Interreg

EUROPEAN UNION

Danube Transnational Programme

MOVECO

Extended Producer Responsibility Schemes and their influence on innovation in the TransDanube region

MOVECO PROJECT

Mobilising Institutional Learning for Better Exploitation of Research and Innovation for the Circular Economy

Deliverable: D.3.1.3

Date: December 2017

Prepared by Antonia Bozic Cerar, CCIS and Tina Krošelj, MESP

Project co-funded by European Union funds (ERDF, IPA)
www.interreg-danube.eu/moveco

Acknowledgement: This report was prepared on the basis of the national reports prepared by MOVECO project partners: Chamber of Commerce and Industry of Slovenia, Chamber of Commerce and Industry Bistrita-Nasaud, Slovak University of Agriculture in Nitra Ministry of the Environment and Spatial Planning of the Republic of Slovenia, Tera Tehnopolis Ltd. Croatia, Bulgarian Chamber of Commerce and Industry, Slovak Business Agency, Europa Consortium Regional Development Non-profit Ltd., Business Upper Austria, Cluster of Environmental Technology Bavaria, Bavarian Research Alliance GmbH and Institute Mihajlo Pupin Serbia

Contents

Abbreviations

B&A	Batteries and Accumulators
B2B	Business to Business
BMUB	German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
DE	Domestic extraction
DfE	Design for Environment or eco-design
DMC	Domestic Material Consumption
DMI	Direct Material Input
DR	Danube Region
DTP	Danube Transnational Programme
EC	European Community
EEA	European Environmental Agency
EEE	Electrical and Electronic Equipment
EEE	Electrical and electronic equipment
EIR	Environmental Implementation Review
EMEPA	Enterprise for Management of Environmental Protection activities
EPR	Extended Producer Responsibility
ERA	Elektro Recycling Austria GmbH
EU	European Union
EW-MFA	Economy-wide material flow accounts
GDP	Gross Domestic Product
NTCA	Customs Administration of Hungary
NTCA	National Tax and Customs Administration of Hungary
OECD	Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturers
PPW	Packaging and Packaging Waste
PRO	Producer Responsibility Organisation
R&D	Research and Development

REACH	Registration, Evaluation, Authorisation of Chemicals
RoHS	Restriction of Hazardous Substances
SDI	Sustainable Development Indicators
SME	Small and Medium-Sized Enterprise
WEEE	Waste Electronic and Electrical Equipment

Executive summary

There is no doubt that existing EU legislation has enforced an increase in collection and recycling rates of common, predominantly consumer induced waste streams such as packaging waste, electrical and electronic equipment, batteries and accumulators. Despite improved management and successful implementation of waste management legislation, it is not a match for the rise in new products, differing in format, material or combinations of materials and formats, which are increasingly more difficult to disassemble, reuse and recycle, by design.

Extended producer responsibility (EPR), a strategy to support better design for managing post-consumer waste streams has fallen short of this objective, with no incentives to support better product design for better resource management, in line with the proposed new circular economy legislative package currently under discussion at EU level.

After over twenty years, extended producer responsibility has again fallen under the scrutiny of the European commission, as an opportunity and measure to support better design, innovation and eco-innovation. This should support the transition towards a more sustainable economy, where material resources are kept in the economy as long as possible, through greater product longevity and durability, material and component reuse and recycling and phasing out of disposal, either through landfill or incineration.

The new, draft legislative package currently being discussed in EU institutions, supporting the transition towards a more circular way of production and consumption offers some ground rules, which address some common problems that have been identified in a number of studies on EPR and the shortcomings of this approach.

A general observation of the EPR systems existing in the Danube region is that the system seems to be less complicated and more straightforward for electrical and

electronic equipment, while the approach to packaging EPR systems is more diversified. Eco-design for electronic and electrical equipment is supported by the eco-design directive, which enforces some technical eco-design measures and requirements through its implementation acts. The Waste Electronic and Electrical Equipment (WEEE) directive and the Restriction of Hazardous Substances (RoHS) directive have been reviewed and updated recently, enforcing more unified approaches, which ensure greater consistency and predictability of how the systems work in each member state.

The packaging directive on the other hand is quite old (1994) and seems not to have kept up with the evolving packaging market and rapid development of new materials and packaging solutions. The EU has announced it will present a plastics' strategy to address some of the main environmental issues regarding plastics and plastic packaging by the end of 2017.

The EPR systems are evolving to include separate registration and coordination points i.e. clearing houses to coordinate and manage the flow of materials and money through the collective, competitive producer responsibility organisations as well as compliance of companies.

It is surprising that in the age of the internet, it can be very difficult to get adequate information on the workings of individual country schemes. There are some examples of good practice within the DR in this regard, with the Eko-kom scheme for packaging and packaging waste from the Czech Republic, which is an exception to the rule and offers the most transparency with regard to requirements producers, must fulfil and how its system operates. In Hungary, the system has just been overhauled, and it is very difficult to get information in English, to inform small and medium enterprises (SMEs), wishing to enter the market from other countries of their obligations and the potential costs to fulfil these obligations. Without our project partner in Hungary, it would have been more difficult to obtain information. This implies that SMEs wishing to enter the market would also need good partners in Hungary to inform them of their obligations and help them comply with them. This

is an observation, which is more or less valid also in other Danube region countries. Business support organisations can offer valuable guidance on legislation to SMEs; a good example is the information on legislative requirements offered on the website of the Austrian Chamber of Commerce.

Even where information is provided in English, it may be the safest bet for SMEs to work with state licensed producer responsibility organisations in order to be sure all administrative requirements are being fulfilled; i.e. in Croatia where the EPR system works through the environmental fund. Though a lot of information is provided in English on the Fund's website, some of the more practical details are still missing. Two organisations, which cannot legally obtain status as Producer Responsibility Organisations (PRO), due to legislation, offer services to ensure SMEs can be sure of their compliance.

The different systems from country to country can certainly be perceived as an obstacle for SMEs wishing to expand their business within the region. The overwhelming administrative demands can overshadow any incentives for eco-design or design for the circular economy.

According to a recent publication[i] prepared by the European Environmental Agency, titled Monitoring progress towards a circular economy, there is, at present, no recognised way of measuring how effective the EU, a country or even a company is in making the transition towards a circular economy, nor are there holistic monitoring tools for supporting such a process.

In this overview, we looked at indicators used in the EU Environmental Implementation Review (EIR) package[ii], such as Domestic Material Consumption (DMC), resource productivity, waste generation and waste management.

For innovation we referred to the innovation and eco-innovation scoreboards.

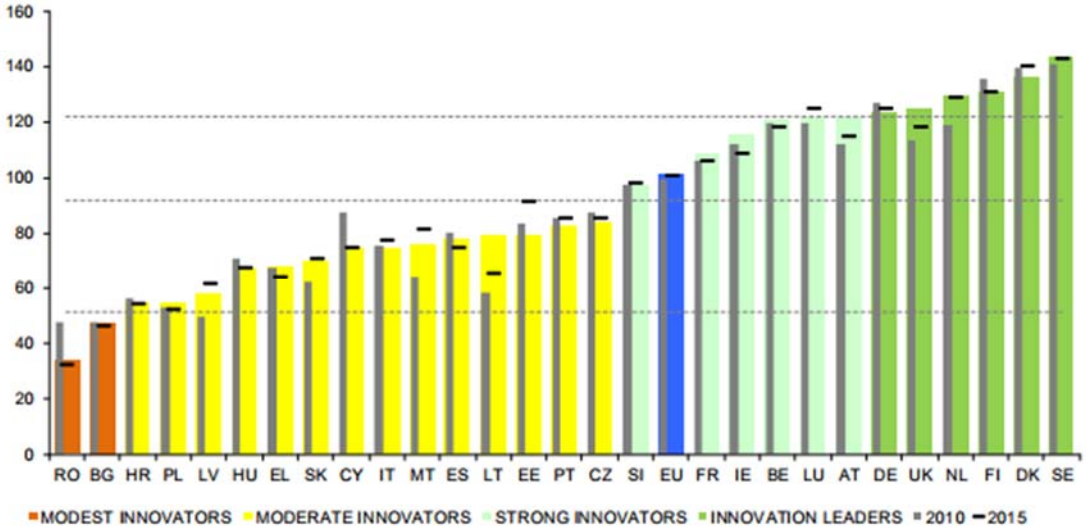


Fig. 4 Innovation ranking published in 2017[iii].

The innovation scoreboard prepared in 2017 ranked Germany amongst innovation leaders, Austria and Slovenia amongst strong innovators, with the Czech republic being ranked at the top of moderate innovators, followed by Slovakia, Hungary, Serbia and Croatia. Bulgaria and Romania were ranked as modest innovators.

Unfortunately, all the indexes were not available for all the countries covered in this report or were not updated with the latest data for all DTP countries.

During our investigation, the eco-innovation index has proven to be a good mirror of how eco-design and eco-innovation is perceived in the individual countries. Where the index for eco-innovation is higher, this correlates with country stakeholder recognising eco-innovation as more of an economic opportunity and advantage.

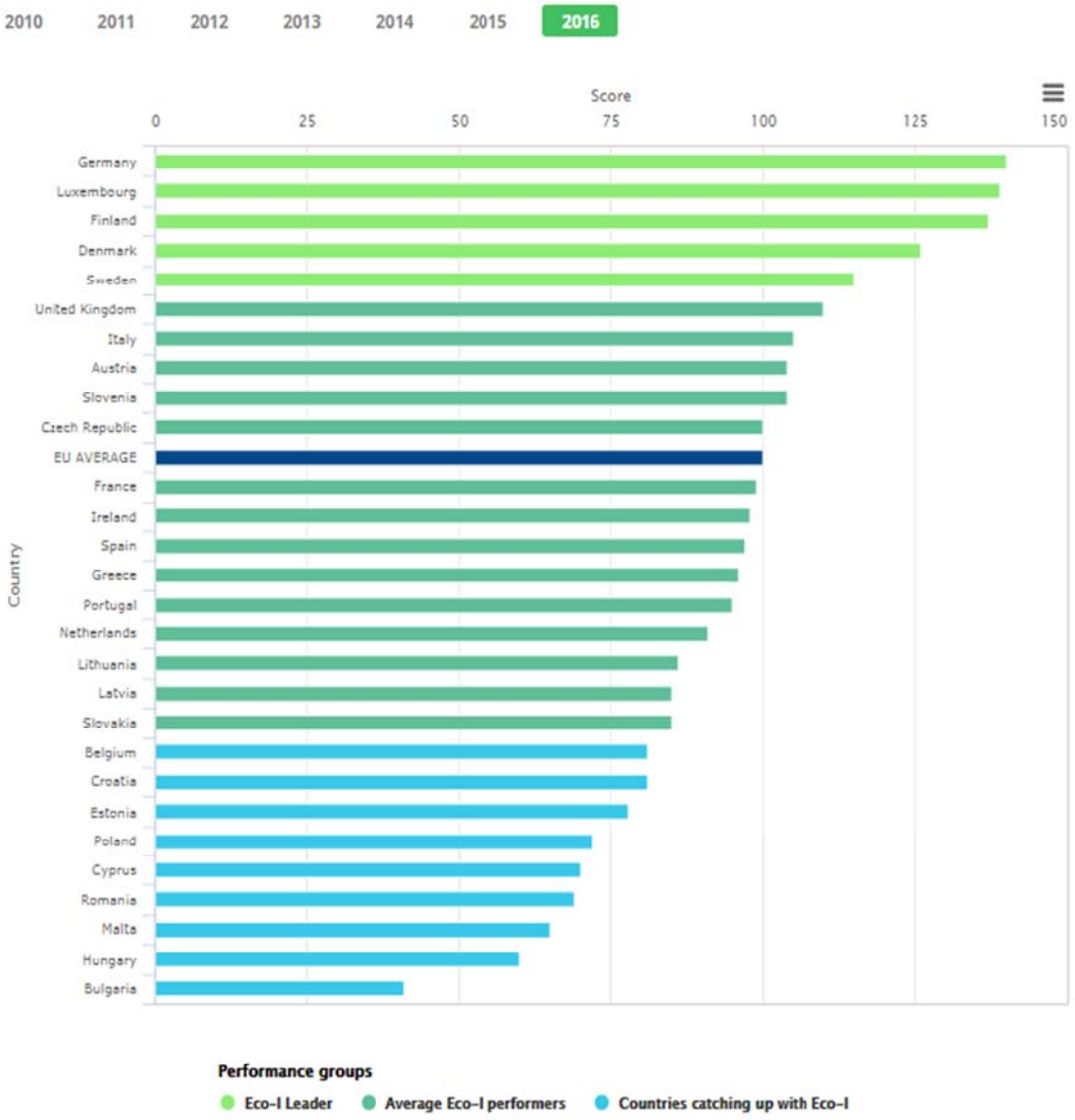


Fig. 6 eco-innovation scoreboard for 2016[iv]

According to the eco-innovation scoreboard for 2016, Germany has been ranked Eco-I leader, Austria, Slovenia and the Czech Republic are ranked as average Eco-I performers, one under another, just above the EU average. Slovakia is also ranked as average Eco-1 performer. Croatia, Romania, Hungary and Bulgaria are ranked as countries catching up to Eco-I.

In the report, we focused on data for municipal waste management indicators, as the objective of extended producer responsibility is focused on fast moving consumer goods ending in household waste streams.

The latest available statistics concerning resource efficiency indicate improvement, but also an increased need for raw materials in some of the countries from the DTP.

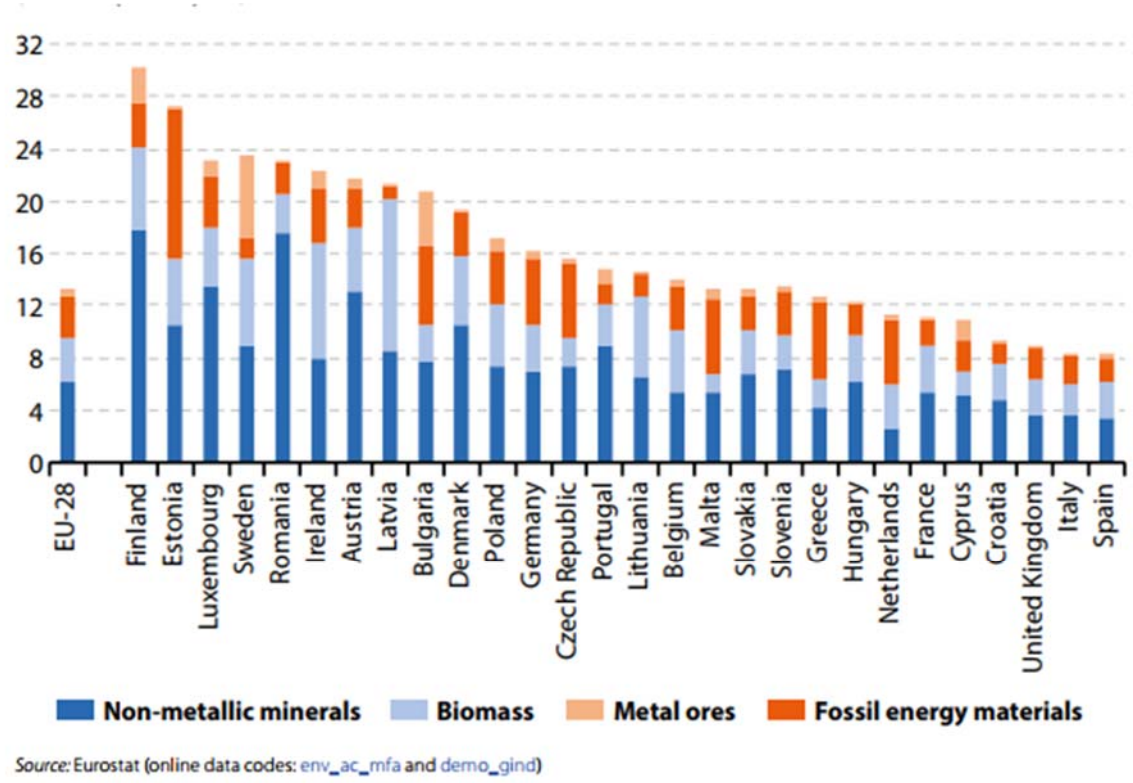


Fig. 2 Domestic material consumption by main category 2015[v] (tonne per capita)

Of the 25 EU Member States whose resource productivity improved between 2000 and 2015, eight (**Bulgaria, Croatia**, Latvia, Lithuania, Luxembourg, Poland, **Slovakia** and Sweden) have, nevertheless, experienced an increase in demand for materials of between 19 % and 46 % over the same period. The three countries (Estonia, Malta and **Romania**) that did not achieve improvements in resource productivity saw even higher increases in material use. **Romania**, Estonia and Malta's material use rose by

168 %, 104 % and 60 %, respectively (Eurostat, 2016b). In general, policies and targets for reducing overall material use are far less common than those aimed at increasing resource productivity.

In the report, we focused on data for municipal waste management indicators, as the objective of extended producer responsibility is focused on fast moving consumer goods ending in household waste streams.

Municipal waste consists to a large extent of waste generated by households, but may also include similar wastes generated by small businesses and public institutions and collected by the municipality; this part of municipal waste may vary from municipality to municipality and from country to country, depending on the local waste management system.

