the production and subsequent use of products, and in order to ensure that the recovery and disposal of products that have become waste take place in accordance with Articles 4 and 13.

Such measures may encourage, inter alia, the development, production and marketing of products that are suitable for multiple use, that are technically durable and that are, after having become waste, suitable for proper and safe recovery and environmentally compatible disposal.

4. In accordance with the polluter-pays principle, the costs of waste management shall be borne by the original waste producer or by the current or previous waste holders.

2. Member States may decide that the costs of waste management are to be borne partly or wholly by the producer of the product from which the waste came and that the distributors of such product may share these costs.

Box 1: Main European EPR legislation

Summary of main European EPR legislation

- The **PPW Directive** follows the waste hierarchy as set out in the 2008 WFD, by putting priority on waste prevention. Although the Directive pre-dates the Waste Framework Directive 2008/98/EC, the waste hierarchy is mentioned as an objective in Art. 1(2) PPWD in the proper order of the later WFD. Separate Articles deal in a detailed way with waste prevention, recovery and recycling as well as separate waste collection. The concept of extended producer responsibility is mentioned in Art 4 (1) second indent as a “may be introduced” soft law requirement.
- The **ELV Directive** follows the same pattern and makes reference to the waste hierarchy in its Art. 1. with following specific Articles on prevention, re-use and recovery including recycling, as well as collection and treatment. The concept of life cycle thinking is not specifically addressed in either Directives.
- The **Batteries Directive**, mostly due to the characteristics of this waste stream, instead of referring to the waste hierarchy in general, mentions in its objectives only collection, treatment, recycling and disposal of batteries. Waste prevention is not mentioned. Life cycle thinking already finds its place in Art. 1 and 5 of the Directive. Art. 5 in particular makes reference to eco-design in obliging Member States to promote the substitution of hazardous substances in batteries, such as mercury, cadmium and lead. Easy removal through design is also encouraged. Extended producer responsibility is broadly dealt with in Art. 8.
- The **WEEE Directive** (Directive 2012/19/EU) provided for the creation of collection schemes where consumers return their WEEE free of charge. The establishment of producer responsibility is intended to encourage design and production of EEE which take into full account and facilitate its repair, possible upgrading, re-use, disassembly and recycling.

tion can be deemed as too limited as it focuses mainly on the acceptance of returned products and waste and the financial responsibility of the subsequent management. This responsibility represents an internalisation of end-of-life management costs according to management standards and recycling targets defined by European/national governments.

But after more than twenty years of implementation of EPR schemes, the expected internalisation of environmental externalities has been only partial and has been found not to provide enough incentive for producers to increase the reuse and recyclability of their products.

On the other hand, although EU policy highlights the importance of extended producer responsibility in product design, in most waste streams the results have not come from EPR implementation through PROs but rather through the

mandatory ecological requirements set by the Ecodesign directive.

The above-mentioned issues give reasons for the current approach to Extended Producer Responsibility (EPR) principle to be reconsidered with the goal of strengthening its role within European waste and product policies, as well as its energy links.

Hence, EPR must embody the idea of life-cycle thinking and must aim at:

- Promoting upstream design changes of new products aiming to reduce the impacts from end-of-life management.
- Ensuring downstream improvements of collection and recycling infrastructure that facilitates high re-utilisation of products, components and materials.

Extended Producer Responsibility should recover the spirit of the original definition by Lindhqvist seeing it more as “an environmental protection strategy to reach an environmental objective of a decreased total environmental impact from a product⁵” than only its implementation through EPR schemes.

Making the manufacturer of the product responsible for the entire life-cycle of the product and especially for the take-back, recycling and final disposal of the product individually or through PROs should only be one in a set of political tools although perhaps the most important. As a general formulation EPR should be an evolving policy that needs to be continually reassessed so that it incorporates new incentive mechanisms for industries to permanently improve their products and processes.

The Extended Producer Responsibility schemes should be strengthened through the implementation of more economic instruments, as well as administrative and informative instruments also being improved. The final target is to continually incorporate incentive mechanisms for industries to continuously improve their products and processes; the composition of these instruments determines the precise form of the Extended Producer Responsibility.

Furthermore, the EPR principle needs to be implemented both in product and waste policy spheres. Policy instruments have been applied to improve waste management practices and therefore impacts from waste, especially through EPR schemes, but far fewer policies are targeted towards producers, especially within EPR schemes, who particularly have control over the products causing harm.

It is only with an integrated implementation that builds the bridge between waste management policies and product-oriented environmental policies that EPR can fulfil its targets as a desired policy principle that helps to build a Zero Waste society. The loop needs to be closed between product and waste policies by introducing a life-cycle thinking approach and looking at products from the perspective of waste throughout the products' life cycle.

3.2. A more comprehensive approach to EPR

As the sole implementation of EPR through PROs has been found to progress too slowly towards zero waste, the new circular economy package should take into account the feasibility of complementing them with more EPR instruments. Whilst recognizing that PROs are a cornerstone of EPR policy, there is need for a strong incentive framework outside PROs.

Economic instruments such as deposit/refund systems for liquid product containers, advance disposal fees to cover costs of non collected waste streams, raw material taxes, recycled content requirements for packaging and other products...

As EPR is considered to be a policy principle, it is not in itself a legal mechanism or tool, but must be implemented through the use of administrative, economic and informative instruments.

The sole implementation of EPR through PROs has been found to progress partially and too slowly towards zero waste; therefore, the new circular economy package should take into account the feasibility of complementing them with more EPR instruments. Whilst recognizing that PROs are a cornerstone of EPR policy, there is need for a strong incentive framework outside PROs.

According to Sander et al. (2007) “it must be recognized that “elements of the concept could be identified in some policy instruments that were formulated before the birth of the terminology and its definition. Examples include management of packaging and packaging waste in Germany and the Netherlands, deposit-refund systems for beverage containers in Sweden, some states in the United States and the like. However, people engaged in the development of these instruments did not perceive EPR as a guiding concept for these policy instruments at that time”.

EPR programme may vary but there is usually a mix of administrative, economic and informative policy instruments applied. Economic instruments such as deposit/refund systems for liquid product containers, advance disposal fees to cover costs of non-collected waste streams, raw

5. Extended Producer Responsibility is an environmental protection strategy to reach an environmental objective of a decreased total environmental impact from a product, by making the manufacturer of the product responsible for the entire life-cycle of the product and especially for the take-back, recycling and final disposal of the product. The Extended Producer Responsibility is implemented through administrative, economic and informative instruments. The composition of these instruments determines the precise form of the Extended Producer Responsibility. (Lindhqvist, 1992).

material taxes, recycled content requirements for packaging and other products... need to be considered as part of the EPR strong legal framework that is needed outside PROs in order to incentivise them to provide the most environmentally sound and cost-effective answer towards EPR targets.

Overall, the implementation of EPR schemes, coupled with the use of economic instruments (landfill and incineration taxes, disposal bans for certain products or materials, pay-as-you-throw schemes) has been a particularly effective approach to meeting the recycling and recovery targets.

3.2.1. Administrative instruments

The most typical administrative instrument applied in EPR programmes is the mandate for producers to **take back** their products from customers when they reach their end-of-life. In the case of European legislation, there are four Directives that include the take back obligation and 25 states have PROs. Take back requirements are normally accompanied by **reuse, recycling and recovery targets** to ensure that a minimum level of reutilisation of materials in products and packaging takes place.

Minimum recycled material content standards have been used in EPR programmes to stimulate

Table 4: Typologies of EPR policy instruments

Typologies of instruments	Policy Instruments
Administrative	Landfill and incineration bans Material restrictions Eco-design requirements related to reuse/recycling, minimum recycled material content standards Source separation/collection requirements Waste prevention requirements Waste prevention targets Collection targets Landfill/incineration diversion targets Reuse targets Recycling targets Recovery targets
Administrative/economic	Producer take back requirements
Economic/Market Based	Deposit-refund systems Producer responsibility Taxes on virgin materials Taxes on hazardous substances Landfill and incineration taxes/charges Waste disposal taxes/fees/charges Recycling fees/charges Product taxes/charges Tradable recycling credits
Informative	Information provision requirements, eco-labels

Source: Saki, 2011

the demand for recycled materials generated through the collection and recycling system.

Current EPR policies have been crucial to create a supply of recycled materials or secondary raw materials. Nevertheless, these flows do not find a viable European market due to a lack of demand. Overall, 25% of sorted materials in Europe are exported to Asia, and this rate will continue to increase with the increased sorted volume (Suez 2015). Defining minimum recycled material contents in PRO schemes can promote demand and link end-of-life with production phases.

Substance restriction or bans of substances or materials that can cause negative environmental impacts when recovered, recycled or disposed have been common policy elements in the European Union.

Landfill/disposal bans of products covered under EPR legislation can be used to divert the end-of-life products to the separate collection infrastructure and not through mixed waste streams.

Extension of **minimum guarantees** for consumer durable goods, in order to extend the products' expected lifetime can help increasing reparability and life expectancy of products, thus fighting planned obsolescence.

3.2.2. Economic Instruments

A **materials tax** is an example of an input tax and would be imposed on the raw materials used to manufacture a product or packaging,

with due account being taken of existing reuse and recycling rates. To meet the criterion of economic efficiency the size of the levy or charge needs to be directly connected to the environmental damage done by the production and consumption of the product, plus any scarcity premium if relevant.

Advanced recycling fees (ARF) or advanced disposal fees (ADF) levied by governments can be considered product charges and are in contrast to a materials tax, considered to be output taxes. Financing charges have been used to facilitate collection, processing, recycling, and recovery and final disposal of waste.

Tradable Permits: To date, the use of tradable material recovery certificates in the area of WEEE management is extremely limited.

Deposit-Refund Systems: Deposits have been traditionally used as a mechanism to ensure that reusable products or packaging is returned to the producer.

3.2.3. Informative Instruments

Reporting requirements to authorities regarding the number of products put on the market as well as the amount of waste products treated, reused, recycled, recovered and sent to disposal are common components of EPR programmes. Information should be in a format that is easily accessible to consumers and businesses, to facilitate informed decision-making and the repair and recycling of products.

Box 2: Examples of economic instruments

Denmark has adapted its **packaging tax** to reflect the differences in environmental impact of each material, and Latvia has also introduced differentiation according to material⁶. The Commission is prepared to support a structured exchange of information between Member States on their approaches.

An example of **advanced recycling fees** is that of the tax on one-way packaging in Norway. This tax was set to protect Norwegian glass industry and, on top of a basic fee (1,1 Kr) there is a graduated fee that has a maximum of 6,44 Kr (for cans) and 4,32 Kr (for plastic bottles) and can be reduced proportionally to the recycling rate of the packaging.