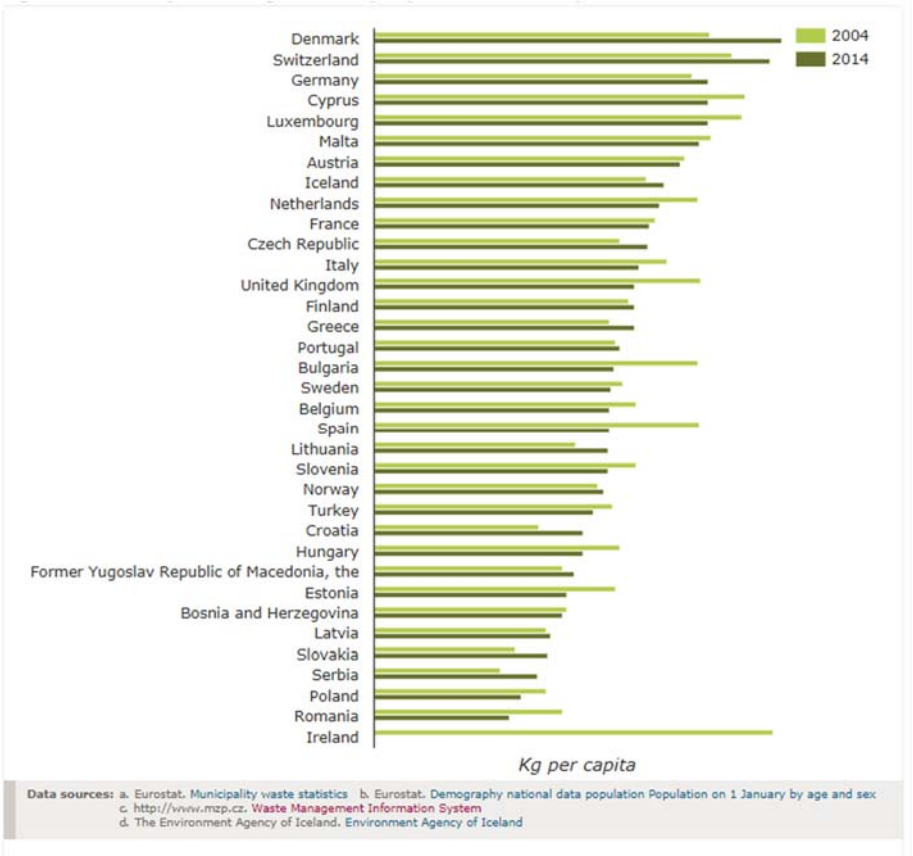


Fig. 7 Municipal waste generated per person[vi] (2004 and 2014)

According to the ten year period presented, generated municipal waste has increased in Croatia, Serbia, Slovakia, Germany and the Czech Republic and decreased in Romania, Austria, Bulgaria, Slovenia and Hungary.

A depiction of the main municipal waste management operations are presented for each country in their country group. The diagrams are taken from the last Environmental Implementation Review.

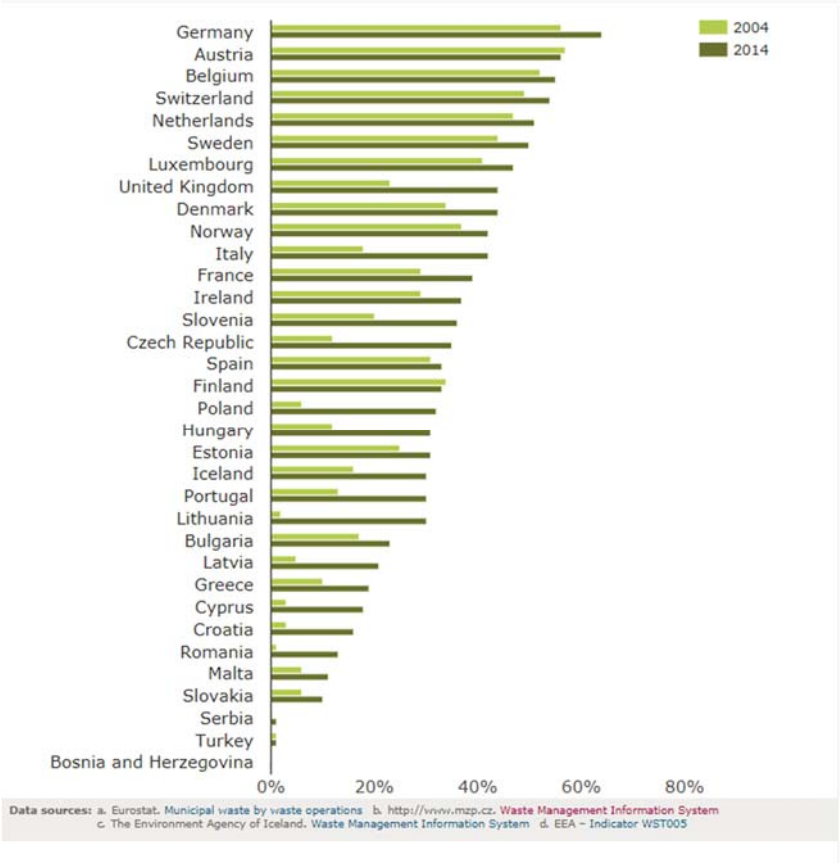


Fig. 8 Municipal waste recycling[vii] (2004 to 2014)

One of the success stories of environmental policy in Europe is the increase in the rates of municipal waste recycling (covering material recycling, composting and digestion of bio-wastes). EEA countries achieved an average total recycling rate of

33 % in 2014, compared with 23 % in 2004 (EU-27: 31 % to 44 % over the same time period) (Eurostat, 2016a).

- Germany, Austria, Belgium, Switzerland, the Netherlands and Sweden recycled at least half of their municipal waste in 2014.
- The highest increase in recycling rates between 2004 and 2014 was reported in Lithuania, Poland, Italy, the United Kingdom and the Czech Republic (increase of 20–29 percentage points).
- Overall, in 15 out of 32 countries, the increase in recycling rates was at least 10 percentage points over this period.
- However, in seven countries, the proportion of recycled municipal waste barely changed and in two countries, it even decreased slightly.

Increasing recycling rates and declining rates of landfilling are clearly linked. Usually, landfilling declines much faster than the growth in recycling, as waste management strategies mostly move from landfill towards a combination of recycling and incineration, and in some cases also mechanical–biological treatment (EEA, 2013).

The recycling rates for generated municipal waste per capita in 2016 for our DTP countries were highest in Germany, where they recycled 300 kg per capita of municipal waste, followed by Slovenia with 199 kg of municipal waste recycled per capita. Both values are well above the EU28 average value of 140 kg per capita. In Hungary 102 kg of municipal waste was recycled per capita, Bulgaria 92 kg per capita, The Czech Republic 91 kg per capita, Austria 85 kg per capita, Croatia 77 kg per capita, Romania 14 kg per capita and Serbia 1 kg per capita.

The rate of municipal waste landfilling for the 32 EEA member countries fell from 49 % in 2004 to 34 % in 2014. The performance of individual countries varied. In Austria, Belgium, Denmark, Germany, the Netherlands, Norway, Sweden and Switzerland, virtually no municipal waste is sent to landfill. On the other hand,

Cyprus, Croatia, Greece, Latvia, Malta and Turkey still landfill more than three quarters of their municipal waste.

Overall, the rates of landfilling decreased in 27 out of 32 countries. Between 2004 and 2014, the largest decreases occurred in Estonia (57 percentage points), Finland (41 percentage points), Slovenia (41 percentage points) and the United Kingdom (41 percentage points).

The amount of municipal waste landfilled and incinerated in 2014 ranged from 102 kg/person in Slovenia to 480 kg/person in Malta, with an average of 270 kg/person in Europe (32 European countries).

According to the latest data for landfilling in 2016[viii] Germany and Austria have phased out landfilling, Slovenia landfilled 38 kg of waste per capita in 2016. The Czech Republic sent 169 kg of municipal waste per capita to landfill, Croatia 309 kg per capita. Slovakia 228 kg per capita, Hungary 192 kg per capita, Bulgaria 260 kg per capita, and Serbia 211 kg per capita in 2016, while Romania sent 178 kg per capita and Montenegro 488 kg per capita to landfill in 2015.

Digitalisation potential to improve reuse, recycling has not yet been recognised practically, though the basic principle of digitalisation are similar to the principle to implement circular economy business models. A study by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety indicates that no other lead market in the environmental sector stands to benefit from digitalisation more than the circular economy. The study prepared by the Wuppertal Institute concludes that though Germany is still a world leader when it comes to exporting technologies for the circular economy, this advantage will be seriously threatened, if Germany does not start to make major investments in the digitalisation of its own circular economy soon[ix].

A general observation made in most of the region is, that inconsistencies exist between overlapping product legislation relevant for product and consumer safety, food safety requirements, chemical and waste legislation for a transition towards a

more circular economy and that a common approach should be developed at EU level to resolve these issues.

In the countries where waste targets are yet to be achieved and infrastructure and legislation are still lagging, more effort is understandably being invested in the waste end of the product cycle, with less priority to the design phase of product life. This indicates that these countries are still evolving through the initial demands of waste management, with most focus on infrastructure.

Stakeholders mentioned that though it would be easier to introduce local initiatives to reduce environmental impacts, especially for short distance food packaging, there is very small demand for such measures in local markets, while companies report that global competition provides increased incentive for increased environmental measures. Green public procurement could support more environmental design.

A report prepared by the Institute for European Environmental Policy published in the beginning of November 2017 on EPR in the EU Plastics Strategy and the Circular Economy: states: "A focus on plastic packaging, has ascertained that EPR has a yet unexploited potential to induce better design for the environment and strengthen financial incentives for eco-design. Some existing design features prevent more efficient recycling due to additives and components, which have no additional value for the consumers and could be removed with better information on product design features inhibiting better recycling."

The legislative circular economy package presented by the European Commission at the end of 2015 has recognised the potential for EPR schemes to support more efficient design and has included subsequent supporting measures in the new proposals for waste legislation.

The package currently under discussion at EU level has identified most of the drawbacks of the existing EPR experience as there seems to be as many complex approaches to extended producer responsibility as there are countries and waste streams.

Though the legislative proposal securing the transition towards a circular economy has focused on waste, this transition should not be viewed as solely as an environmental initiative, but also as an economic one with opportunities to improve resource productivity.

Potential to exploit these opportunities in the Danube region lie within the four pillars addressing the major issues emphasised in the action plan proposed by EU Strategy for the Danube Region. These comprise of ensuring better resource and energy sustainability, through the development of a knowledge society, through research, education and information technologies, supporting competitiveness of enterprises, including cluster development, investing in people and skills and stepping up institutional capacity and cooperation.

Action at EU level will drive investments and create a level playing field, remove obstacles stemming from European legislation or inadequate enforcement, deepen the single market, and ensure favourable conditions for innovation and the involvement of all stakeholders.

The MOVECO project has forged a strong transnational partnership to prepare a transnational strategy for the transition towards the Circular Economy within the DR and roadmaps for their implementation in different innovation regions. The project partners are supporting new business models and research – business cooperation along value chains, with new services and tools for eco-design and eco-innovation. The partnership comprises of representatives of all target groups, policy makers, business support organisations, Research & Development institutions as well as civil society organisations. The partnership is committed to unleash the potential of the Circular Economy in the Danube Region, boosting competitiveness and ensuring security of supply; required for economic growth and new jobs.

The objective of this overview is to ascertain, if any links exist between the extended producer responsibility schemes established in the Danube region and product

design, with emphasis on eco-design and design supporting innovation for transition towards a circular economy.

Introduction

Extended producer responsibility (EPR) is a concept first formally introduced in Sweden by Thomas Lindhqvist. It is an environmental protection strategy to decrease total environmental impact of 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.

In the 2016 OECD guidance on extended producer responsibility, it was estimated that over 400 EPR schemes operate globally for different waste streams. Small consumer electronic equipment accounts for more than one third of EPR systems followed by packaging and tyres. Though the strategy seems straightforward, it is practically impossible to compare various EPR schemes as they differ not only on waste streams but also within individual waste streams with regard to fees, geographical areas covered, service coverage, management, roles of public waste services, collection and recycling possibilities to name a few.

The MOVECO project titled Mobilising Institutional Learning for Better Exploitation of Research and Innovation for the Circular Economy, addresses the links between currently functioning EPR schemes in the Danube Region (DR) and innovation required for the transition towards a more circular economy. MOVECO's objective is to improve the framework conditions and policy instruments for eco innovation and the transition to a Circular Economy, fostering smart and sustainable growth and reducing disparities in the Danube Region (DR). The objective corresponds with the legislative proposals on waste and action plan for a circular economy launched by the European Commission on 2015.

The legislative proposals on waste, prepared by the European Commission together with EU action plan for the circular economy focuses on waste legislation, including long-term targets to reduce landfilling and to increase preparation for reuse and recycling of key waste streams such as municipal waste and packaging waste.

Further measures are proposed to make implementation clear and simple, promote economic incentives and improve extended producer responsibility schemes. The action plan includes It includes comprehensive commitments on ecodesign, the development of strategic approaches on plastics and chemicals, a major initiative to fund innovative projects under the umbrella of the EU's Horizon 2020 research programme, and targeted action in areas such as plastics, food waste, construction, critical raw materials, industrial and mining waste, consumption and public procurement.

The Commission is also proposing to encourage better product design by differentiating the financial contribution paid by producers under extended producer responsibility schemes on the basis of the end-of-life costs of their products. This should create a direct economic incentive to design products that can be more easily recycled or reused.

Economic actors, such as business and consumers, are key in driving this process. Local, regional and national authorities are enabling the transition, but the EU also has a fundamental role to play in supporting it.

The aim is to ensure that the right regulatory framework is in place for the development of the circular economy in the single market, and to give clear signals to economic operators and society at large on the way forward with long term waste targets as well as a concrete, broad and ambitious set of actions, to be carried out before 2020.

Action at EU level will drive investments and create a level playing field, remove obstacles stemming from European legislation or inadequate enforcement, deepen the single market, and ensure favourable conditions for innovation and the involvement of all stakeholders.

The MOVECO project has forged a strong transnational partnership to prepare a transnational strategy for the transition towards the Circular Economy within the DR and roadmaps for their implementation in different innovation regions. The project

partners are supporting new business models and research – business cooperation along value chains, with new services and tools for eco-design and eco-innovation. The partnership comprises of representatives of all target groups, policy makers, business support organisations, Research & Development institutions as well as civil society organisations. The partnership is committed to unleash the potential of the Circular Economy in the Danube Region, boosting competitiveness and ensuring security of supply; required for economic growth and new jobs.

The objective of this overview is to ascertain, if any links exist between the extended producer responsibility schemes established in the Danube region and product design, with emphasis on eco-design and design supporting innovation for transition towards a circular economy.

Though several studies have been conducted on this subject, very limited information can be obtained from them, on how EPR requirements are implemented within the Danube region.

The scope of the study is centred on extended producer responsibility schemes for packaging and packaging waste, waste electronic and electrical equipment and batteries and accumulators.

The study gives a general overview and a chapter with more detailed description of current practices and EPR characteristics for each partner country. Each national chapter is concluded by a good practice example relevant to EPR schemes and innovation and eco-design for the circular economy. The good practices are accessible in the national studies and in the project brochure "Your trash is my treasure"

The transnational study is structured as follows:

- The first chapter provides a basic overview with a presentation of EU legislation

- The second chapter presents an overview of indicators monitored by Eurostat and the European Environmental Agency that have been used in other reports to track the shift towards a more circular economy such as the innovation and eco-innovation indexes, the resource efficiency index and member state municipal waste management statistics regarding waste generation, recycling and disposal.
- A separate chapter is dedicated to each partner country and Moldova, providing basic information concerning legislation, the number of stakeholders involved and their characteristics, a good practice case and conclusion.

Methodology

Each partner conducted a desk research of relevant legislation with literature review to establish the main characteristics of implemented waste legislation relevant to extended producer responsibility within their region, identifying regional activities supporting a transition towards a circular economy

Quite a few studies have been prepared on the roles and workings of EPR schemes at both EU and global level. Beginning with the background EU studies published in 2014 at the launch of the first legislative package for a circular economy, followed by the Zerowaste study on Redesigning producer responsibility and global level, with an updated guidance on extended producer responsibility having been published in 2016. This study exposes flaws in existing collective EPR schemes, one of which is that they have had only limited impact on eco-design, which was one of the main drivers behind their creation. Though the legislative package was focused on waste and includes minimum requirements for the working of EPR schemes, the Zerowaste study determines that » In order for a product to be reused, repaired, rebuilt, refurbished, refinished, resold, recycled or composted, this needs to be considered in the initial design phase of the product. 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 be part of the bridge between waste and products policies.

This was followed by a mapping exercise to determine potential organisations from the target groups within the partner region

Target groups

- producers (electrical and electronic equipment and/or components, B&A, packaging and packaging waste – the electrical and electronic as well as the B&A industry are subject to packaging requirements, so the packaging aspects could be verified with WEEE and B&A, therefore more insight on packaging and packaging waste could be gained through interviews in the food and beverage sector i.e. , where packaging presents a substantial cost) /20 to 30 visits, the final number is determined on the basis of regional characteristics which each partner describes briefly for each target group
- producers of materials applied in WEEE, packaging, B&A (for example plastics)
- producer responsibility organisations (all dealing with WEEE, PPW, B&A), the final number is determined on the basis of regional characteristics which each partner describes briefly for each target group. Where PROs do not exist or their role is performed by one (state) body, this body should be referred to as a PRO
- waste management entities the final number is determined on the basis of regional characteristics which each partner describes briefly for each target group
- recyclers and
- collectors / public and private),
- local and state/regional public authorities (municipalities/local governments, ministries

Partners performed in depth interviews with representatives of each the target group. The final number of each stakeholder was determined by each partner on the basis of regional characteristics which they described briefly for each target group

A guidance template provided the basic content of the in depth interviews. The template was not meant to serve as a strict questionnaire but a list of the most important topics to be covered with possible answers for the in depth interview to proceed smoothly. The template, supplemented as annex 1 to this report, is divided into three parts covering general aspects of the organisation, their cooperation with PRO and environmental priorities. Many of the general questions are closed questions, which are elaborated more with regard to environmental aspects and circular economy in the other parts of the template

The guidance template primarily targeted producers, importers, but the topics could be adapted according to the practices and needs of other organisations, PROs can be dealing with one or more material waste stream, they may have different environmental practices and objectives, which may support innovation and eco-design, this is true also for waste management activities…

Before the interview, the interviewer was instructed to prepare and gather general information about the interviewed organisation available from company websites and other public records. This will help the interviewer answer some of the organisation profile questions and prepare on which topics they need to focus on more during the interview.

Some partners opted to obtain answers through the organisation of focus group meetings / round tables, which initiated dialogue and exchange of views amongst relevant stakeholders. In this case, the template was adapted according to the method of discussion and the target groups participating.

After the partners prepared their national reports, the facts were double-checked, via desk study, and communication with the individual partners, to prepare this report in a harmonised and uniform manner. Due to the diversified characteristics of

national approaches implementing extended producer responsibility and the lack of concise information in English on the websites of the stakeholders involved in EPR, straightforward answers were not always easily obtained.

A final draft version of this report was sent to all the partners for additional feedback and correction.

The best practice cases included in the national partner reports have been compiled into a best practice brochure, “Your trash is our treasure” and are not included in this report.

EU characteristics and legislation for extended producer responsibility

Current legislation

Waste framework directive 2008/98/EC

Article 8. of the existing waste framework directive defines extended producer responsibility target groups.

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.

3. When applying extended producer responsibility, Member States shall take into account the technical feasibility and economic viability and the overall environmental, human health and social impacts, respecting the need to ensure the proper functioning of the internal market.

4. The extended producer responsibility shall be applied without prejudice to the responsibility for waste management as provided for in Article 15(1) and without prejudice to existing waste stream specific and product specific legislation.