Deposit and refund schemes have existed for many decades for refillable packaging in European countries. In the case of one-way packaging the first one to be implemented was in Sweden in 1984 for aluminium cans. Since then, nine other European countries have implemented such systems that achieve higher than 85% collection rate. The next state to introduce a deposit scheme will be Lithuania in 2016

6. Cf. EEA, Using the market for cost-effective environmental policy, 2006

Table 5: Taxes on products in European countries

Products	Austria	Belgium	Denmark	Finland	France	Germany	Greece	Iceland	Ireland	Italy	Luxembourg	Holland	Norway	Portugal	Spain	Sweden	United Kingdom
Tyres																	
Beverage cont.																	
Packaging																	
Bags																	
Pesticides																	
CFCs																	
Batteries																	
Light bulbs																	
PVC/phtalates																	
Lubrication oil																	
Fertilisers																	
Paper, board																	
Solvents																	

source: EEA, 2006

Product and/or component labelling may be included in the programme to identify to consumers on the need to separately collect the product in question or specific components such as batteries within products from the general waste stream. Component labelling aimed at assisting treatment operators on the location of hazardous or valuable components.

3.3. Legally binding eco-design requirements

According to recent studies, EPR programmes have had limited impact on product design. One of the main reasons for this is the relatively low compliance cost associated with financing end-of-life products when they are placed on the market compared with other business costs.

To overcome this situation, the scope of eco-design requirements needs to be expanded to cover not only energy-related products but all main product groups: packaging, batteries or disposable nappies are just some products that should be part of the revision of the Eco-products directive. This revision should:

- Define minimum requirements on durability including measures against planned obsolescence

- Develop a set of product standards which include repairability, reusability, secondary raw material content and recyclability

The design and implementation of EPR policies should motivate producers to improve the design of their products and packaging. Although this is the theory behind EPR there is debate over the ability of EPR schemes' design to provide enough and appropriate incentive mechanisms to stimulate producers to improve the design of their products from an environmental point of view.

Although sound waste management and recycling have generally improved, notably through the implementation of EPR, there is no clear evidence of a strong positive impact of EPR on the eco-design of the products. EPR programmes do not create economic signals that are strong enough to have impact on product design and although few or no targets or indicators regarding eco-design have been developed, many studies and reports suggest that the development of collective schemes –which collectivize individual responsibilities of different producers– has had the effect of 'averaging' PRO fees among producers, thereby de-incentivising individual efforts for eco-design.

Only a few PROs include incentive mechanisms that lower the fees for eco-designed products⁷

7. Less common is the case when a penalisation is introduced for worse performing products.

and that ensure that producer fees include recyclability in order to favour industrial eco-design approaches. (Bio by Deloitte, 2014)

Some of the reasons for this problems are pointed by Rossem (2008) points to a number of reasons:

- Relatively low compliance cost associated with financing end-of-life products when they are placed on the market compared with other business costs. It has also been suggested that in many cases these fees are unavoidable and represent more of an output tax (when expressed as a fixed fee), thus providing no incentive for altering firm behaviour.
- Consumers are often willing to absorb costs with little demand implications, producers are even more reluctant to push for change in financing models. In some way these results are hardly surprising given that in the particular EPR programmes reviewed, there was never an intention to elicit change on behalf of producers, as the focus was rather on designing cost-covering measures.

It is clear that an approach based solely on internalisation of costs does not represent a big enough incentive for producers to redesign their products or to opt for reusable, refillable packaging.

On the other hand, there seems to be a greater incentive for eco-design where a design can reduce the costs of recycling or final treatment.

The role of anticipatory effects of the EPR legislation on firms decisions to innovate, rather than from the implementation of EPR schemes and clear incentives within them. In particular the WEEE, RoHS and ELV Directives have been cited as the key drivers in the literature for their product categories, whereas in the case of packaging seems to be more effective the inclusion of legal provisions to establish waste prevention plans for companies. A part from this specific cases, Ecodesign directive has been found to be the most effective piece of legislation in providing eco-design progress.

EPR programmes are most effective in reducing waste generation and increasing recycling where there is a potential for product design changes that can reduce the costs of recycling. Examples of such design changes include the elimination of hazardous substances (e.g. mer-

cury and cadmium in batteries, and lead in the components of EEE) or of unnecessary material (e.g. optimisation of packaging), increased reuse (e.g. transport packaging, refillable bottles, component reuse for some EEE), increased use of recyclable materials (e.g. change from plastic to metal and development of recyclable plastics in cars and EEE), and promotion of design for disassembly (e.g. bumpers and fuel tanks in cars, some components of EEE).

For some products producer responsibility for take back and recycling may not send sufficiently strong signals to producers to implement design changes. This is typically the case with hazardous substances. EPR programmes for these products are often supplemented with hazardous substance restrictions.

The scope of eco-design requirements needs to be expanded to cover all main product groups, not only energy-related products. Packaging, batteries, diapers are some of the products that should be part of the revision of the Eco-products directive that should be the cornerstone of a well-thought-out product policy that increases products' expected lifetime, durability, reusability and recyclability. This revision should:

- Promote a lifecycle-oriented approach in product policies, in particular by establishing harmonised methods for evaluating products' environmental footprints;
- Define minimal requirements on durability including measures against planned obsolescence for different categories of products.
- Develop a set of product standards which include repairability, reusability, secondary raw material content and recyclability to be fulfilled individually by every producer.

Finally, as a precondition to eco-design provisions, the Commission should consider extending the minimum legal guarantees for consumer products requiring manufacturers subject to the relevant directives (Waste, Ecodesign, WEEE, Batteries, Consumer Rights) and to make information such as life-time of the product available to the general public.

3.4. Better EPR schemes

Many studies show that the internalisation of costs through current EPR schemes is not enough incentive for producers to provide better, more environmentally sound products.

Only separate collection and treatment costs are covered properly by EPR schemes. Mixed waste collection falls outside the scope of EPR schemes in most of the cases.

Moreover, the current fee structure of most PROs produce an ‘averaging’ effect and individual producers do not bear the full net costs of the collection and treatment of its products. There is a need for a more individualized responsibility that does not get diluted in a PRO. The ‘internalization of costs’ principle would work best in combination with a transparent cost and fee structure from PROs and a modulation of fees that should be made explicit and visible to consumers, in order to guide their choices

Finally aspects such as reusability, recyclability and detoxification are not well implemented in most in EPR schemes.

In order to tackle this flaws, a proposal for better EPR schemes has been developed.

3.4.1. Integration of reuse in EPR

Although reuse is at the top of the waste hierarchy according to the WFD there is no legally binding provisions in European Legislation that establish targets solely for reuse within EPR schemes.

Such targets should be defined for existing EPR schemes and also a set of minimum requirements for reuse in order to avoid competition for collected streams between recyclers and the reuse industry.

The reuse of repaired, refurbished, renewed products is agreed to be the most environmentally sensitive alternative. That is recognised in the European legislation by placing this at the top of the waste hierarchy (i.e. WFD). Nevertheless there are no legally binding provisions in European Legislation that establish targets for reuse; the inclusion of targets for both reuse – and preparation for reuse– and recycling is the most similar approach.

Moreover, different studies say that reuse could provide more than 300,000 new jobs (Beasley & Georgeson, 2014) if separate re-use targets are included in the Circular Economy Package, especially for furniture and textiles.

Setting individual reuse targets for different waste streams and product categories would be helpful but there is also need to set provisions that help achieve the targets such as the design and production of products which take into full account and facilitate their repair, possible upgrading, reuse, disassembly and/or recycling. For specific waste streams, for instance furniture and textiles, the establishment of new EPR schemes is also needed.

For existing EPR such as WEEE, and as general best practices for existing infrastructures such as recycling yards a set of minimal requirements for reuse would be needed in order to avoid competition between recyclers and the reuse industry and to support the development and consolidation of reuse and repair infrastructures and networks:

- Promotion of reuse and preparation for reuse through quantitative targets
- Logistics, collection and handling should be adequate to guarantee potential reuse.
- Priority access to the potentially reusable waste streams for approved reuse centres, avoiding abuses from involved EPR schemes (including social enterprises)
- Access to repair and service manuals, software and hardware of after sales service providers of manufacturers (For WEEE)

3.4.2. Full-cost coverage

The internalization of costs is one of the drivers for producers. Therefore, fees paid to a collective system by an individual producer should bear the full net costs of the collection and treatment of its products.

As current EPR schemes cover mostly only costs of separate collection and treatment of product waste –plus public communication and administrative costs– the prerequisite to a good cost coverage is a high separate collection rate.

Provisions regarding the –total or partial– coverage of costs of non separately collected waste and littering should be included within European EPR scope through compulsory external economic instruments or minimal requirements for PROs.

The rationale behind economic responsibility within PROs is to move away costs from local administration and transfer it to producers. This internalisation of costs should be the driver for producers to redesign products to become less

costly at their end-of-life and more environmentally sound. To achieve this theoretical approach, fees paid to a collective system by a producer should reflect the full net costs of the collection and treatment of its products.

An integral analysis of cost coverage shows that all the product waste that goes not through separate collection systems creates collection needs and disposal costs that are born by local administrations through public budget.

Nevertheless, most current EPR legislation and existing PRO schemes cover only operational costs, costs of separate collection and treatment of product waste that is collected separately, plus public communication and administrative costs. Therefore, a prerequisite to a proper internalization of costs is a high separate collection rate.

According to Bio by Deloitte (2014) only in some cases other costs are covered:

- Contributions to a prevention / governmental fund (Austria, Czech Rep, Belgium)
- Cover additional costs for municipalities (e.g. use of public space, container area cleaning, etc., cf. Germany)
- Cover R&D and prevention actions (France)
- Cover anti-litter programmes (The Netherlands, Belgium)

The sub-optimal performance of many separate collection systems makes that, in order to fulfil European legislation (e.g. Landfill Directive), more and more pre-treatment plants (notably MBT plants) are being built in order to stabilise biowaste and to separate remaining waste streams especially cardboard, metals, glass

and plastics—. Most of this materials are part of existing PROs with low collection rates that do not bear the proportional investment and operational costs of the treatment facilities that recover their materials.

On the other hand there is the issue of littering that is especially important in some product streams such as plastic bags, beverage and food packaging, e.g. on-the-go packaging, and that creates very important street cleaning costs in the public spaces such as streets, parks or beaches as well as ecological impacts in the case of marine littering.

Provisions regarding the total or partial, coverage of costs of non-separately collected waste and littering should be included within European EPR scope through internal or external economic instruments or minimum requirements for PROs. Otherwise, internalisation of costs is not fulfilled and public budget is de facto subsidizing waste production.

When discussing the full-cost issue industry opposes bearing extra costs for non-separated waste and challenges their role in littering.

In the case of littering industry argues that they cannot be blamed for personal behaviours and that a shared responsibility, and hence a shared allocation of costs, needs to be applied.

Regarding bad performing separate collection systems they argue that covering the costs for non-separately collected waste would not imply incentive for municipalities to promote selective sorting and it would lead to a negation of the polluter-pays principle.