Directive on packaging and packaging waste 94/62/EC

Article 4, second paragraph regarding prevention determines, that preventive measures may consist of national projects to introduce producer responsibility to minimise the environmental impact of packaging or similar actions adopted, if appropriate in consultation with economic operators, and designed to bring together and take advantage of the many initiatives taken within Member States as regards prevention. They shall comply with the two main objectives of the directive, to reduce the impact of packaging on the environment and to support the functioning of the internal market.

Article 9 determines the essential requirements for packaging. The essential requirements are specified in annex II of the directive, where they are categorised according to requirements specific to the:

- Manufacturing and composition of packaging
- Reusable nature of packaging
- Recoverable nature of packaging with packaging recoverable in the form of:

- Material recycling
- Energy recovery
- Composting and
- Biodegradable packaging.

Article 11 of the directive defines concentration levels of heavy metals present in packaging. These should not exceed 100 ppm by weight except for specified lead crystal glass.

Directive 2012/19/EU on waste electrical and electronic equipment (WEEE)

Article 4 Product design, member states shall encourage cooperation between producers, recyclers and measures to promote design and production of EEE, notably in view of facilitating re-use, dismantling and recovery of WEEE, its components and materials. Eco-design requirements for reuse and treatment of WEEE must be applied and producers do not prevent through specific design features or manufacturing processes present overriding advantages.

Article 7 on collection rates implements the producer responsibility principle.

Article 15 information for treatment facilities requires producers provide information free of charge about preparation for re-use and treatment.

Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS-2)

The second RoHS directive, which is currently under revision, provides the framework for the gradual extension of the requirements to all electrical and electronic equipment (EEE), including cables and spare parts. It introduces restrictions of new substances and presents a methodology for the assessment of new hazardous substances in EEE with restrictions mainly based on waste-related criteria. It provides a review of the list of restricted substances, new substance restrictions and clearer, more transparent rules for granting, renewing or revoking exemptions, with the obligation of manufacturers to apply for exemptions and to carry out the necessary

assessment. Annex 2 to the directive sets limit values by weight for homogeneous materials for contents of Mercury (Hg: 0.1 %), Cadmium (Cd:0.01 %), Lead (Pb:0,1 %), Chromium VI (Cr6+: 0,1%), polybrominated biphenyls (PBB: 0.1 %), and polybrominated diphenyl ethers (PBDE: 0.1 %). Annex III contains a list of exemptions to this requirement.

> Directive 2009/125/EC establishing a framework for the setting of eco-design requirements for energy-related products.

Eco-design is defined as the integration of environmental aspects into product design with the aim of improving the environmental performance of a product throughout its whole lifecycle.

The directive refers to generic and specific eco-design requirements; generic requirements are requirements originating from the environmental profile of the product without set limit values for particular environmental aspects, while specific eco-design requirements are quantified requirements relating to a particular environmental aspect of a product, such as energy consumption during use, calculated for a given unit output performance.

A list of generic eco-design requirements is published in annex I based on phases of the product life cycle. Amongst the requirements contained in the list are: ease for reuse and recycling through the number of materials and components used, use of standard components, time necessary for disassembly, complexity of tools necessary for disassembly, use of component and material coding standards for the identification of components and materials suitable for reuses and recycling (including marking of plastic parts in accordance with ISO standards), use of easily recyclable materials, easy access to valuable and other recyclable components and materials; easy access to components and materials containing hazardous substances together with incorporation of used components, avoidance of hazardous substances detrimental to reuse and recycling, lifetime extension implementing availability of spare parts, modularity, upgradeability, reparability,

reference to chemical legislation with regard to hazardous substances; all of which resonate with the design requirements for transition towards a circular economy.

Item 14 of Article 1 of the directive defines reuse as any operation by which a product or its components, having reached the end of their first use, are used for the same purpose for which they were conceived, including the continued use of a product which is returned to a collection point, distributor, recycler or manufacturer, as well as reuse of a product following refurbishment. Part 2 of this annex determines information which must be supplied to consumers on maintenance, extended life expectancy measures, end-of-life measures and information for treatment facilities concerning disassembly, recycling or disposal at end-of-life.

Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators repealing Directive 91/157/EEC

Article 4. Prohibition of batteries or accumulators on the market containing more than:

- 0,0005 % Hg by weight, except for button cells where the limit is 2 % by weight
- 0,002 % Cd by weight, except for emergency and alarm systems, including emergency lighting, medical equipment or cordless power tools.

Article 11 requires Member States shall ensure that manufacturers design appliances in such a way that waste batteries and accumulators can be readily removed. Appliances into which batteries and accumulators are incorporated shall be accompanied by instructions showing how they can be removed safely and, where appropriate, informing the end-user of the type of the incorporated batteries and accumulators. These provisions shall not apply where, for safety, performance, medical or data integrity reasons, continuity of power supply is necessary and requires a permanent connection between the appliance and the battery or accumulator.

Fulfilment of extended producer responsibility requirement through collection schemes is defined in article 8 of the directive, with free take back requirements. The schemes can run together with schemes for waste electrical and electronic equipment where this is feasible. Collection targets of 45 % until 26. September 2016. Treatment and recycling are defined in article 12, and detailed in annex III of the directive.

Article 20. details required information for end-users with regard to awareness raising, available collection and recycling schemes, meaning of symbols regarding recycling and chemical contents.

This is continued in article 21 with labelling and marking requirement laid out in paragraph 3 stating compulsory marking with the chemical symbols Hg, Cd or Pb for batteries, accumulators and button cells containing more than 0,0005 % of Mercury (Hg), more than 0,002 % Cadmium (Cd) or more than 0,004 % of lead (Pb).

Proposed future legislation

Draft for new waste framework directive in 2015

Amends article 8 to be more binding and introduces article 8.a with minimal requirements extended producer responsibility schemes / product responsibility organisations must fulfil. Article 8 is amended as follows:

(a) in paragraph 1, the following sub-paragraph is added:

'Such measures may also include the establishment of extended producer responsibility schemes defining specific operational and financial obligations for producers of products.'

(b) the second sentence of paragraph 2 is replaced by the following:

'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 preparation for re-use and recycling in order to facilitate proper implementation of the waste hierarchy. The

measures should take into account the impact of products throughout their life cycle.'

(c) the following paragraph 5 is added:

'5. The Commission shall organise an exchange of information between Member States and the actors involved in producer responsibility schemes on the practical implementation of the requirements defined in Article 8a and on best practices to ensure adequate governance and cross-border cooperation of extended producer responsibility schemes. This includes, inter alia, exchange of information on the organisational features and the monitoring of producer responsibility organisations, the selection of waste management operators and the prevention of littering. The Commission shall publish the results of the exchange of information.'

Subsequently a new Article 8a is inserted:

'Article 8a

General requirements for extended producer responsibility schemes

1. Member States shall ensure that extended producer responsibility schemes established in accordance with Article 8, paragraph 1:

   - define in a clear way the roles and responsibilities of producers of products placing goods on the market of the Union, organisations implementing extended producer responsibility on their behalf, private or public waste operators, local authorities and, where appropriate, recognised preparation for re-use operators;

   - define measurable waste management targets, in line with the waste hierarchy, aiming to attain at least the quantitative targets relevant for the scheme as laid down in this Directive, Directive 94/62/EC, Directive 2000/53/EC, Directive 2006/66/EC and Directive 2012/19/EU;

- establish a reporting system to gather data on the products placed on the Union market by the producers' subject to extended producer responsibility. Once these products become waste, the reporting system shall ensure that data is gathered on the collection and treatment of that waste specifying, where appropriate, the waste material flows;

- ensure equal treatment and non-discrimination between producers of products and with regards to small and medium enterprises.

2. Member States shall take the necessary measures to ensure that the waste holders targeted by the extended producer responsibility schemes established in accordance with Article 8, paragraph 1, are informed about the available waste collection systems and the prevention of littering. Member States shall also take measures to create incentives for the waste holders to take part in the separate collection systems in place, notably through economic incentives or regulations, when appropriate.
3. Member States shall take the necessary measures to ensure that any organisation set up to implement extended producer responsibility obligations on behalf of a producer of products:

   (a) has a clearly defined geographical, product and material coverage;

   (b) has the necessary operational and financial means to meet its extended producer responsibility obligations;

   (c) puts in place an adequate self-control mechanism, supported by regular independent audits to appraise:

   - the organisation's financial management, including the compliance with the requirements laid down in paragraph 4(a) and (b);

- the quality of data collected and reported in accordance with paragraph 1, third indent, and the requirements of Regulation (EC) No 1013/2006.

(d) makes publicly available the information about:

- its ownership and membership;
- the financial contributions paid by the producers;
- the selection procedure for waste management operators.

4. Member States shall take the necessary measures to ensure that the financial contributions paid by the producer to comply with its extended producer responsibility obligations:

(a) cover the entire cost of waste management for the products it puts on the Union market, including all the following:

- costs of separate collection, sorting and treatment operations required to meet the waste management targets referred to in paragraph 1, second indent, taking into account the revenues from re-use or sales of secondary raw material from their products;
- costs of providing adequate information to waste holders in accordance with paragraph 2;
- costs of data gathering and reporting in accordance with paragraph 1, third indent.

(b) are modulated on the basis of the real end-of-life cost of individual products or groups of similar products, notably by taking into account their re-usability and recyclability;

(c) are based on the optimised cost of the services provided in cases where public waste management operators are responsible for implementing operational tasks on behalf of the extended producer responsibility scheme.

5. Member States shall establish an adequate monitoring and enforcement framework with the view to ensure that the producers of products are implementing their extended producer responsibility obligations, the financial means are properly used, and all actors involved in the implementation of the scheme report reliable data.

   Where, in the territory of a Member State, multiple organisations implement extended producer responsibility obligations on behalf of the producers, Member State shall establish an independent authority to oversee the implementation of extended producer responsibility obligations.

6. Member States shall establish a platform to ensure a regular dialogue between the stakeholders involved in the implementation of extended producer responsibility, including private or public waste operators, local authorities and, where applicable, recognised preparation for re-use operators.'

7. Member States shall take measures to ensure that extended producer responsibility schemes that have been established before comply with the provisions of this article within twenty-four months of that date.'

Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 94/62/EC on packaging and packaging waste

Article 4, such measures may consist of national programmes, **incentives through extended producer responsibility schemes** to minimise the environmental impact of packaging or similar actions adopted, if appropriate in consultation with economic operators, and designed to bring together and take advantage of the many initiatives taken within Member States as regards prevention. They shall

comply with the two main objectives of the directive, to reduce the impact of packaging on the environment and to support the functioning of the internal market.

The proposal defines targets for preparation for reuse and recycling, while the currently valid directive speaks of recovery, re-use and recycling. With this rewording the definitions are more aligned with the definitions from the waste framework directive.

> Proposal for a Directive of the European Parliament and of the Council amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment

The proposal amends implementation reporting requirements for member states and sets new targets for recycling and preparation for reuse.

Environment and Innovation indicators

Resource efficiency

Resource efficiency[x] is a key component of Europe 2020, the EU's strategy for building growth and jobs over the next ten years. The strategy aims to encourage economic growth that is smart (based on knowledge and innovation), sustainable (green growth will be more sustainable in the longer term), and inclusive (because high rates of employment deliver improved social and territorial cohesion).

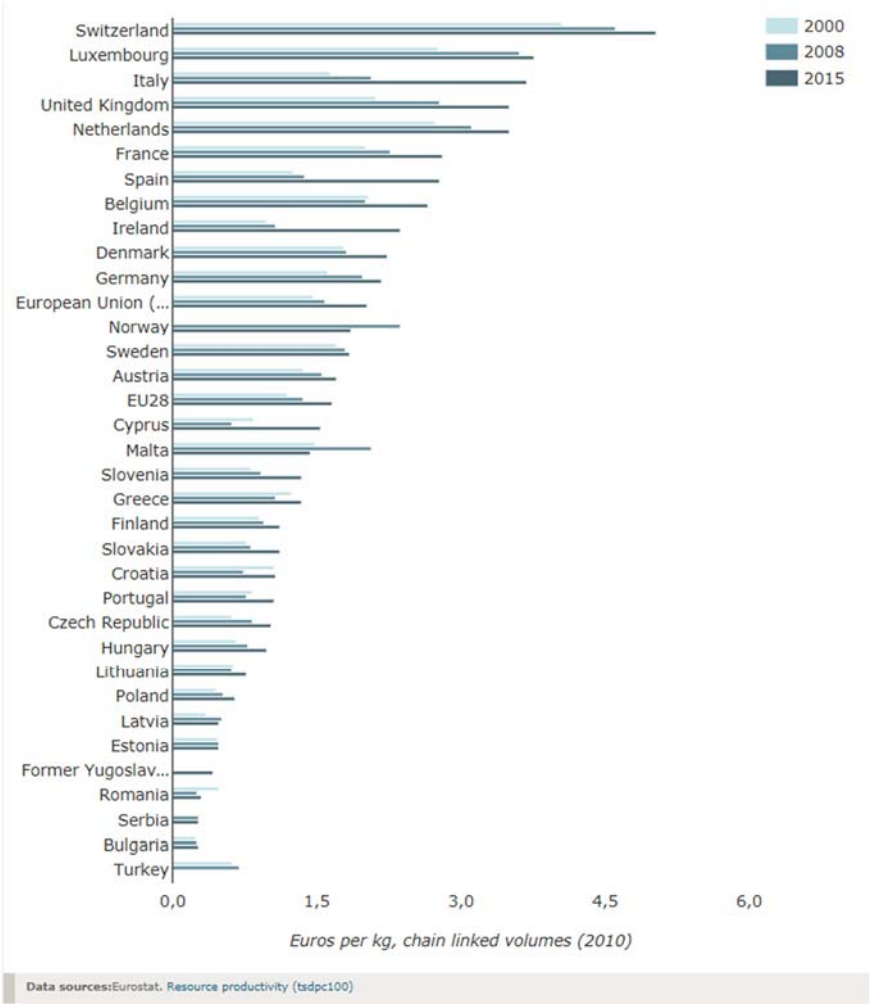


Figure 1: Resource efficiency index[xi]

Resource productivity is calculated from domestic material consumption and national GDP. The domestic material consumption (DMC) measures the total amount of material directly used by an economy. This indicator is defined as the direct material input (DMI) minus all physical exports. The DMI measures the direct input of materials for the use in the economy and equals to domestic extraction (DE) plus all physical imports. DMC is based on the economy-wide material flow accounts (EW-MFA). DMC in tonnes per capita provides an indication of the comparable material consumption of nations normalised with the population.

The indicator is available for each EU Member State, EU-28 aggregate, EFTA countries and some candidate countries. It is important to note that the term "consumption" as used in DMC denotes apparent consumption and not final consumption. DMC does not include upstream hidden flows related to imports and exports of raw materials and products

The indicator is a Sustainable Development Indicators (SDI). It has been chosen for the assessment of the progress towards the objectives and targets of the EU Sustainable Development Strategy.

Resource productivity measures the quantity of economic output produced using a certain amount of extracted resources; it is used as a proxy for resource efficiency by the European Commission. It effectively measures the decoupling of material use from economic growth. However, under conditions of relative decoupling, overall material use can increase despite an increase in resource productivity.

Resource productivity varies between countries by a factor of nearly 20. This variation is not a sign of more efficient industry in one country compared with another, but rather a reflection of the types of material resources available in the country and its economic structures. Countries with service-based economies will tend to have higher resource productivity than economies with a high proportion of heavy industry, since service industries typically have a lower demand for material inputs (EEA, 2013).

Improving resource productivity has not necessarily led to reduced overall material use. EU-28[xii] resource productivity increased from 1.47 EUR/kg in 2000 to 2.07 EUR/kg in 2016, an increase of 41 %. This was not a steady increase: in particular the financial and economic crisis marked a change in 2008 (see Figure 1). Indeed, resource productivity reported a steady but modest increase from 2000 to 2008 (7.9 %). From 2008 to 2016 resource productivity surged from 1.59 to 2.07 EUR/kg, despite a dip in 2011. During this period annual growth was highest in 2009 (8.6 %) and 2012 (7.3 %).

An analysis of the resource productivity components helps to explain these developments. During the period from 2000 to 2007, GDP and DMC grew in parallel and there was no apparent decoupling between economic and environmental variables. Between 2007 and 2009 there was a relative decoupling of GDP from DMC, while an absolute decoupling of GDP from DMC was apparent in most years between the low point of the financial and economic crisis and the latest period for which data are available, in other words from 2009 to 2016.

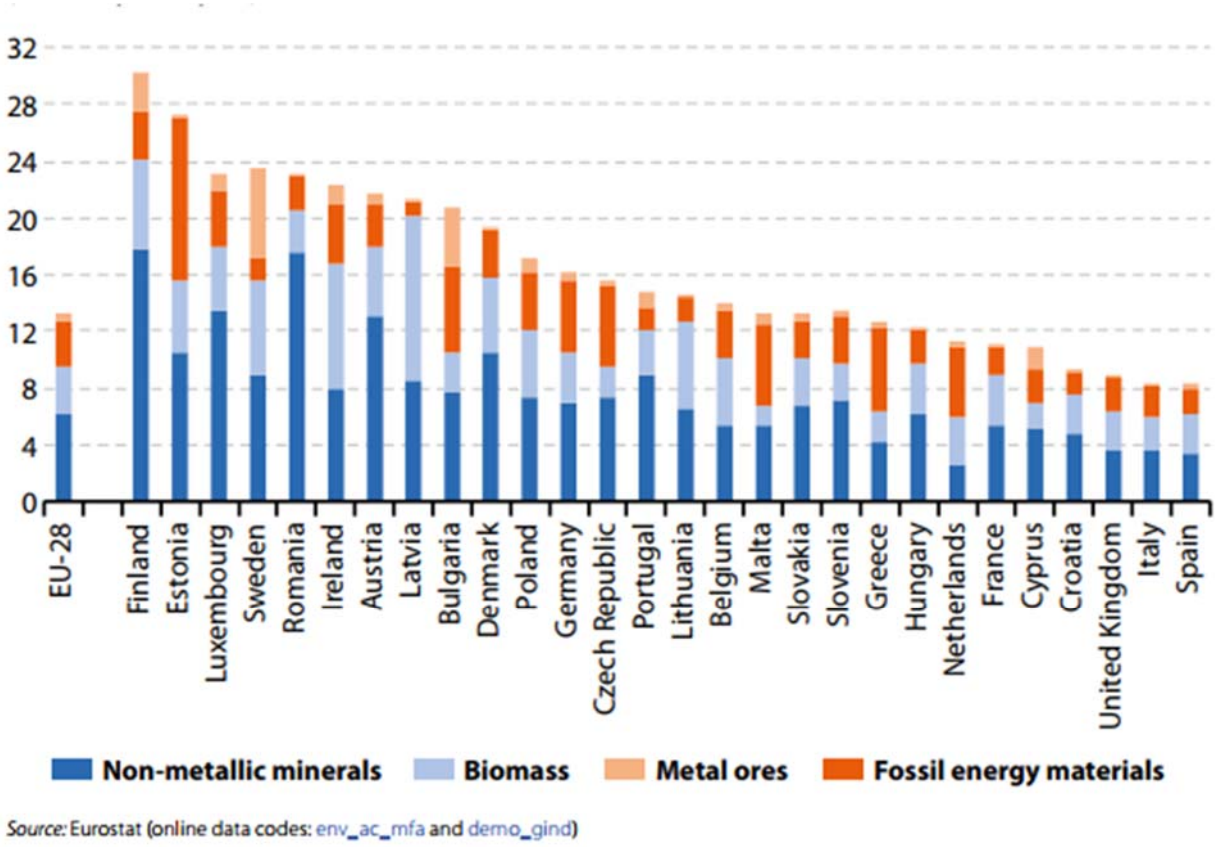
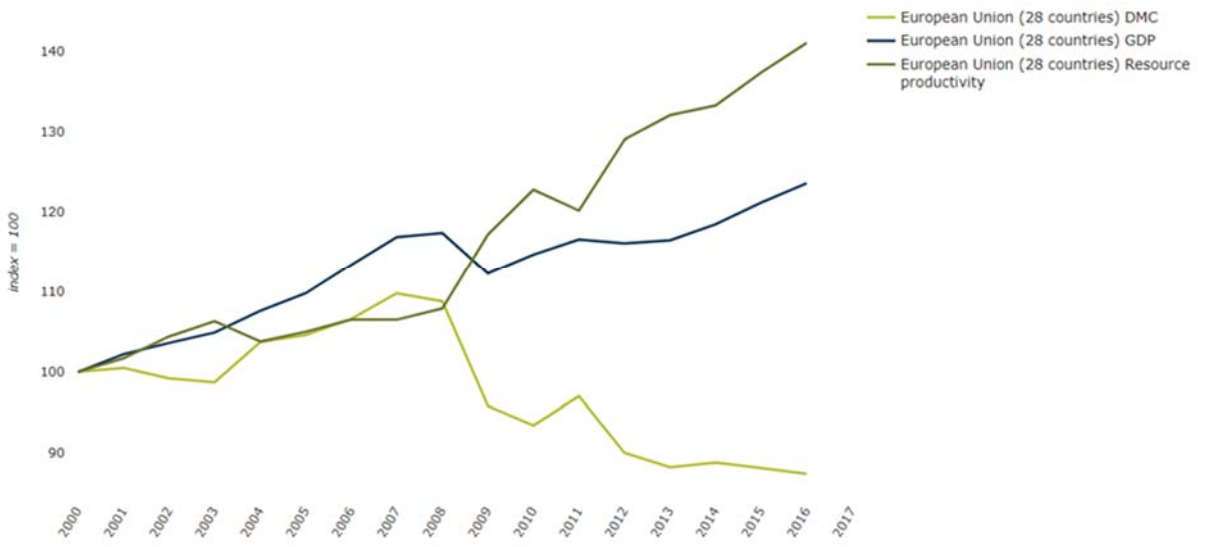


Figure 2: Domestic material consumption by main category 2015[xiii] (tonne per capita)

Of the 25 EU Member States whose resource productivity improved between 2000 and 2015, eight (**Bulgaria, Croatia,** Latvia, Lithuania, Luxembourg, Poland, **Slovakia** and Sweden) have, nevertheless, experienced an increase in demand for materials of between 19 % and 46 % over the same period. The three countries (Estonia, Malta and **Romania**) that did not achieve improvements in resource productivity saw even higher increases in material use. **Romania**, Estonia and Malta's material use rose by 168 %, 104 % and 60 %, respectively (Eurostat, 2016b). In general, policies and targets for reducing overall material use are far less common than those aimed at increasing resource productivity.



Note:
2013 is the latest year for Norway and Serbia.
Resource productivity is measured in Euros (chain-linked volumes, reference year 2010) per kilogram of domestic material consumption (euroCLV2010/kg DMC).

Figure 3: Resource productivity EU average including data for 2016[xiv]

According to the data for resource productivity for 2016[xv] illustrated below, in the following table, Slovenia has an index of 177,5, followed by the Czech Republic 172,5, Hungary 155,3, Slovakia 151,5; Germany 137, Serbia 133, Austria 122,5, Bulgaria 120, Croatia 102,5 and Romania 64,4.; while the EU average is 141.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
EU-28	100	101.7	104.4	106.3	103.8	105.0	106.5	106.5	107.9	117.2	122.8	120.2	129.0	132.0	133.2	137.3	141.0
Belgium	100	98.6	102.2	105.7	106.8	107.6	97.2	98.8	99.1	107.4	109.2	104.7	117.0	120.7	121.4	130.7	133.8
Bulgaria	100	97.1	100.8	104.8	99.4	105.0	103.3	107.4	105.6	127.4	130.9	120.3	124.5	130.1	119.3	111.2	120.0
Czech Republic	100	101.9	110.4	111.2	110.0	118.0	122.3	127.2	132.7	138.3	149.0	144.0	160.6	162.3	161.8	163.5	172.5
Denmark	100	103.1	108.3	105.3	101.9	95.1	93.1	97.5	101.7	117.4	127.6	111.4	113.7	122.9	125.0	125.4	121.5
Germany	100	107.6	110.2	110.7	110.4	114.9	116.0	119.8	121.9	120.8	125.7	120.5	125.3	128.8	124.1	133.9	137.0
Estonia	100	111.4	103.0	87.5	99.8	111.5	110.6	98.2	102.4	93.3	94.5	95.4	99.3	94.5	99.6	102.9	114.3
Ireland	100	105.0	109.6	100.2	98.3	102.8	101.1	101.8	110.0	137.7	162.3	173.0	187.6	170.7	191.7	241.6	230.6
Greece	100	98.1	99.2	95.5	102.2	102.6	110.8	82.6	86.7	97.7	103.2	104.3	105.7	110.3	107.6	109.0	114.1
Spain	100	101.0	95.4	93.2	93.4	93.9	93.3	94.6	109.7	129.6	146.0	163.7	199.9	209.3	210.4	221.4	225.5
France	100	106.0	106.6	114.3	106.8	112.0	112.2	110.3	112.9	122.5	127.2	126.0	129.9	130.4	133.7	140.3	145.5
Croatia	100	85.0	77.1	76.7	70.7	76.0	75.1	78.7	70.0	82.6	96.0	96.7	103.8	97.6	106.6	102.6	102.5
Italy	100	104.4	111.9	124.4	117.6	114.9	115.8	123.6	128.4	132.9	143.5	148.9	170.6	192.0	223.2	224.8	225.0
Cyprus	100	103.6	98.7	114.9	107.6	109.2	115.4	105.1	72.5	90.6	98.6	100.7	132.9	172.9	171.2	181.1	166.5
Latvia	100	110.9	111.0	119.6	122.0	121.2	126.3	128.7	147.4	164.2	136.9	131.7	142.3	137.3	141.5	138.0	135.3
Lithuania	100	118.6	105.2	99.1	98.9	102.9	109.8	103.1	99.6	125.8	116.0	113.4	128.4	109.8	121.0	123.2	131.1
Luxembourg	100	100.0	96.6	95.6	94.2	98.1	94.7	105.5	119.1	116.9	121.5	125.0	125.7	126.8	125.7	124.2	143.0
Hungary	100	91.3	99.2	101.7	90.6	82.4	102.2	131.3	117.9	135.1	148.6	151.1	171.8	153.0	123.8	147.2	155.3
Malta	100	104.4	112.0	96.6	95.8	114.0	95.4	120.5	140.3	128.7	155.4	120.1	107.5	126.7	100.5	97.5	99.1
Netherlands	100	102.3	111.9	116.2	113.3	116.9	119.0	116.4	113.7	117.0	119.5	124.3	127.7	136.9	134.8	128.0	152.9
Austria	100	104.4	99.0	104.8	102.8	102.1	102.6	105.7	113.6	116.8	118.9	116.4	118.1	120.6	121.1	124.8	122.5
Poland	100	105.3	112.6	113.2	111.7	113.8	118.4	113.5	115.6	123.8	122.9	104.3	121.6	130.5	135.3	142.9	149.5
Portugal	100	97.0	100.7	112.9	105.5	106.8	98.8	97.5	93.1	100.4	109.9	116.3	121.6	137.9	125.3	126.2	129.6
Romania	100	66.5	73.0	70.7	71.6	68.1	68.3	61.4	51.8	61.3	65.9	59.2	61.1	62.9	63.4	62.4	64.4
Slovenia	100	104.7	104.8	99.6	102.8	110.1	99.9	96.5	113.3	126.4	135.4	151.3	169.9	171.4	164.4	165.8	177.5
Slovakia	100	96.8	96.9	104.7	94.6	92.6	101.3	110.7	106.2	113.9	121.8	121.1	142.0	150.9	139.9	144.1	151.5
Finland	100	100.5	101.9	99.3	102.2	103.1	102.7	106.0	105.4	117.3	112.0	113.5	116.6	102.1	121.6	123.5	115.5
Sweden	100	103.2	103.7	105.5	106.3	100.7	113.4	105.7	105.7	115.9	108.4	105.9	105.3	103.5	104.1	108.7	104.3
United Kingdom	100	102.1	107.6	111.2	109.6	115.8	120.2	124.1	131.3	143.1	149.8	150.7	157.8	158.9	157.9	165.6	170.3
Norway (2)	:	:	:	:	:	:	100	103	89	93	88	89	86	87	90	70	:
Switzerland (3)	100	101	104	107	104	105	107	113	114	111	111	112	116	116	117	124	:
Former Yugoslav Republic of Macedonia (4)	:	:	:	:	:	:	:	:	:	:	100	93	97	102	105	108	:
Serbia (5)	:	100	101	112	109	114	117	130	128	136	129	130	142	135	140	133	:
Turkey (6)	100	113	116	118	124	114	107	110	112	109	99	104	122	130	133	0	:

(:) not available

(1) GDP in chain-linked volumes, reference year 2010
(2) 2006-15
(3) 2000-15
(4) 2010-15
(5) 2001-15
(6) 2000-14

Source: Eurostat (online data code: env_ac_rp)

Table 1. Latest published resource productivity (2016) by country[xvi]

European innovation scoreboard 2017

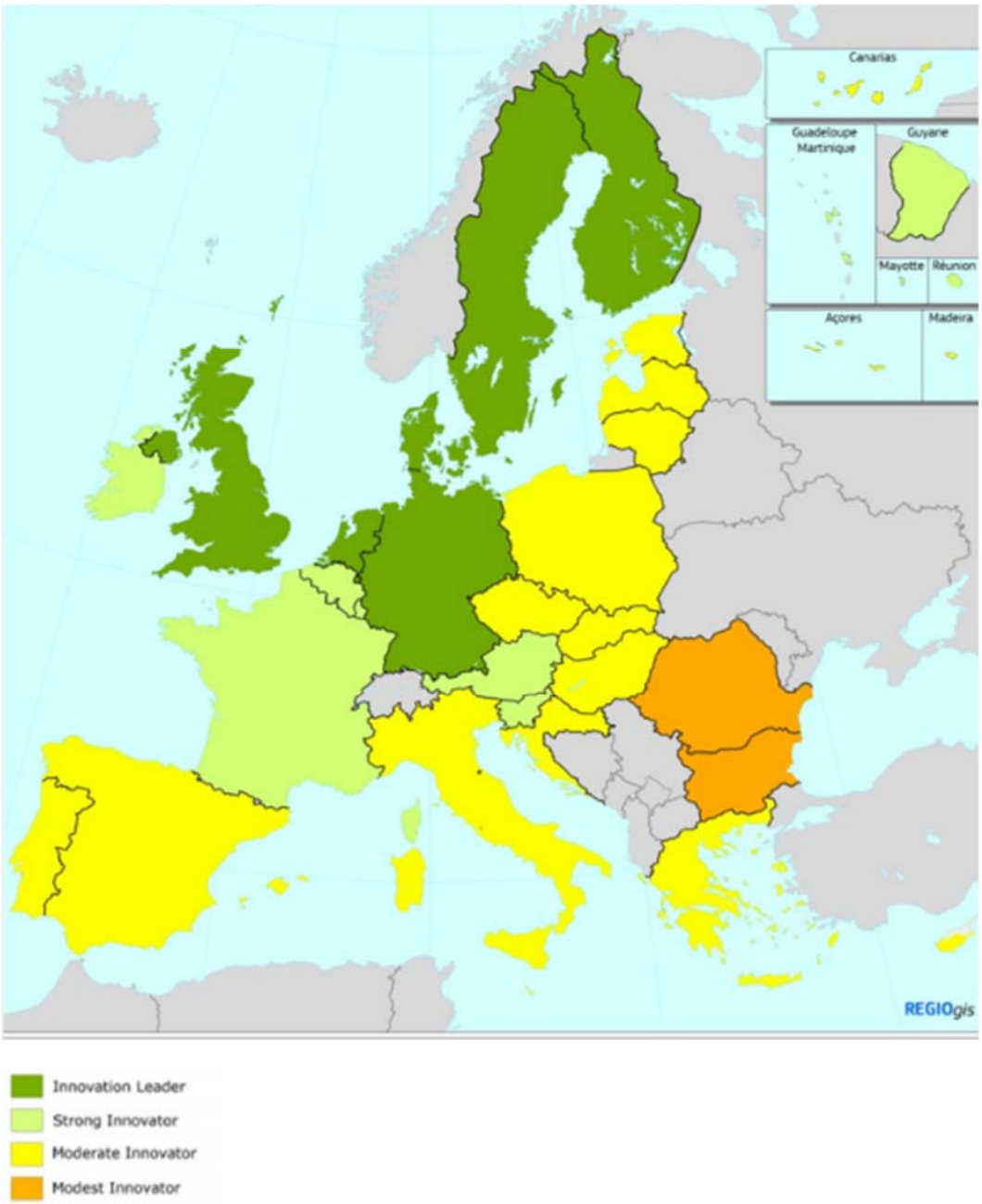


Figure 4: Innovation ranking published in 2017[xvii].

The innovation index measures the performance of innovation systems according to average performance of 27 indicators. The EIS measurement framework distinguishes between four main types of indicators and ten innovation dimensions, capturing in total 27 different indicators. Framework conditions capture the main drivers of innovation performance external to the firm and cover three innovation dimensions: Human resources, Attractive research systems, as well as Innovation-friendly environment. Investments capture public and private investment in research and innovation and cover two dimensions: Finance and support and Firm investments. Innovation activities capture the innovation efforts at the level of the firm, grouped in three innovation dimensions: Innovators, Linkages, and Intellectual assets. Impacts cover the effects of firms' innovation activities in two innovation dimensions: Employment impacts and Sales effects. Member States are classified into four performance groups based on their average performance scores.

The innovation scoreboard prepared in 2017 ranked Germany amongst innovation leaders, Austria and Slovenia amongst strong innovators, with the Czech Republic being ranked at the top of moderate innovators, followed by Slovakia, Hungary,

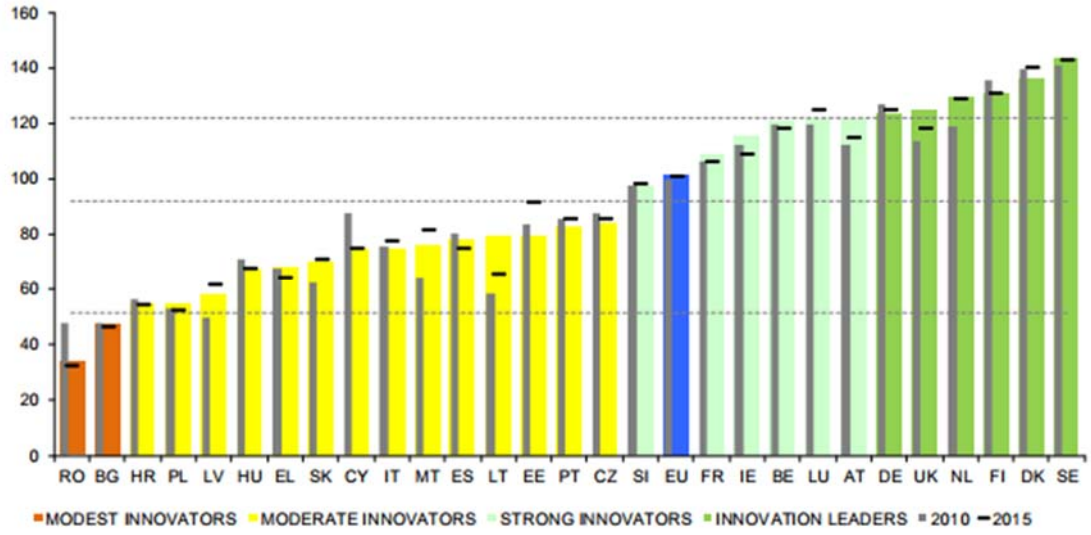


Figure 5: Performance of EU Member States' innovation systems[xviii]

Serbia and Croatia. Bulgaria and Romania were ranked as modest innovators.

Coloured columns show Member States' performance in 2016, using the most recent data for 27 indicators, relative to that of the EU in 2010. The horizontal hyphens show performance in 2015, using the next most recent data for 27 indicators, relative to that of the EU in 2010. Grey columns show Member States' performance in 2010 relative to that of the EU in 2010. For all years the same measurement methodology has been used. The dashed lines show the threshold values between the performance groups in 2016, comparing Member States' performance in 2016 relative to that of the EU in 2016.