Box 3: Minimal cost-coverage requirements for EPR

EPR should be able to define the most suitable set of tools in order to cover all types of costs, namely:

- Collection, transport and treatment costs for separately collected waste;
- Collection, transport and treatment costs for non-separately collected waste covered by EPR (e.g. waste covered by EPR collected with mixed municipal waste);
- Cost for public communication and awareness raising (on waste prevention, separate collection, etc.);
- Costs for litter prevention and management;
- Costs for the appropriate control of the system (including auditing and measures against free riders)
- Administrative costs, i.e. costs linked to the running of the PROs

These costs should be covered by two economic inputs:

- Revenue from the sales of the materials/products
- Fees paid by producers that reflect individual costs

Whereas this can be partly true, the design of both the products and the EPR schemes can provide solutions that mitigate or limit to a great extent extra costs born by public administrations. In most cases, the decision to implement instruments to tackle littering or to design better performing collection schemes lies in the field of both industry and government.

Many examples could be found in both areas; in the case of companies, design can help mitigate the economic effects of littering; in the case of chewing gum designing biodegradable and less sticky products; or in the case of cigarette butts using biodegradable filters.

Better performing schemes can be adopted by governments in the case, for instance, of disposable products that have little economic value as individual items but create important litter abatement costs. A typical example is that of deposit on one-way beverage packaging, that has shown littering reduction in those countries where it has been introduced in recent years⁸. But such an instrument can also be used to achieve high collection rates for other packaging that form part of littering (crisp packets and other on-the-go packaging).

Regarding the supposed disincentive that covering costs of material found in the mixed waste stream poses, The French paper industry has recently adopted an EPR scheme for graphic paper that includes (partial) compensation for paper waste that ends up in landfills or incinerators. Reaching high collection levels in municipal collection systems is in the interest of both industry and local government but it requires the participation of all the different stakeholders and it takes time until such systems are fully in place. In the meantime an EPR scheme that partially covers the costs of waste found in mixed waste collection seems fairer in terms of cost allocation while not meaning a disincentive for local administrations to advance towards better performing collection systems.

3.4.3. Individualisation

For EPR to be successful at internalizing costs, an individual company should bear individual financial responsibility that fully pays for the end-of-life management of its own products. Nevertheless PROs tend to average costs among producers, thereby disincentivising individual efforts towards

recyclability, use of recycled materials, toxicity reduction or reparability.

Only a few PROs introduce modulations in order to reward producers that make eco-design efforts to contribute to decreasing end-of-life environmental impacts and economic costs.

*Minimal requirements for PRO should include a fee scale which reflects the **real full costs of end-of-life management** based on the waste hierarchy.*

As mentioned before, EPR is only successful when it stimulates individual producers' behaviour in order the design of more environmentally sound products; but this can only happen when a company bears individual financial responsibility and it pays for the end-of-life management of its own products. When a group of producers pay for the end-of-life management of their products regardless of brands, their financial responsibility is collective like in the case of PROs. It is difficult to achieve an individualization effect due to the 'averaging' of costs that happens under a PRO. Fees paid within PROs schemes tend to average costs among producers, thereby disincentivising individual efforts towards recyclability, use of recycled materials, toxicity reduction or reparability.

Without a fee modulation that rewards those producers who take into account eco-design approaches in order to facilitate recycling and reuse efforts and contribute to resource efficiency, there is no fair competition and EPR is not properly enforced.

Most PROs have an average fee for all their members that includes a degree of differentiation, usually according to the use of materials and their final value but only a few PROs introduce modulations in order to reward producers that make eco-design efforts to contribute to decreasing end-of-life environmental impacts and economic costs.

A fee modulation principle should be introduced in European legislation as a minimal requirement for all EPR schemes and reflect the real full costs of end-of-life management based on the strict application of the waste hierarchy.

According to the report "Development of Guidance on Extended Producer Responsibility (EPR)", many stakeholders believe that "it would

8. <http://www.bottlebill.org/about/benefits/litter/bbstates.htm>

be very interesting to differentiate the fee paid by producers reflecting the real end-of-life costs, and thereby create an incentive for eco-design". In order to be easily adopted by industry, modulation of the fees should:

- Be based on a limited in number, simple to implement, easy to monitor and periodically revised rules
- Established by independent third parties or established by the PROs themselves (possibly based on government requirements)
- Reflected in treatment and recycling standards to make sure eco-design efforts by producers are not implemented in vain.
- Implement eco-taxes that relate to the non-collected waste fraction

From the Zero Waste point of view, this scale should include the following concepts:

a) Bonus/malus for use of recycled materials

The best example is the case of Ecofolio, the French EPR scheme for graphic paper where the basic 52 €/t fee has a bonus/malus system based on:

- inclusion of secondary fibres has a 10% bonus and
- presence of elements or materials that disrupt recycling process have a penalization of 5%⁹

Increased incorporation of recycled materials –or secondary raw materials (SRM)– in products may be steered by setting a minimum recycled content target in products or sectors. This may be done in connection with the future revision of the Ecodesign Directive.

b) Recyclability and reusability

Recyclability of products remains an unsolved issue¹⁰ and the introduction of modulated fees could help improve both recycling and reusing products and materials at their end-of-life.

An example of fee modulation for recyclability is the case of Eco-Emballages in France¹¹, but the effects of the approach is yet not studied and its impacts on eco-design remain unmeasured. Other packaging PRO like the German green dot

are also walking in the same direction but no proposal is still implemented.