Eco-innovation indicators

The Eco-Innovation Scoreboard (Eco-IS) and the Eco-Innovation Index illustrate eco-innovation performance across the EU Member States. They aim at capturing the different aspects of eco-innovation by applying 16 indicators grouped into five dimensions: eco-innovation inputs, eco-innovation activities, eco-innovation outputs, resource efficiency and socio-economic outcomes. The Eco-Innovation Index shows how well individual Member States perform in different dimensions of eco-innovation compared to the EU average and presents their strengths and weaknesses. The Eco-IS and the Eco-Innovation Index complements other measurement approaches of innovativeness of EU countries and aims to promote a holistic view on economic, environmental and social performance

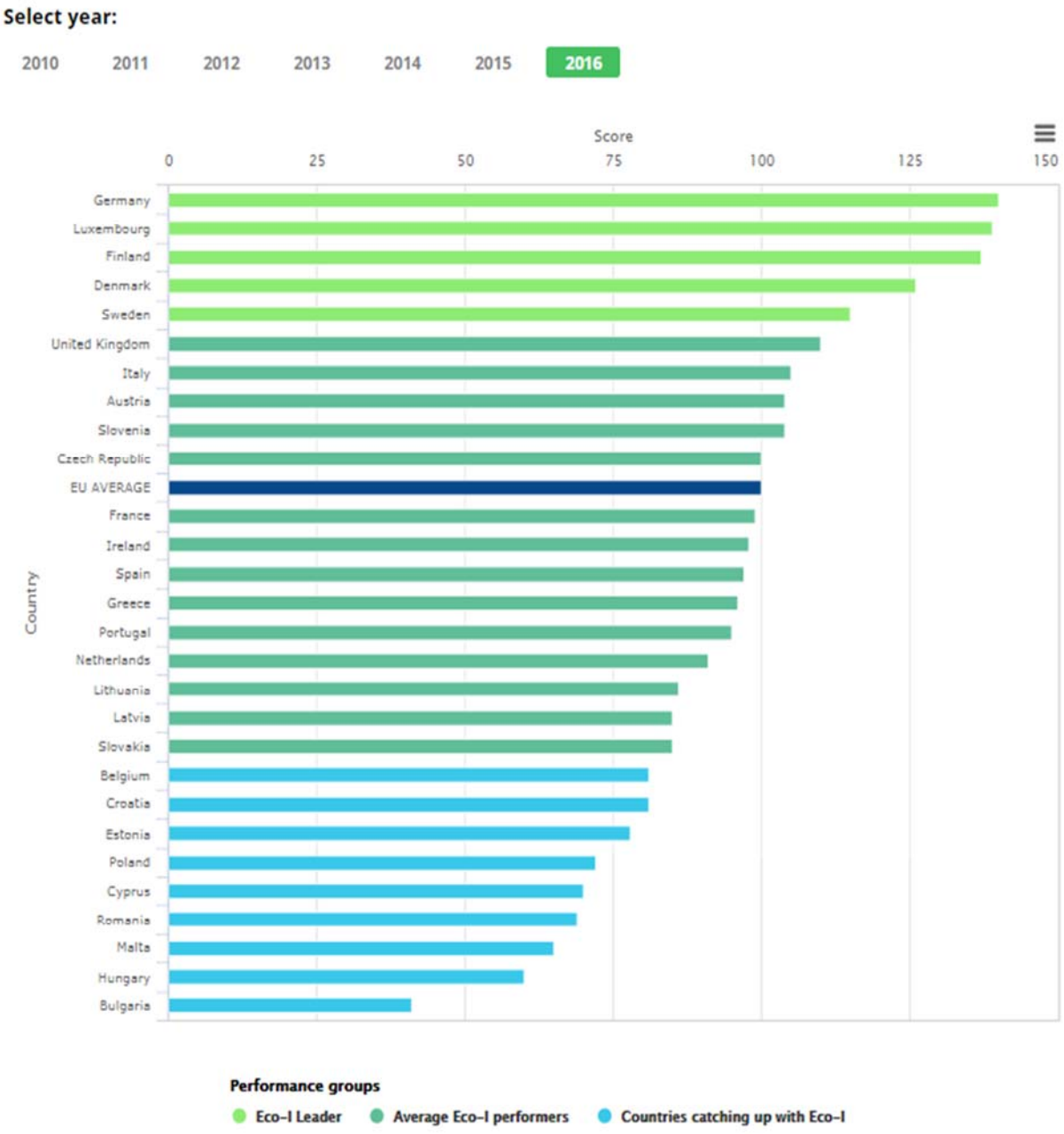


Figure 6: eco-innovation scoreboard for 2016[xix]

The latest eco-innovation scoreboard rank Germany as leader, Austria, Slovenia and Czech Republic are ranked in this same order just above the EU average as average eco I performers. Slovakia is ranked as the last country in this category, below EU average. The other EU partner countries are ranked as countries catching up with Eco I, with Croatia with the highest rank, followed by Romania, Hungary and Bulgaria, as last on the list.

Municipal waste indicators

In the report, we focused on data for municipal waste management indicators, as the objective of extended producer responsibility is focused on fast moving consumer goods ending in household waste streams.

Municipal waste consists to a large extent of waste generated by households, but may also include similar wastes generated by small businesses and public institutions and collected by the municipality; this part of municipal waste may vary from municipality to municipality and from country to country, depending on the local waste management system.

In this report, we chose indicators concerning municipal waste generation, recycling and landfill.

Total municipal waste generation in the EEA countries declined by 3 % in absolute terms and average generation per person by 7 % from 2004 to 2014. However, there has been no uniform trend across countries, with an increase in municipal waste generation per person in 16 and a decrease in 19 countries

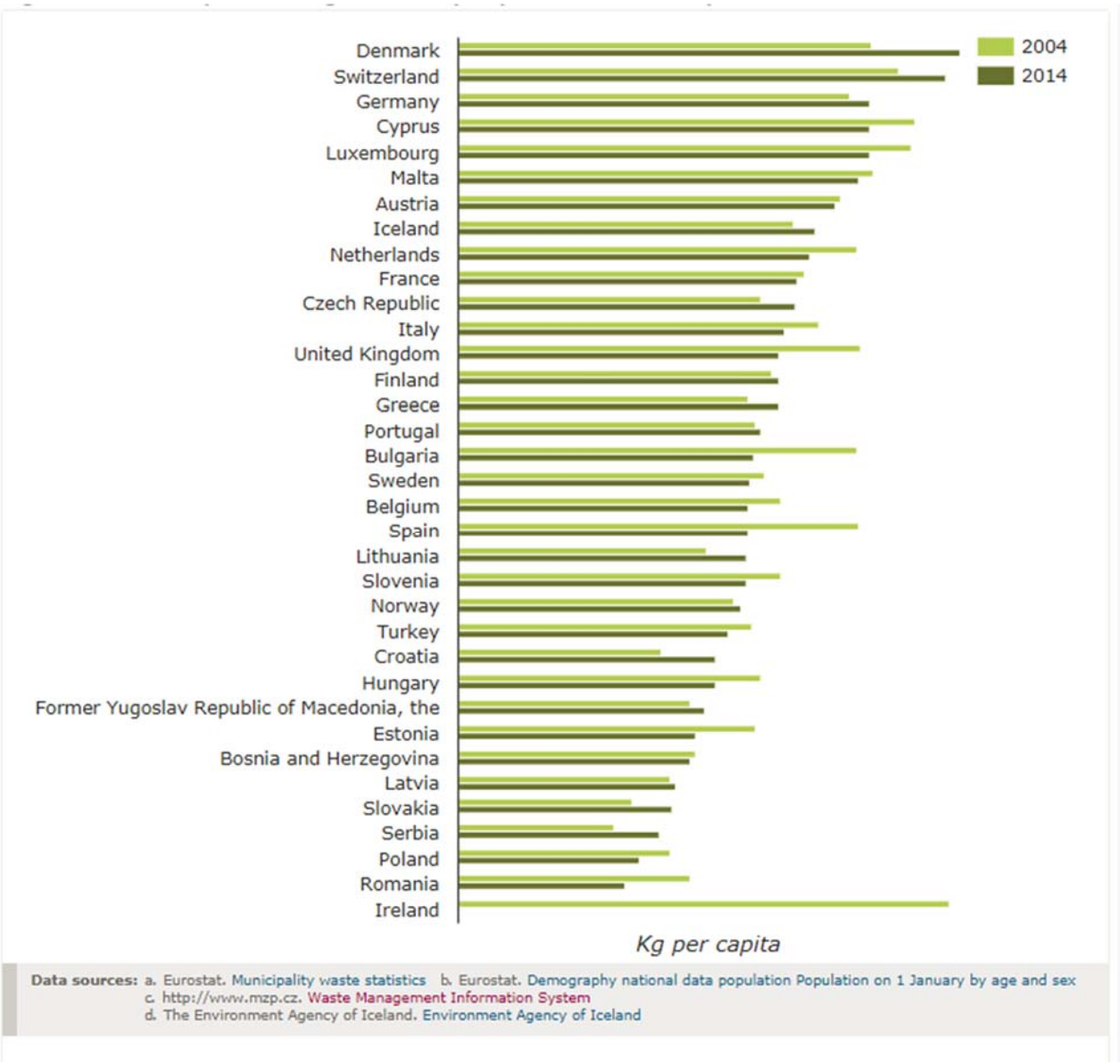


Figure 7: Municipal waste generated per person[xx] (2004 and 2014)

Total municipal waste generation[xxi] in the EEA countries declined by 3 % in absolute terms and average generation per person by 7 % from 2004 to 2014. However, there has been no uniform trend across countries, with an increase in municipal waste generation per person in 16 and a decrease in 19 countries

According to the ten year period presented, generated municipal waste has increased in Croatia, Serbia, Slovakia, Germany and the Czech Republic and decreased in Romania, Austria, Bulgaria, Slovenia and Hungary.

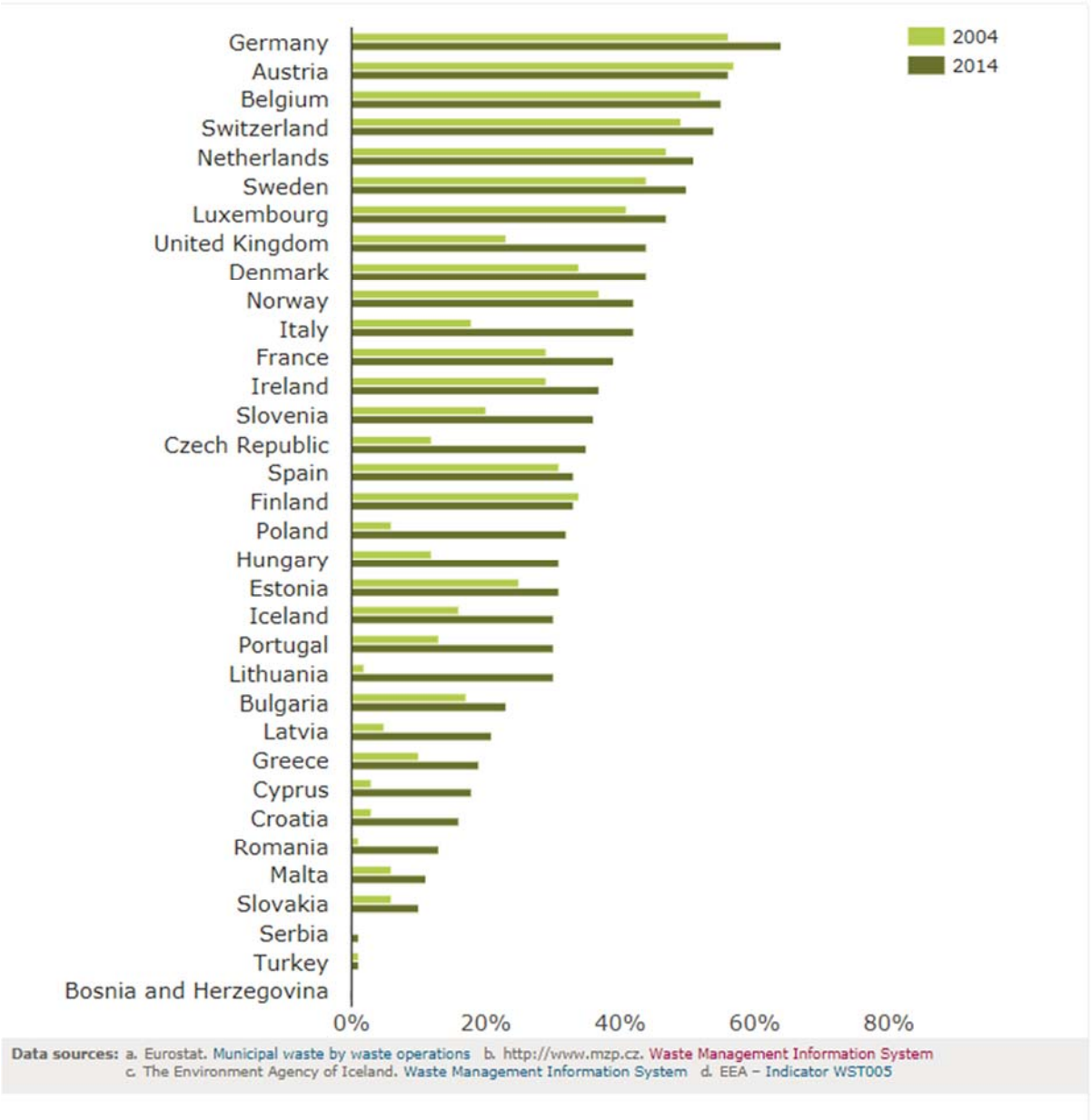


Figure 8: Municipal waste recycling[xxii] (2004 to 2014)

One of the success stories of environmental policy in Europe is the increase in the rates of municipal waste recycling (covering material recycling, composting and digestion of bio-wastes). EEA countries achieved an average total recycling rate of 33 % in 2014, compared with 23 % in 2004 (EU-27: 31 % to 44 % over the same time period) (Eurostat, 2016a).

- Germany, Austria, Belgium, Switzerland, the Netherlands and Sweden recycled at least half of their municipal waste in 2014.
- The highest increase in recycling rates between 2004 and 2014 was reported in Lithuania, Poland, Italy, the United Kingdom and the Czech Republic (increase of 20–29 percentage points).
- Overall, in 15 out of 32 countries, the increase in recycling rates was at least 10 percentage points over this period.
- However, in seven countries, the proportion of recycled municipal waste barely changed and in two countries, it even decreased slightly.

Increasing recycling rates and declining rates of landfilling are clearly linked. Usually, landfilling declines much faster than the growth in recycling, as waste management strategies mostly move from landfill towards a combination of recycling and incineration, and in some cases also mechanical–biological treatment (EEA, 2013).

The recycling rates for generated municipal waste per capita in 2016 for our DTP countries were highest in Germany, where they recycled 300 kg per capita of municipal waste, followed by Slovenia with 199 kg of municipal waste recycled per capita. Both values are well above the EU28 average value of 140 kg per capita. In Hungary 102 kg of municipal waste was recycled per capita, Bulgaria 92 kg per capita, The Czech Republic 91 kg per capita, Austria 85 kg per capita, Croatia 77 kg per capita, Romania 14 kg per capita and Serbia 1 kg per capita.

The rate of municipal waste landfilling for the 32 EEA member countries fell from 49 % in 2004 to 34 % in 2014. The performance of individual countries varied. In

Austria, Belgium, Denmark, Germany, the Netherlands, Norway, Sweden and Switzerland, virtually no municipal waste is sent to landfill. On the other hand, Cyprus, Croatia, Greece, Latvia, Malta and Turkey still landfill more than three quarters of their municipal waste.

Overall, the rates of landfilling decreased in 27 out of 32 countries. Between 2004 and 2014, the largest decreases occurred in Estonia (57 percentage points), Finland (41 percentage points), Slovenia (41 percentage points) and the United Kingdom (41 percentage points).

The amount of municipal waste landfilled and incinerated in 2014 ranged from 102 kg/person in Slovenia to 480 kg/person in Malta, with an average of 270 kg/person in Europe (32 European countries). [xxiii] According to the latest data for landfilling in 2016[xxiv] Germany and Austria have phased out landfilling, Slovenia landfilled 38 kg of waste per capita in 2016. The Czech Republic sent 169 kg of municipal waste per capita to landfill, Croatia 309 kg per capita. Slovakia 228 kg per capita, Hungary 192 kg per capita, Bulgaria 260 kg per capita, and Serbia 211 kg per capita in 2016, while Romania sent 178 kg per capita and Montenegro 488 kg per capita to landfill in 2015.

Country characteristics

We distributed the findings from the national EPR reports into three summaries according to the ranking on the innovation and eco-innovation scoreboards and geographic location, grouping together

- Germany, Austria and Slovenia; subsequently referred to as G1.
- Slovakia, the Czech Republic, Hungary, and Croatia; subsequently referred to as G2.
- Bulgaria, Romania, Serbia, Montenegro and Moldova; subsequently referred to as G3.

For each group an overview was conducted regarding:

- Innovation ranking
- Eco-innovation ranking
- Resource productivity
- Municipal waste generation per capita, recycling rates for municipal waste per capita and municipal waste quantities per capita being sent to landfill
- How the EPR and supporting systems work for packaging and packaging waste
- How the EPR and supporting systems work for electronic and electrical equipment, accumulators and batteries
- Stakeholder perception on conditions for innovation and eco-innovation and the opportunities for improvement in these areas arising from digitalisation for each of the observed waste streams covered by EPR

Existing EPR schemes, practice and their effect on innovation in Group 1

GROUP 1: Germany, Austria and Slovenia

The innovation scoreboard prepared in 2017 ranked Germany amongst innovation leaders, Austria and Slovenia amongst strong innovators, The latest eco-innovation scoreboard rank Germany as leader, Austria and Slovenia ranked in this same order just above the EU average as average eco I performers.