In the case of WEEE, the producers' fees in France are modulated according to a set of environmental criteria: reusability, recyclability, lifetime, presence of hazardous substances, etc. The introduction of Product Declarations would facilitate reuse and recycling in a more efficient way.

In the case of packaging, there is a trend to increasing the use of environmentally friendly food materials, replacing food packaging with bio-based and biodegradable, compostable material. While this may be seen by some stakeholders as an interesting trend, it has risen criticism due to the use of bio-based materials –that have an important environmental footprint– for throwaway packaging. Also, from the side of recyclers, the appearance of biodegradable materials in the recycled plastic flow has created some disruption in material quality and potential uses.

Finally, it's remarkable the penalization that exists in Ecoemballage towards non-recyclable materials such as ceramic.

c) Detoxifying waste

A move towards a circular economy means a move to non-toxic material cycles, thus removing problems in recycling. Detoxification of material is a step towards easier and more cost-effective material recycling. Warhurst (2015) states that "the circular economy will only be successful in the long term if customers – including the public – are confident in the quality of recycled material. If this confidence is removed, then the market will demand virgin materials, and the attempt to create a circular economy will fail".

ChemTrust defends that chemicals of very high concern need to be phased out of products as soon as possible and a faster, more precautionary, safety assessment of chemicals, should include rapid action to ensure they are substituted with safer alternatives.

Within EPR this should include the commitment of companies to avoiding chemicals likely to be

9. <http://ecofolio.fr/actualites/eco-contribution-2015>

10. According to SUEZ (2015) "24% of plastics packaging cannot be recycled, making it virtually impossible to reach ambitious targets if the situation stays the same".

11. <http://www.ecoemballages.fr/entreprises/bareme-contributif-point-vert-un-tarif-plus-precis-plus-equitable-et-plus-axe-sur-leco>

restricted in the future, e.g. the ChemSec SIN list.

The SIN List is composed of chemicals that have met EU criteria for being substances of very high concern (SVHCs)¹². The environmental NGO ChemSec released the first SIN List (version 1.0) in 2008 and identified 267 such chemicals.

After two updates in 2009 and 2011, in October 2014 the list was updated for the last time and the SIN List was also divided into 31 groups, and a tool for substitution based on the SIN List – SINilarity – was presented.

Current or future EPR schemes should include toxicity criteria in their fees, establishing a penalization if any of the substances in the SIN List is used and information to the supply chain – especially consumers and recyclers– should be provided. A field where such toxicity fees would have and special interest would be through mandatory extended producer responsibility (EPR) schemes for textiles or furniture complemented by a tax on hazardous chemicals on the products.

Some companies, like Sony Ericsson, Sara Lee, Skanska, Marks & Spencer, Dell and Carrefour have already started phasing out and substituting substances in the SIN List.

Environmental toxicity

As part of the toxicity issue, the so-called environmental toxicity should also be taken into account in EPR schemes in order to contribute addressing certain global environmental problems

Such an example is the case of marine litter. Based on the call made by the Emmett Center on Climate Change and the Environment EPR (Gold et al. 2013) a bonus/malus schemes or direct bans could help phasing out of the most common and damaging types of plastic marine litter (e.g. microbeads, fish-egg-sized nurdles, single-use plastic bags, and polystyrene foam food packaging), and substitute all plastics that are not recycled at a rate of 75 percent or more by a certain date.

3.4.4. Separate collection as a target

Recycling targets have always been the major drivers of EPR policies. Although achieving high recycling rates is one of the main goals of EPR schemes, when it comes to internalization of costs, this is not the best indicator nor the only desirable target.

As most EPR schemes cover only those costs induced by separate collection, in order to steer a real internalization of costs, collection targets should be added to existing recycling targets, for instance in packaging directive. Moreover, different collection targets could be set for some waste streams that have special impacts such as littering –in the case of beverage containers– or risk of losing strategic materials –the case of mobile phones.

Since the introduction of waste management indicators and targets, recycling targets have always been the common indicators of EPR policies. Although achieving high recycling rates is one of the main goals of EPR schemes, when it comes to internalization of costs –and hence better economic signals– recycling is not the best indicator. As mentioned before, most EPR schemes cover only those costs induced by separate collection.

According to the costs that need to be covered, full-cost coverage should be assessed based on separate collection targets not uniquely on recycling rate. In this sense, the only product directive that doesn't set collection rates is packaging waste. On the opposite side, batteries directive does not only set collection rates –although clearly too low to represent a good internalization of costs– but also quality of the recycle.

Another important issue is that of differentiation of collection rates by different products. In this case, again packaging lacks this approach whereas WEEE sets differentiated targets for different categories of products.

Recycling is not the only indicator that should be used to assess PROs performance, other indicators like littering could be used and, in consequence, collection targets should be introduced for all waste streams and even for specific product groups to help address certain policies. In the case of marine littering collection targets could be provided for certain packaging or products

¹². Article 57 of REACH: being either carcinogenic, mutagenic or reprotoxic (CMR), persistent, bioaccumulative and toxic (PBT), very persistent and very bioaccumulative (vPvB), or posing an equivalent environmental or health threat.

3.4.5. More products with EPR schemes

The current 45% coverage of products by EPR schemes is not broad enough to steer properly a circular economy transition. Most of the EPR-covered products fall within the scope of European-level regulated EPR schemes; some of them are those for packaging, WEEE, batteries and end-of-life vehicles.

For other waste streams some countries have gone further and set EPR schemes for other products.

In some countries, implementing EPR schemes for graphic paper, textiles, furniture could duplicate the scope of EPR when it comes to coverage.

The fact that only 45% of all product waste is covered by EPR schemes demonstrates that the influence of administration on both product policy and waste policy is quite limited. Most of the EPR covered products fall within the scope of European-level regulated EPR schemes like those for packaging, WEEE, batteries and end-of-life vehicles. Some other products may be covered by some more generic pieces of European legislation but in any case European EPR policies are not broad enough to properly steer a circular economy transition.

It is quite generalised that countries have EPR schemes for other waste streams such as tyres, graphic paper, oils, medical waste or agricultural films.

Interestingly enough, a few European countries have gone further and set EPR schemes for

Table 6: Collection/recycling targets for main waste directives

	Collection targets	Recycling targets
Packaging ¹³	NO	Minimum recycling targets for materials contained in packaging (31 December 2008): - 60% by weight for glass - 60% by weight for paper and board; - 50% by weight for metals; - 22,5 % by weight for plastics, counting exclusively material that is recycled back into plastics; - 15 % by weight for wood.
WEEE ¹⁴	From 2016, the minimum collection rate shall be 45% From 2019, the minimum collection rate to be achieved annually shall be 65% of the average of products placed in the market in the previous three years.	Categories: - 1 or 4 of Annex III, 80 % shall be prepared for re-use and recycled - 2 of Annex III, 70 % shall be prepared for re-use and recycled - 5 or 6 of Annex III, 55 % shall be prepared for re-use and recycled; - 3 of Annex III, 80 % shall be recycled.
Batteries ¹⁵	Collection targets are set as: - 25 % by 26 September 2012 - 45 % by 26 September 2016	a) recycling of 65 % by average weight of lead-acid batteries and accumulators, including recycling of the lead content to the highest degree that is technically feasible while avoiding excessive costs; b) recycling of 75 % by average weight of nickel-cadmium batteries and accumulators, including recycling of the cadmium content to the highest degree that is technically feasible while avoiding excessive costs; and c) recycling of 50 % by average weight of other waste batteries and accumulators.
End-of-life vehicles ¹⁶	100%	- no later than 1 January 2015, re-use and recycling shall be increased to a minimum of 85 % by an average weight per vehicle and year.

13. <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:01994L0062-20150526>

14. <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012L0019>

15. <http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:02006L0066-20131230&rid=1>

16. <http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:02000L0053-20130611&qid=1405610569066&from=EN>

other products. A very interesting EPR scheme could be that for graphic paper, that complements paper/cardboard packaging waste collection very well and optimizes the costs.

Also, EPR schemes for furniture or household hazardous waste, only implemented in France, or textiles, currently only in France but under study for Nordic countries, should be assessed and regulated at European level. Recently, the Local Government Association, representing English and Welsh municipalities has urged mattress and furniture manufacturers to provide a “take-back” service¹⁷.

In countries where such EPR schemes do not exist, an implementation of schemes for graphic paper, textiles and furniture could duplicate the scope of EPR when it comes to weight coverage.

Some of the waste streams that have no EPR scheme behind them are currently providing enough income and already represent an opportunity for charities to create jobs. The implementation of any new EPR legislation should avoid undermining such charity organisations by helping them to be operators (both collectors and sorters) under a mandatory EPR system.

Costs incurred by charity organisations from increased administration, sorting and handling of increased volumes of recyclable textiles should be integrated on the costs covered by the EPR system.

3.4.6. Ban on landfilling and incineration of EPR covered recyclables

As the primary goal of EPR policies is to encourage better product design, and reuse and recycling of products and materials, EPR should be constructed in a way that avoid that reusable or recyclable materials end up in landfills or incineration in any of its forms (pyrolysis, gasification, cement kilns).

A ban on landfilling and incineration should be enforced gradually, in order to promote redesign of products and materials that currently cannot be recycled, despite their separate collection; a starting point for this could be forbidding incineration of any waste that is collected through an EPR scheme.

In agreement with the fact that the primary goal of EPR policies is to encourage better product design, and reuse and recycling of products and

materials, EPR should be constructed in a way that avoid that reusable or recyclable materials end up in landfills or incineration in any of its forms (pyrolysis, gasification, cement kilns). As of now, 49% of total refused derived fuels (RDF) produced in Europe comes from municipal waste and many of this is plastic, paper and wood that is covered by EPR schemes, especially packaging PROs (ENT, 2012). The fact that materials covered by EPR schemes end up incinerated or landfilled points at the failure of many EPR schemes to provide effective collection schemes and, even more worryingly, the failure to disincentivise the use of non-recyclable materials or to promote market opportunities for such materials. Using the argument of energy recovery, industry is lagging back in the redesign of their products from a circular economy point of view.

A gradually enforced ban on landfilling and incineration should be implemented, in order to promote redesign of products and materials that currently cannot be recycled, despite their separate collection. The anticipatory effects of such bans has been seen to have more effect on firms to take decisions to innovate than incentives within EPR schemes (Rossem, 2008). A starting point for this could be forbidding incineration of any waste that is collected through an EPR scheme.

3.5. Economic reform that pushes for service instead of products

The sole current implementation of EPR does not provide enough economic incentives for companies to rethink their business model and provide services that would help reduce waste production. Apart from the economic instruments that governments may put in place, a broad environmental tax reform (ETR) would shifting tax burden from labour to environmentally harmful production and consumption, thus creating a proper playground to help providing incentives for better use of resources.

In parallel with this move, a phase-out on subsidies to environmentally harmful activities should be implemented, including grants for final disposal facilities.