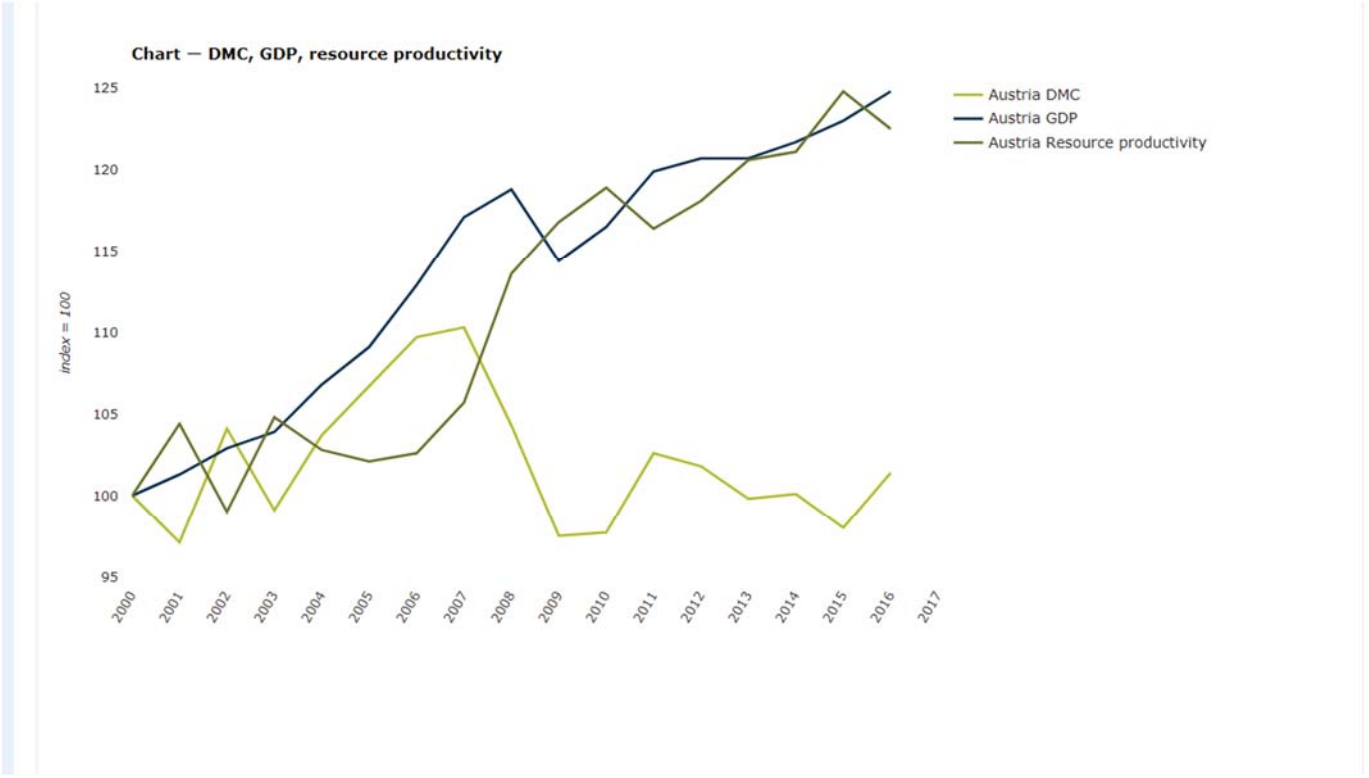


Figure 9: Resource productivity Austria[xxv]

The resource productivity index for Austria was 122,5, while the EU average was 141.

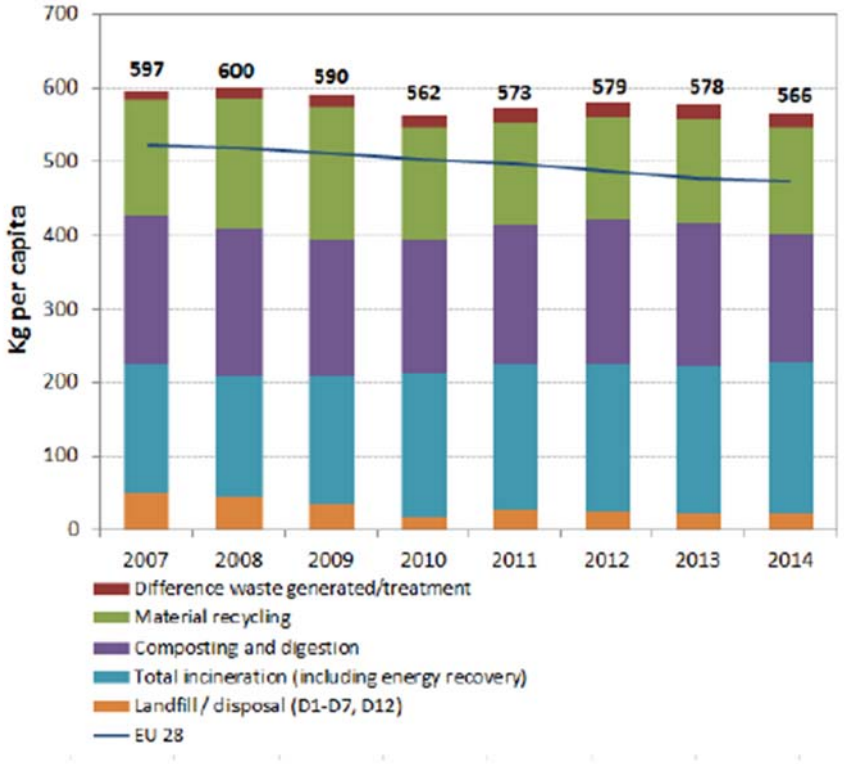


Figure 10: Municipal waste by treatment Austria 2007-2014[xxvi]

The latest figures[xxvii] for recycling (2016) show that Austria recycled 85 kg of municipal waste per capita of the 560 kg of municipal waste generated in 2015.

In 2016 each inhabitant in Germany generated 626 kg of municipal waste, in Austria the figure for 2015 was 560 kg of municipal waste per inhabitant and in Slovenia 466 kg of municipal waste was generated per inhabitant. Slovenia recycled 199 kg of municipal waste per capita and Germany recycled 300 kg.

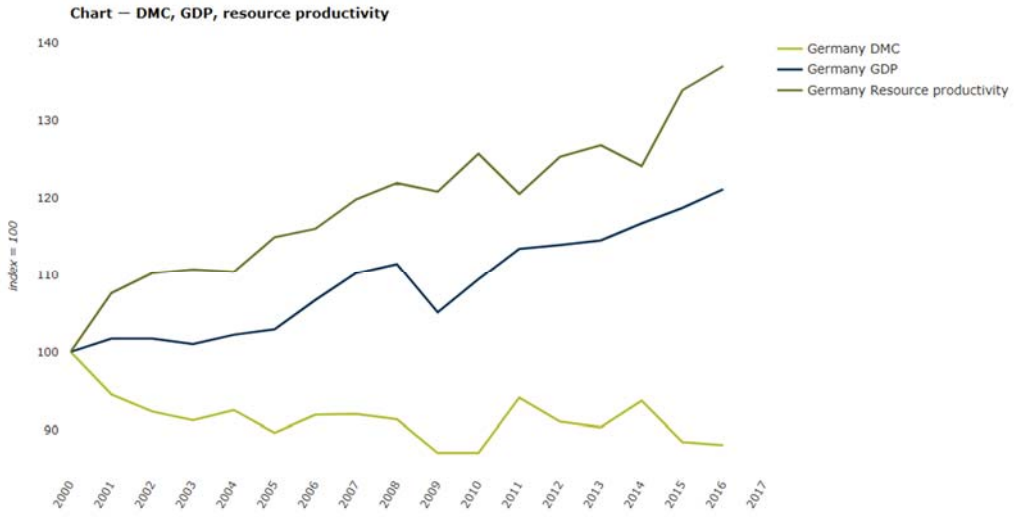


Figure 11: Resource productivity Germany[xxviii]

The resource productivity index for Germany it was 137 in 2016

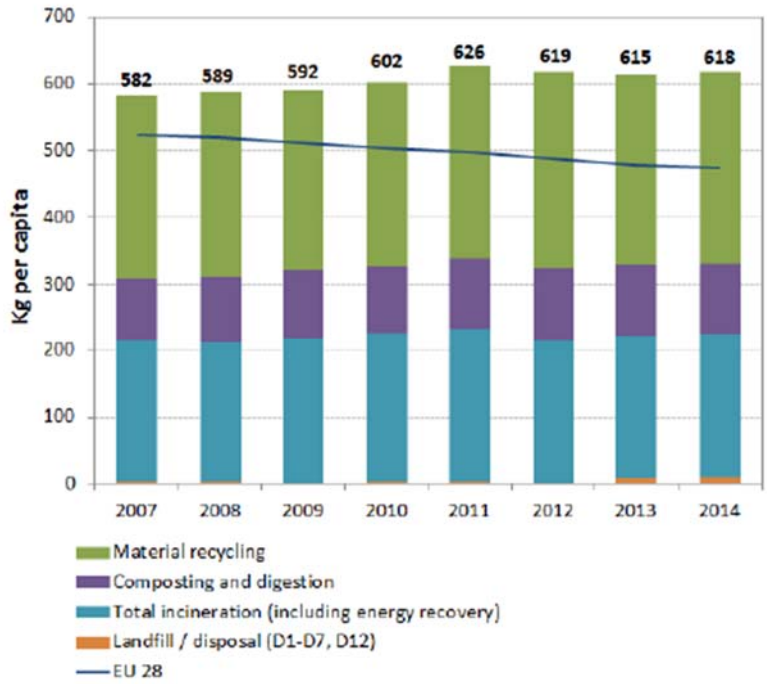


Figure 12: Municipal waste by treatment for Germany 2007-2014[xxix]

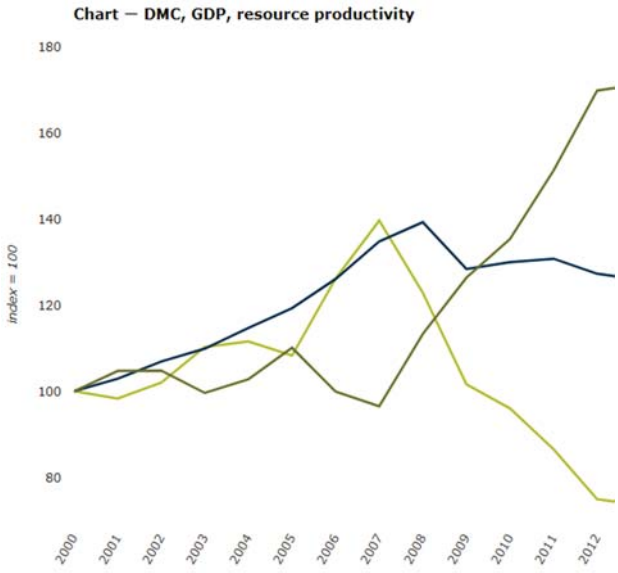


Figure 13: Resource productivity Slovenia[xxx]

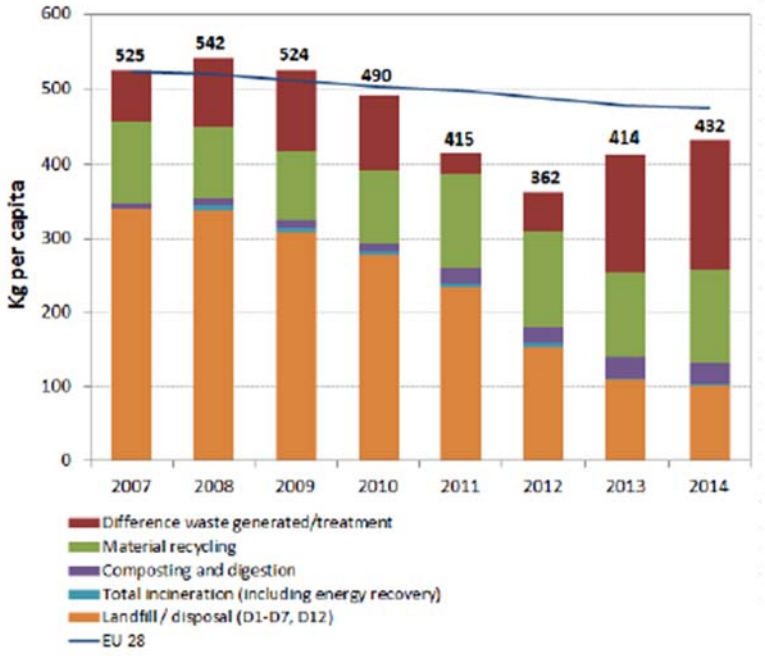


Figure 14: Municipal waste by treatment Slovenia 2007-2014[xxxi]

According to the Environmental Implementation Review[xxxii] published in the beginning of February 2017 by the European Commission, Germany no longer performs any waste landfill of municipal waste, with waste management procedures consisting of incineration, composting and material recycling. The situation is similar in Austria, with relatively small quantities of municipal waste being transferred to landfills or other options for treatment. In Slovenia the share of waste being landfilled is decreasing annually with the current rate of landfilling falling below 20 %, the rates of incineration are small, while the share of composting is increasing, as is the quantity of waste being treated by other methods. The level of material recycling is also increasing. In 2016, Slovenia only landfilled 38 kg of municipal waste per capita of the 466 kg of municipal waste generated per capita that year, reducing landfilling below 10 %. All three countries have achieved their targets for EPR covered waste streams.

The EPR schemes in each country situated in group 1, recognise multiple competitive producer responsibility organisations or/and multiple competitive recovery operators in all waste streams. The details of how the systems work in each country are quite complicated and all of the details could not by covered in our report.

How the systems apply to packaging and packaging waste

Austria and Germany have a dual model for packaging and packaging waste, where industry has full operational and financial responsibility over collection, sorting and recycling. There is a separate collection system designated to local authorities but their influence is minimal. In Slovenia, the responsibility is shared between industry and the local authorities based on common agreements regarding collection. Municipalities are responsible for collection and perform sorting, though the level and quality of this sorting differs from municipality to municipality. To date only Austria has established two separate clearing houses for packaging and for electronic and electrical equipment, to ensure that each PRO does its fair share, with the Verpackungskoordinierungsstelle gemeinnützige GmbH or VKS or

Verpackungskoordinierungsstelle gemeinnützige GmbH for packaging and waste packaging and the Elektro Recycling Austria GmbH or ERA for electrical and electronic waste. Germany has a clearing house for electronic and electrical waste and another one, planned for packaging, to be established in the second half of 2018,

Germany published a new packaging act in the beginning of July 2017, which will continue to support the operation of multiple, competitive producer responsibility organisations for packaging waste. The new act will also establish modulated fees for packaging waste management according to recyclability. The Act shall come into force on the 1st of January 2019, while producers and other stakeholders obliged to fulfil packaging and packaging waste requirements will be required to register with the newly formed clearing house in 2018.

Slovenia is planning a registration procedure for packaging. The initial registration shall be done by obligated companies, regardless of packaging quantities placed on the market, by the end of January 2018.

Both the German and Austrian legislation distinguish between consumer or household packaging on the one hand and commercial, industrial packaging on the other hand. Packaging waste determined as household waste requires producers offering packaged goods on the market to comply with EPR obligations through cooperation with a producer responsibility organisation.

A lot of comprehensive information on how the system works in Austria is available at the website of the Austrian Chamber of Commerce.

With regard to commercial or industrial packaging, producers are left with more leeway on how they handle it, when it becomes waste. This signals that this waste is a positive commodity of value, though companies may choose to execute B2B packaging obligations through the PRO together with their consumer, i.e. household packaging.

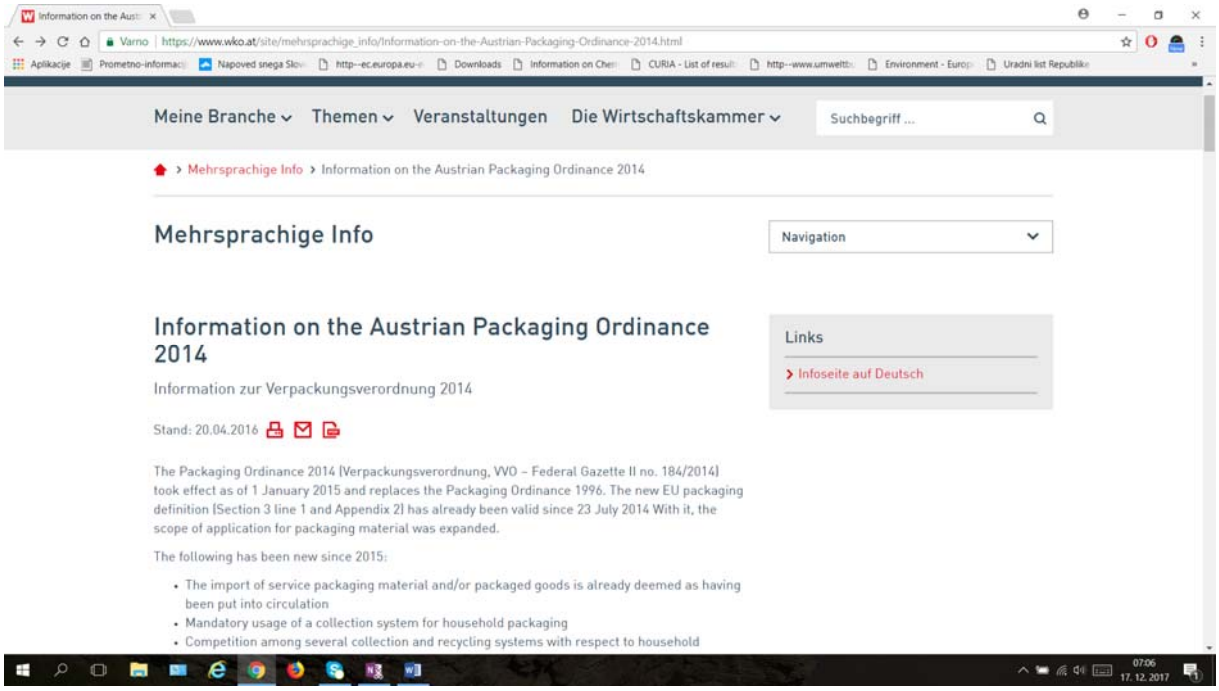


Figure 15: The website of the Austrian Chamber of Commerce.

In Germany, special provisions are set for single use, consumer packaging as opposed to multiple use consumer packaging. In Germany, a deposit refund scheme is in place for cans and for single use as well as returnable, multiuse bottles. The deposit for multiuse bottles is compulsory, though there is no deposit for fruit juice, milk products, wine and spirits as well as bottles with more than three litres content. In the case of single use beverage packaging, the distributers are obligated to charge the consumer a deposit of at least 0,25 EUR.

In Austria two tariffs are administered, one higher for consumer packaging and another lower for B2B packaging. Packaging is described in a quite detailed list of 47 product groups, as defined in the packaging classification ordinance; additionally the packaging must be determined according to size to distinguish between consumer and commercial i.e. industrial packaging. In Austria, a lump sum is paid for packaging quantities below 1500 kg per year and exemptions for producers

placing small packaging quantities on the market and additional thresholds per material flow determine which producers may be exempt from the requirements for packaging. Entities[xxxiii] putting minor quantities into circulation are merely obligated to take back the packaging material put into circulation by them at the request of their customers and convey it to a recycling system. Entities putting only minor quantities into circulation have the option to avail themselves of a simplified disposal at a collection and recycling system for commercial packaging. The quantities for which exemptions apply are 300 kg per annum of paper board, cardboard, corrugated cardboard; 800 kg of glass, 100 kg of metal packaging, 100 kg of plastic packaging, 100 kg of wooden packaging and for all other packaging materials the limit for exemption if 50 kg per annum.

In Slovenia the threshold for exemption of EPR obligations is 15 000 kg per annum, entities having to comply with EPR obligations must do so for both types of packaging or obtain an individual permit to manage their own, industrial packaging waste from the State Environmental Agency.

In all cases, costs are administered per tonne according to packaging material with additional specifications for reuse. There are no incentives for improved design for recyclability, reparability, disassembly or biodegradability. Austria and Germany's pricelists published on the web distinguish higher prices for consumer packaging, typically primary, smaller packaging, which is expected to end up in household collection due to consumer consumption.

While pricelists are publicly available, final costs for packaging waste collection and treatment are determined at PRO – company level in Slovenia, due to competition between the multiple PROs.

How the systems apply to electronic and electric waste, batteries and accumulators

As both waste streams are often encountered and subsequently also managed together, at least in regard to small portable batteries, we shall include them in the report within the same heading. As with packaging and packaging waste, several

competitive PRO exist to manage waste electronic and electrical equipment as well as batteries and accumulators. Some of the service providers in Germany and Slovenia are specialised to cater to the requirements of specific waste streams such as lighting equipment or industrial batteries and accumulators.

All three countries have established public registers where producers entering each individual market must register. Registration in each country is the initial measure required before products may be placed on the individual markets.

The total number of service providers in Germany is not known, but estimated to be around a few dozen. The costs for waste management are differentiated into product categories and then administered according to weight.

ElektroaltgeräteElektro Recycling Austria GmbH is the clearing house for electronic and electrical waste in Austria.

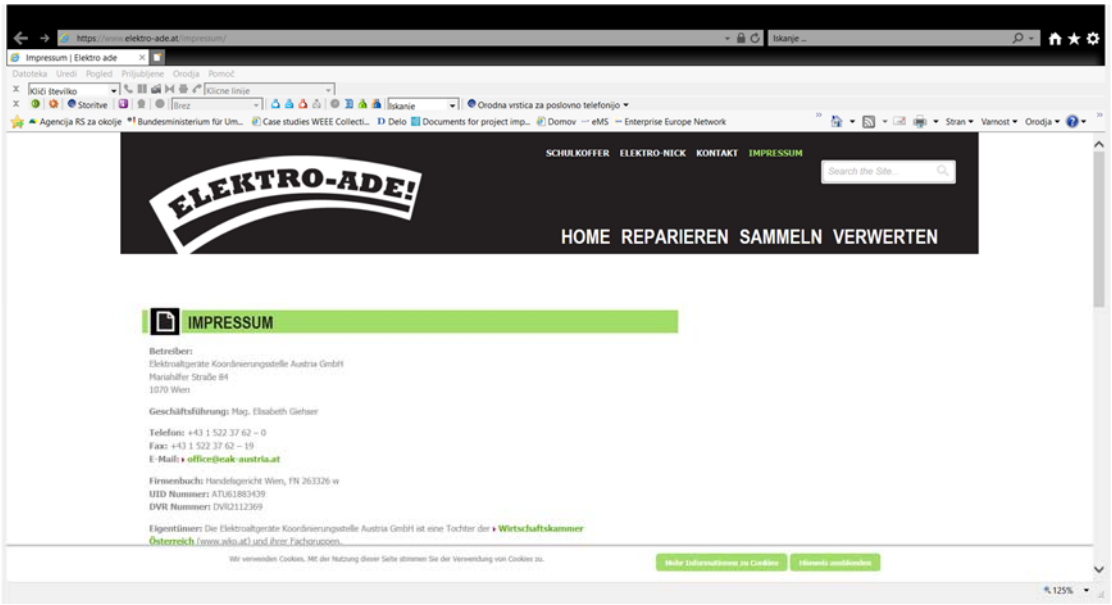


Figure 16: The elektro-ade website[xxxiv]

The Elektro-ade website[xxxv] offers information concerning repair, collection and recovery of electronic and electrical appliances and their waste in Austria.

The German national register for electronic and electrical equipment (Stiftung EAR) Elektro- Altgeräte Register), was founded by producers, and acts as their clearing house, taking care of registration, authorisation and provision of collection and equipment for collection at municipal collection sites.

Slovenia has no clearing house. The registration for electronic and electrical equipment is managed by the national environmental agency. As mentioned in the information for Slovenia on packaging, a similar registration process ~~for packaging~~ must be initiated and completed by the end of January 2018. By all producer placing packaging or packaged goods on the market regardless of quantities.. The environmental agency's website also contains a list of drop off collection sites managed by each scheme and information on further waste management.

Slovenia has an environmental tax for both packaging and electrical and electronical equipment being put on the market, which is collected by the Customs Office. The value of the taxes is not high, as they were envisioned for state bookkeeping, most companies complain that the reporting is time consuming ensuing administrative costs in work hours lost to prepare the required reports the taxation is based on.

General characteristics of stakeholder perception along the extended producer responsibility waste streams

Innovation in general

Though innovation is regarded as an important aspect of modern business, the ability and willingness of businesses to tap into its potential differs from sector to sector. Innovation does not necessarily imply eco-innovation, though companies systematically comply with environmental legislative requirements when designing a new product or process. Companies feel they are not rewarded enough for eco-design, i.e. eco-innovation. Additionally many requirements need to be fulfilled regarding consumer safety and absolute traceability of material composition in order to ensure there are no hazardous substances in the reused and recycled materials, which hinder their use both for packaging, especially food packaging and the

production of electrical and electronic equipment. Not enough experience has been gained yet with the use of new bio-based materials and/or new additional measures and costs would be needed to verify their applicability and practical implementation. The final product acceptance or non-acceptance of the product by consumers is considered a risk for companies, which does not validate the risk of costs incurred. Without increased consumer awareness, producers are hesitant to risk changes, which could increase the price of the final product. There is a lack of incentives and support for a wider use of bio-based or recycled materials with additional legislative barriers in consumer and safety regulations, which cause extra costs and technical uncertainties for wider application. Though in theory knowledge exists that better product design is a key factor for the transition towards a circular economy, but companies, especially SMEs, feel there are still too may barriers and risks involved and no real incentives.

Innovation & Digitalisation

Digitalisation shares many common guiding principles with the circular economy, such as systems thinking, innovation, collaboration, value optimisation and transparency. The transition towards both digitalisation and circular economy is quite complex, requiring knowledge, resources and support from top management, which is not yet in place. The interviewees were usually not people directly involved in digitalisation processes.

They track waste transport digitally together with issued procurement and sale processes. Most stakeholders digitally manage administrative actions linked to finances, sales and procurement. Many interviewees reported that digital tracking ceased within the organisation, with waste handling onsite, though general input and output of waste is tracked though waste transfer notes, that are registered in the state waste information system. The private sectors seem to have more experience with digitalisation than public ones. Larger companies and original equipment manufacturers (OEM) are more aware of digitalisation, and the need to reassess their operations in light of it. A study by the German Federal Ministry for the

Environment, Nature Conservation, Building and Nuclear Safety (BMUB) indicates that no other lead market in the environmental sector stands to benefit from digitalisation more than the circular economy. The study prepared by the Wuppertal Institute[xxxvi] concludes that though Germany is still a world leader when it comes to exporting technologies for the circular economy, this advantage will be seriously threatened, if Germany does not start to make major investments in the digitalisation of its own circular economy soon.

Innovation opportunities and challenges for packaging and packaging waste

The key role of packaging is to protect the product within the packaging. New materials need to be adapted to production processes and fulfil product protection demands requiring additional efforts and costs.

New bio-based materials are usually more expensive than conventional materials, while final waste management costs or cooperation in PROs, do not reflect easier or cheaper waste management, as fees are determined according to average costs per material of all companies cooperating within a PRO.

Recycled materials require additional verification and testing, to ensure that they are not contaminated with any hazardous or dangerous substances. Recycled packaging materials may not be applicable for food packaging due to lingering smell or other characteristics, which could have a negative effect on the organoleptic properties of the food or beverage in the packaging. Traceability of incoming waste materials used as material input and the contents of undesirable components is still difficult to ensure.

Collectors and recyclers of packaging waste are wary of new materials due to their influence of the recyclability of more widely used materials, such as PE, where existing collection and treatment is supported by economy of scale. With the

increase of different forms of small-scale packaging and an increasing range of packaging materials, collection and recycling is more difficult and expensive.

Due to safety regulations for packaging coming into contact with foods, new materials must comply with food protection guidelines and traceability protocols which must be adapted to the specifics of new materials.

Innovation opportunities and challenges for waste electrical and electronic equipment & waste batteries and accumulators

The WEEE, ROHS and eco-design directives have a strong influence on the production of electrical and electronic equipment, which exceeds the influence of EPR fees. There is concern that repair and preparation for reuse of waste electrical and electronic equipment may have a negative impact on the sales of new equipment (market cannibalism), with the possible handicap of equipment which is repaired or prepared for reuse not living up to equipment safety standards. Producers, which produce components that are installed into the production line of original equipment manufacturers, do not feel in control of design in order to make changes to support a circular economy. Technical constraints prevent the wider use of recycled materials, especially plastic materials. Despite the RoHS directive minimising or forbidding the use of certain hazardous substances in the production of electrical and electronic equipment as well as batteries and accumulators, these substances will remain in the material streams for some time before they will have been diluted and eradicated. This will require long-term efforts and protocols to ensure traceability and verify the actual composition of recycled materials and components designated for reuse. Some countries have legislation forbidding the reuse of salvaged components in new products or as spare parts. EPR requirements do not support design for disassembly, reuse or recyclability with additional barriers to enhance the use of some recycled materials due to higher contents of hazardous substances in old appliances entering the material waste streams and requirements imposed by chemical legislation – REACH (Registration, Evaluation, Authorisation of Chemicals). Some aspects of design exist to protect intellectual property, such as

difficulty for disassembly and repair can be in direct opposition with the goals of a circular economy.

Conclusions for Group 1

To support the transition towards a circular economy and enhanced innovation incentives need to:

- Reflect the cost of waste management and provide incentives for products that are easier to disassemble, repair or upgrade,
- Compensate costs for waste management and awareness raising, especially for plastic packaging, with regard to its littering potential
- Determine a compromise or intermediate solution to bridge the gap between the opposing demands of waste legislation and product safety requirements without endangering consumers.

It is necessary to understand the hazardous substances will be present in circulating material waste streams for quite some time, due to their higher contents in existing products, which are still entering the waste streams.

- Awareness campaigns need to elevate consumer sensitivity.
- Organisations, with emphasis on SMEs need additional assistance and incentives to overcome technical, financial and knowledge barriers for the introduction of new bio-based or improved recycled materials.
- Incentives need to be provided for the design of products that present a lesser burden on natural resources and society in general.

The draft of the circular economy legislative package currently under discussion at EU level has determined most of the drawbacks of the existing EPR experience as there seems to be as many approaches to EPR as there are countries and waste streams.

Existing EPR schemes, practice and their effect on innovation in group 2

GROUP 2: The Czech Republic, Slovakia, Croatia and Hungary,

The innovation scoreboard prepared in 2017 ranked the Czech Republic ranked at the top of moderate innovators, followed by Slovakia, Hungary and Croatia, which fall under the same category of innovators.

The latest eco-innovation scoreboard ranked the Czech Republic just above the EU average as an average eco I performer. Slovakia is ranked as the last country in this category, below EU average. Croatia and Hungary are ranked as catching up with Eco I.

Of the 25 EU Member States whose resource productivity improved between 2000 and 2015 Croatia, was mentioned together with the countries which have, also experienced an increase in demand for materials.

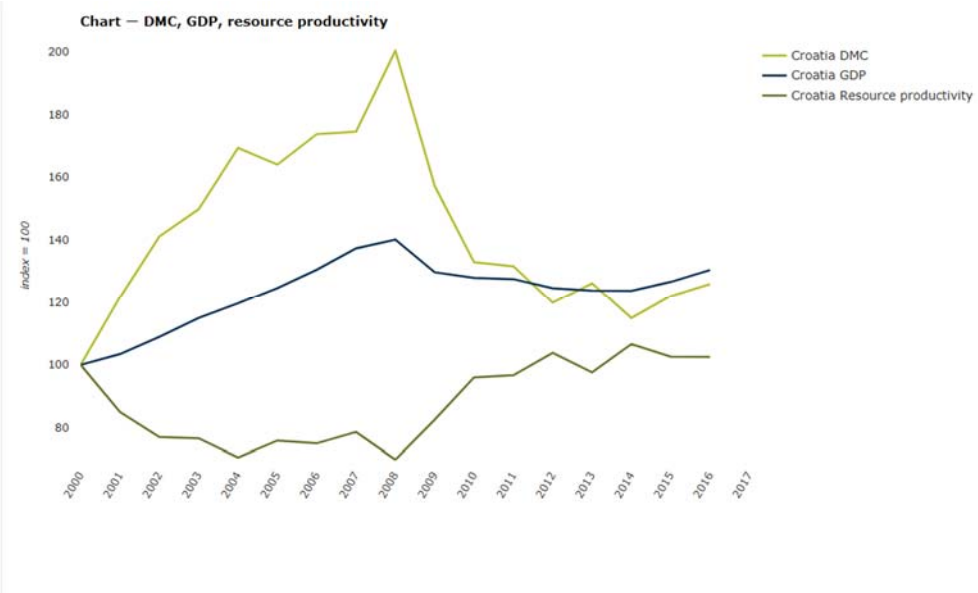


Figure 17: Resource productivity Croatia[xxxvii]

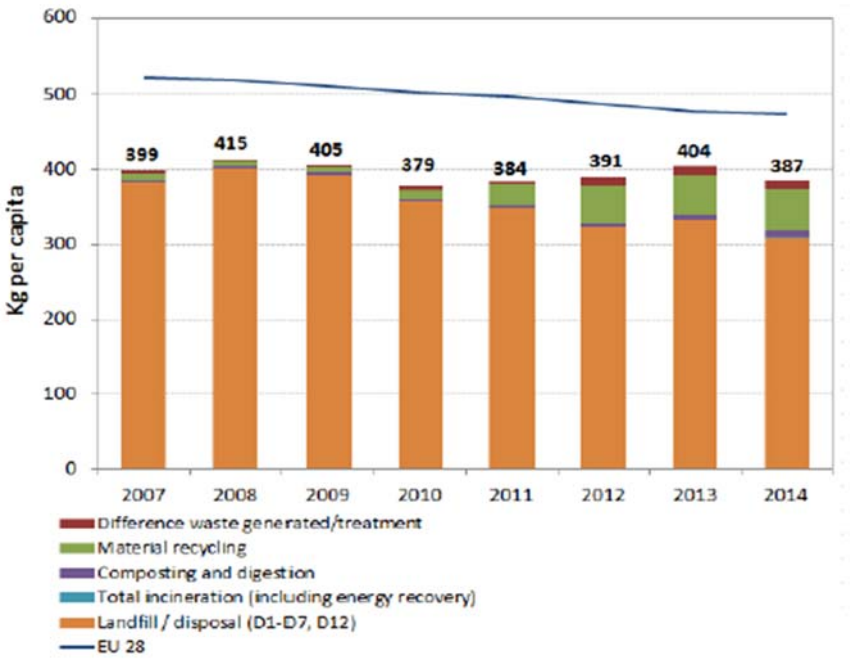


Figure 18: Municipal waste by treatment Croatia 2007-2014[xxxviii]

In 2016 Croatia,[xxxix] at 402 kg of generated municipal waste per capita, noted an increase in municipal waste generation. Of the municipal waste generated 309 kg per capita was sent to landfill and 77 kg per capita was recycled.

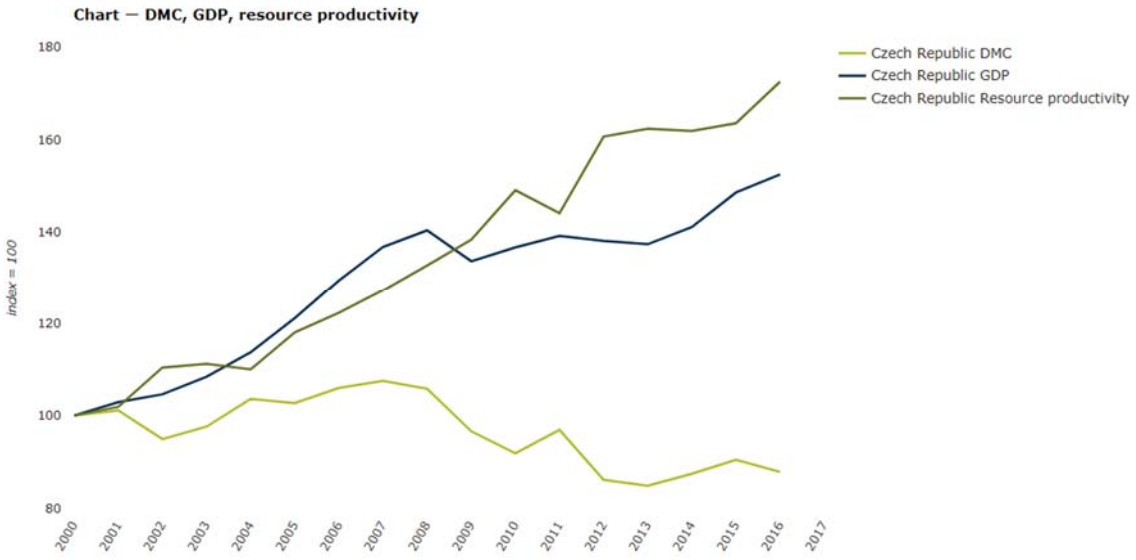


Figure 19: Resource productivity the Czech Republic[xl]

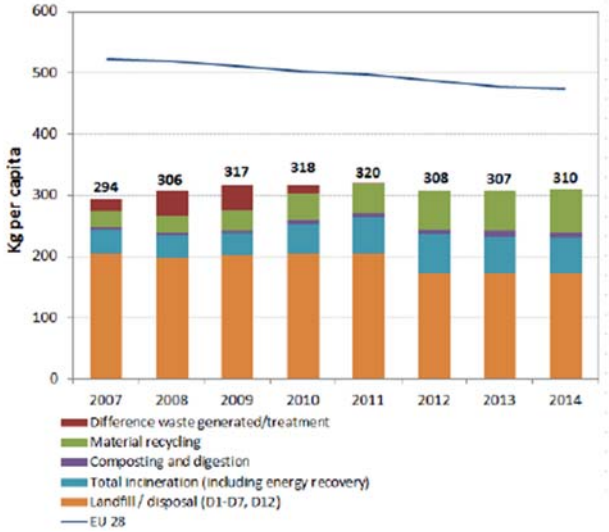


Figure 20: Municipal waste by treatment the Czech Republic 2007-2014[xli]

In 2016 the resource productivity index for the Czech Republic was above EU average at 172,5, the quantity of municipal waste generated per inhabitant was

lower than Eu average at 339 kg, 169 kg or roughly hlaf of the municipal waste generated was sent to landfill and 91 kg of municipal waste per capita was recycled.