The transition to a service-based economy is a cornerstone of a zero waste society. According to the former Commissioner for Environment, Janez Potočnik, Europe needs to “reduce the

17. <http://www.expressandstar.com/news/uk-news/2015/07/24/manufacturers-urged-to-help-tackle-fly-tipping/>

volume of virgin materials used by industry. But that does not mean we must just become service based economies and let industries in other regions of the world feed our needs: we need to de-materialise, not de-industrialise. We need to develop smarter products that do the same with fewer resources, or at least fewer virgin resources. And for the business community that means getting more added value – selling more associated services – on the back of less physical “stuff”.

As we have seen, the sole current implementation of EPR does not provide enough economic incentives for companies to rethink their business model and provide services that would help reduce waste production. Apart from the economic instruments that governments may put in place, a broad environmental tax reform (ETR) would create the proper playing field for providing incentives to better use the resources by shifting tax burden from labour to environmentally harmful production and consumption.

Currently, labour taxes account for 53.3% in the Eurozone Area (% of total tax revenue) against 5.7% Environmental taxation (European Union, 2014).

In a Zero Waste society, durable products should have a better taxation: lower taxes on repair service activities and higher taxes on resource-intensive, non-recyclable and single-use products are to be expected in a greener taxation system. This approach has the support of the Committee on Industry, Research and Energy in the European Parliament that calls to “incentivise re-use, repair and demand of durable

products through demand-side instruments such as a policy of zero VAT on the repair and sale of second-hand products and the reinforcement of green public procurement criteria for purchasing more resource-efficient, less wasteful and more recyclable products” (Pietikäinen, 2014). In this way, tax burden should shift away from labour and differentiating VAT rates in accordance with the waste hierarchy, thus making resource efficiency, recycling, renovation and reuse.

Other voices call for the Commission to “include Secondary Raw Materials (SRM) in the list of goods benefiting from a reduced VAT rate. A reduced VAT rate will benefit the entire value chain; from the price of SRM itself, to the price of the product that includes SRM. The final price of the good will be influenced by the quantity of SRM included, pushing companies to look for more SRMs” (Suez, 2015). The rationale behind this is that recycled materials had already paid full VAT when they were first put into the market.

In parallel with this move, a phase-out on subsidies to environmentally harmful activities should be implemented. A well-known example is that fossil fuels are subsidised by up to EUR 68.8 billion annually on the EU level (OECD, 2013); similarly the only partial coverage of waste collection and management costs by PROs can also be considered as a sort of subsidy to waste production. Not only for existing EPR that have low collection rates but specially for products that fall out of EPR policies. Also, grants from cohesion funds for building new landfills or incineration plants should be seen as subsidies to waste production and should disappear.

Glossary

Ecodesign

According to the Directive, ecodesign means the integration of environmental aspects into product design with the aim of improving the environmental performance of the product throughout its whole life cycle.

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According to the Directive, ecodesign means the integration of environmental aspects into product design with the aim of improving the environmental performance of the product throughout its whole life cycle.

End-of-life vehicles (ELV)

Waste derived from used automotive vehicles.

Environmental tax reform (ETR):

A combination of an environmental tax with a reduction in one or more existing taxes. If the ETR is revenue-neutral it can also be called an environmental tax shift.

Extended producer responsibility (EPR)

EPR is an environmental protection strategy to reach an environmental objective of a decreased total environmental impact from a product. An EPR scheme is any system set up by one or more producers to implement the EPR principle. It can be an individual system when a producer organises its own system, or a collective system when several producers decide to collaborate and transfer their responsibility to an independent organisation (a PRO).

EPR scheme

See PRO.

Fee

Tariff paid by a producer to have its products dealt with through a PRO.

Household hazardous waste (HHW)

There is no clear definition of "household hazardous waste (HHW)" but it can be defined as "waste products that increase the hazardous properties of municipal solid waste when landfilled, incinerated or composted".

Marine litter

Any persistent, manufactured or processed solid material discarded, disposed of, or abandoned in the marine and coastal environment

Packaging and packaging waste (PPW)

All products made of any materials of any nature to be used for the containment, protection, handling, delivery and presentation of goods, from raw materials to processed goods, from the producer to the user or the consumer.

Polluter-pays principle

An environmental policy principle according to which, the producer of pollutant releases to the environment shall bear the costs of its treatment.

Producer responsibility organization (PRO)

Is an organization set up in collective EPR schemes to implement the EPR principle in the name of all the adhering

companies.

Product waste

Any municipal waste that is not kitchen or garden waste.

Recyclate

Material coming from a recycling process. See “Secondary raw material (SRM)”.

Refuse derived fuel (RDF)

Waste that is used as a substitution fuel in industrial processes –e.g. cement kilns– after a homogenisation process.

Secondary Raw Materials (SRM)

Recycled materials that can be used as an input of a production process in substitution of virgin materials.

Separate collection rate

The amount of a determined product or material stream that is collected separately. It’s normally expressed as percentage.

Service-based economy

A service based economy is an economy that lowers demand for energy and/or materials by designing durable and upgradable products with a long-life span. Companies with such a business model shift their business model to delivering customer services rather than the products themselves.

Tradable Permits

“Tradable permits can be defined as marketable rights that allow the emission of polluting substances or the use – or even destruction – of a common resource. Every tradable permit scheme is based on permits (or rights) granted by a regulatory authority to participants to the scheme (usually companies who wish to exploit resources or emit polluting substances).

Waste of electric and electronic equipment (WEEE)

Waste coming from the discarded electric and electronic products.

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