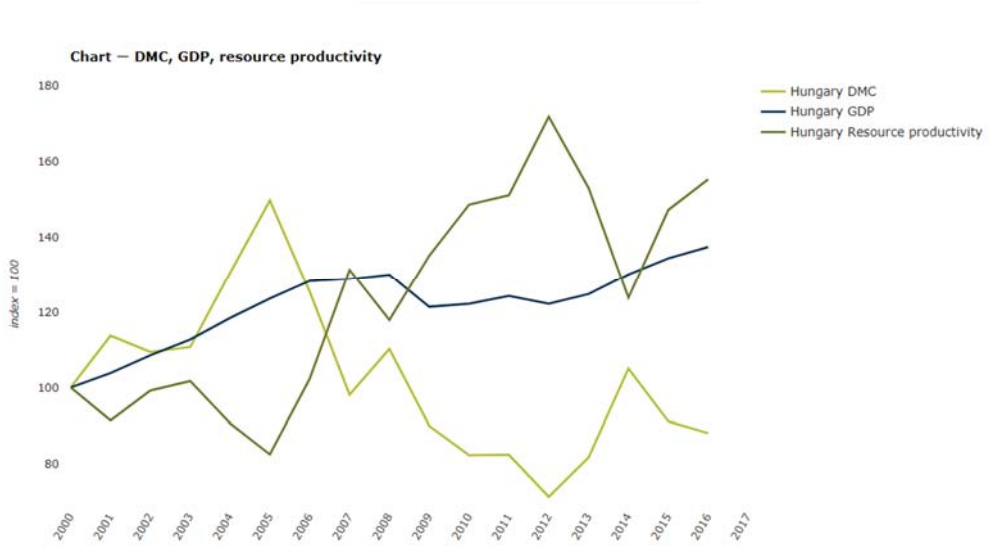


Figure 21: Resource productivity the Hungary[xlii]

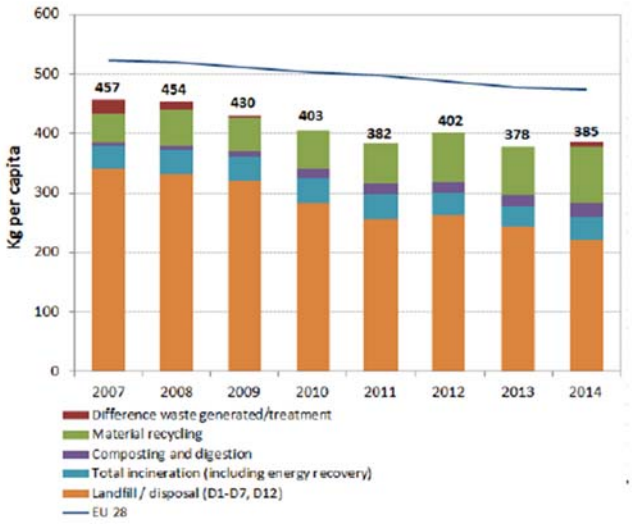


Figure 22: Municipal waste by treatment the Hungary 2007-2014[xliii]

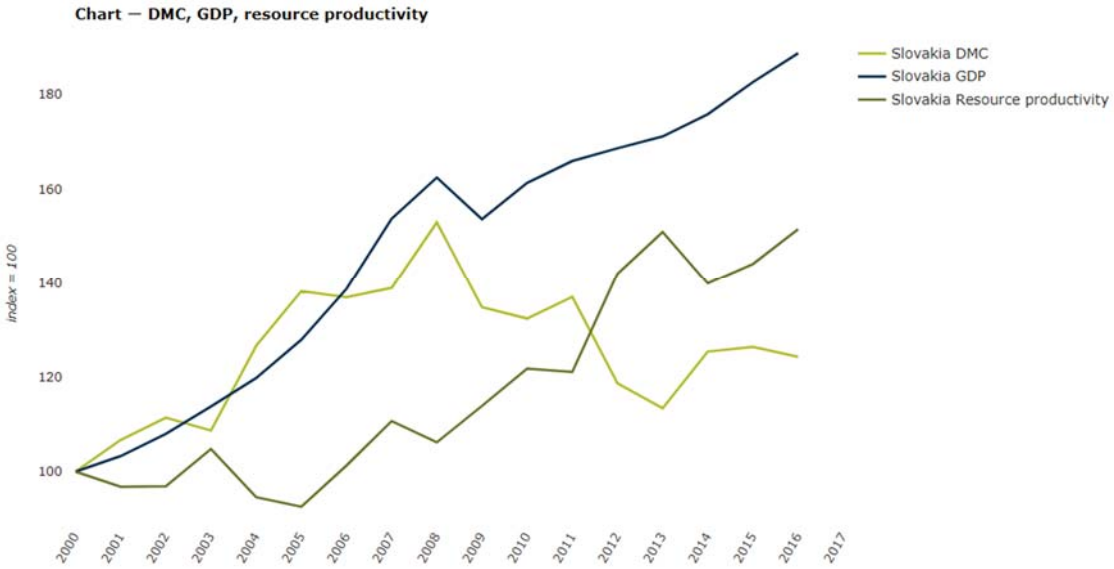


Figure 23: Resource productivity the Slovakia[xliv]

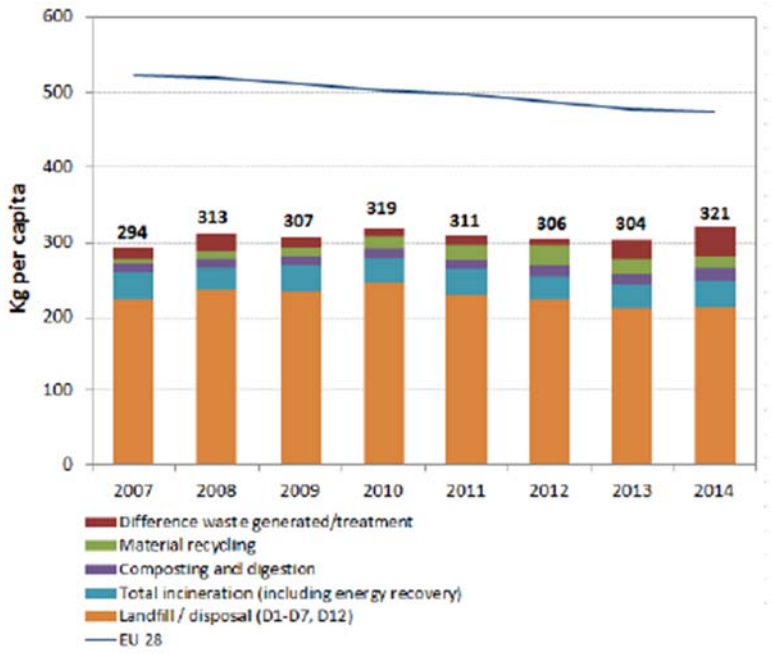


Figure 24: Municipal waste by treatment the Slovakia 2007-2014

According to the latest municipal waste management Figureures for Slovakia[xlv], 348 kg of municipal waste was generated per capita in 2016, of this 228 kg was sent to landfill and 54 kg of municipal waste per capita was recycled.

According to the Environmental Implementation Review[xlvi] published in the beginning of February 2017, by the EU Commission, all four countries still landfill more than half of the municipal waste generated in each country, with Croatia transferring almost 75 % of their generated municipal waste to landfill. On average the quantity of municipal waste generated per capita is lower than in other EU countries by around 20%. Of all four countries, the share of material recycling is lowest in Slovakia. With the exception of Croatia, incineration presents roughly over 10% of the municipal waste treatment.

The last published Environmental Implementation Review[xlvii] mentions, Hungary, and Slovakia have been incurring difficulties in attaining their designated waste targets.

In contrast to the EPR schemes presented in group 1, which were operating in competitive conditions, the circumstances in group 2 countries are more varied. The systems fluctuate between multiple PROs competing for clients in Slovakia; a system combining one prevailing PRO for packaging and multiple competitor PROs for WEEE in the Czech Republic; a state owned organisation in Hungary, implementing EPR through product tax and an environmental fund, responsible for the management of several financial programmes, actions and initiatives, being the single organisation enforcing EPR in Croatia.

The producer responsibility scheme in Hungary was abolished in 2012 with the implementation of a product charge law, which ceased the system operated by the EPR schemes and put the management of recyclable waste into the hands of the state. The most significant amendment of the regulation was that environmental obligations and recycling targets prescribed for producers (packaging waste, electronic waste) cannot be achieved via a coordinating organisation.

In Slovakia a new waste Act approved in 2015 came into force in 2016. With 11 PROs managing packaging and packaging waste till 2017, 11 PROs managing waste electrical and electronic equipment, and 7 PROs for batteries and accumulators the PROs are subject to competition for every waste stream. According to the waste act, these PROs must be non-profit. The new Act has legally defined the conditions for a clearing house per EPR waste stream.

The Czech Republic has one PRO for packaging and packaging waste, 16 PROs for waste electric and electronic equipment and two for batteries and accumulators.

Similarly to Hungary, Croatia has one umbrella PRO for all the mentioned EPR waste streams. There was no mention of any clearing houses in any of the countries, except Slovakia, where a coordination centre has been established for every waste stream, though there is a yet, little practical experience to talk of.

How the systems work for packaging and packaging waste

In Hungary Packaging, electronic and electrical equipment, batteries and accumulators are all subject to the environmental product fee, The Product Fee Act actually applies to a variety of product categories which exceed the WEEE, battery and packaging producer responsibility waste streams. In addition to EEE, batteries and a range of packaging materials, the tax obligation also applies to tires, crude oil products, chemical products (such as soap, deodorants and hair and beauty products), certain plastic products, office paper and paper-based advertising materials.

The Product Fee rates vary per kilogram placed on the Hungarian market, and taxed product quantities are self-assessed. Data reporting and payment of the product fee must be submitted quarterly to the tax authority, the National Tax and Customs Authority, which also carries out product fee inspections. The amount relating to the environmental product fee for each type of product is defined in the Act, with separate rates applying to the various types of packaging materials. The Environmental Product Fee Act enables companies to opt for a flat rate, in which

case they can perform their obligations on an annual basis provided, that they do not exceed the relevant statutory thresholds.

The Environmental Product Fee Act not only imposes a payment obligation, but also subjects companies to other types of obligations as well. Firstly, within 15 days of starting their activities (in the case of non-Hungarian companies, this is most likely the first sale to Hungary), the companies concerned must register themselves at the National Tax and Customs Administration of Hungary (NTCA). Companies that fail to register themselves within the above deadline lose the right to opt for the flat rate product fee. Producers not registering or not qualifying for the flat rate must report and pay on a quarterly basis.

Since 1 April 2016 the state owned, National Organizer of Waste and Asset Management has been in charge of coordinating the public waste management services at the national level, collecting the public service fees from the population and paying the service fee to the public service operators for their activity. The standard fee is to guarantee coverage of the actual costs of waste management

In Slovakia the fees for packaging are determined according to the weight and type of different packaging materials being placed on the market and the average cost for their waste management. No incentives exist for packaging which is easier to collect, reuse, prepare for reuse or recycle.

In the Czech Republic, the sole PRO for packaging is Eko-kom, which operates a nationwide system that provides take back and recovery of packaging waste. The Eko-kom System is based on the cooperation of industrial enterprises (clients), towns and villages. The system ensures that waste from packaging used by the consumer is sorted, transported by refuse collecting vehicles, finally sorted and used as a secondary raw material. The cost to manage primary packaging, in contact with products, which is most liable to end up in household collection bins is roughly 10 times the cost of secondary, transport and packaging ending up on industrial locations through B2B transactions.

Participation within the PRO proceeds upon the application of an entry statement and the payment of an administrative fee, which includes a levy for the state environmental fund and advance payment for the first quarter of participation. After payment, Eko-Kom issues the client, a system participant certificate, which assigns a client number, as proof the company has been registered in the system.

Eko-kom has a user friendly website, offering a comprehensive overview of how the system works, it costs with a representation of financial and material flows.

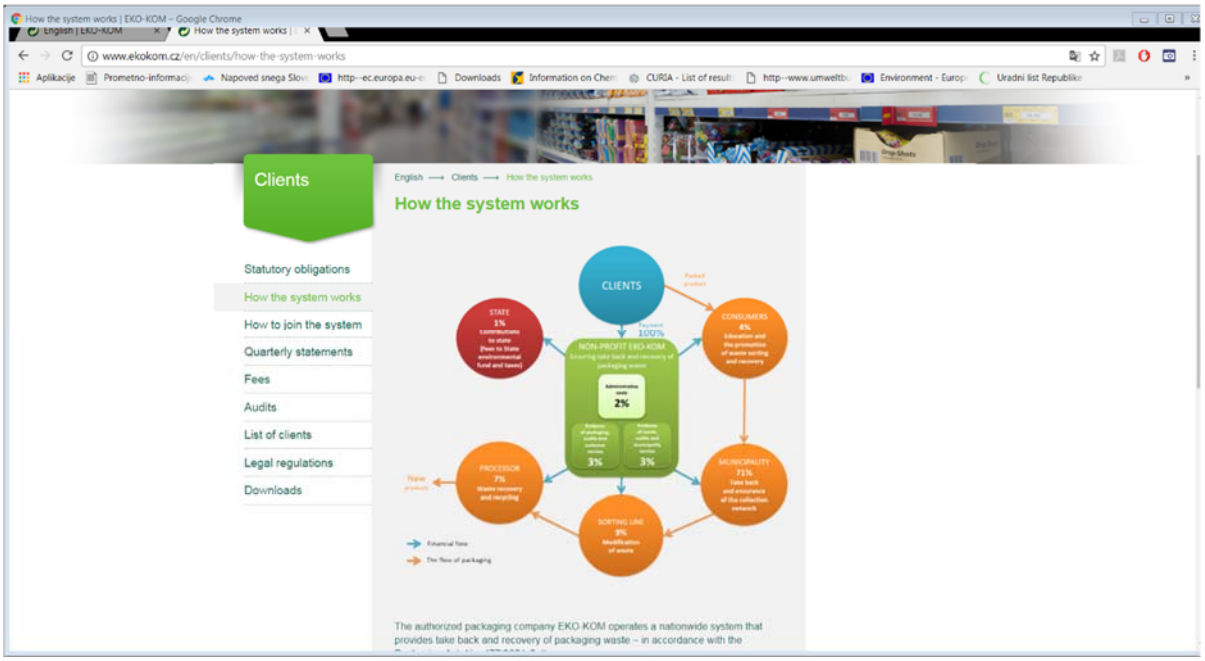


Figure 25: Transparent depiction of fund slows amongst, key stakeholders from the Eko-Kom website.

In Croatia, EPR requirements are managed by the state Environmental Protection and Efficiency Fund. The Fund's activities are much broader than financing waste management of streams subject to EPR, as it is also the central point for collecting and investing extra budgetary resources in the programmes and projects of environmental and nature protection, energy efficiency and use of renewable energy sources. In the system of management and control of utilisation of EU structural instruments in Croatia, the Fund performs the function of Intermediate Body level 2,

for the specific objectives in the field of environmental protection and sustainability of resources, climate change, energy efficiency and renewable energy sources.

The prices for packaging and packaging waste are published in the countries official journal. The highest rates are paid per tonne for plastic bags (almost 200 EUR) and general multi-layered packaging (100 EUR), while the cost for beverage multi-layered packaging is just over 55 EUR. Additional fees for packaging of beverages exceeding 0,2l include a waste disposal fee of 0,013 EUR and deposit of 0,065 EUR per packaging unit. Producers placing small quantities of packaging on the market are exempt (between 50 kg of plastic and 300 kg of glass). Producers are obliged to report to Fund quarterly and annually.

The Environmental Fund offers quite a lot of information on its website in English. Nevertheless, a lot of practical information on how the process works, costs…are not in English. Two PRO type organisations, Eko-Ozra and Interseroh, as the legislation is missing for them to obtain PRO status, offer their consulting services to companies to help them navigate through the different financial and administrative requirements.

How the systems work for electronic and electric waste, batteries and accumulators

As mentioned in the packaging section, electronic and electrical equipment, batteries and accumulators are all subject to the environmental product fee in Hungary. A special decree stipulates the obligation to take back waste equipment from the consumer, under the concept of like for like. WEEE can be collected door-to-door and from waste collection yards.

The Slovak Waste Act (79/2015) introduced the obligation for producers of consumer electrical and electronic equipment (EEE) to display the costs associated to the recycling of their products. This Waste Act was published in March 2015; however, the obligations for producers to display the Visible Recycling Fee have only been mandatory since 1 January 2016. Prices for waste management are suggested by

compliance schemes per appliance unit in relevance to the WEEE category the appliance falls under. The Ministry is responsible for registration and the public register is accessible.

In the Czech Republic the registration body for the List of producers is the Waste Management Department at the Ministry of the Environment of the Czech Republic,

Obligated producers must apply for registration with the List of Producers at the Ministry of the Environment. For producers participating in collective schemes, the application for registration in the List of producers is usually submitted by their agents (collective scheme) on their behalf. A list of the collective schemes in the Czech Republic is published on the ministries site. It is possible to obtain a permit for an individual scheme, but an additional fee must be then paid to the collective scheme for "historic" household electrical and electronic equipment, which was on the market before the WEEE legislation was enforced.

Quarterly statements are required, declaring products placed onto the market. Obligated producers can comply individually by setting up a collection and recovery system at their own cost, through a system set up by two or more producers, or through a Government authorised scheme (known as a collective scheme). Membership of a collective system is generally recommended as much of the administrative and legal burden associated with compliance will be offset. It is also considered a cheaper option than the alternatives. If a producer chooses to comply individually or through a combined system, the producer must apply for registration with the List of Producers at the Ministry of the Environment directly. Distributors must take back waste items from their customers on a "like for like" one for one basis, regardless of where the waste product was originally purchased. Foreign companies must also appoint an Authorised Representative in the Czech Republic to act as a point of contact for the Czech authorities and take on their legal obligations.

Electronic and electrical waste, as well as waste batteries and accumulators in Croatia are also managed by the Environmental Fund. The Fund is a legal entity

performing activities in the field of EE waste management coordination. The Fund collects all information related to producers, collection operators and recovery operators. The Fund annually forwards the collected data to the Agency which prepares annual reports on EE waste management. The obligations of producers, collectors, recovery operators are also determined in a special regulation published in the national official journal. Reporting of quantities placed on the market is monthly, though obligated companies are required to report annually to the State Environmental Agency. The regulation published on the OJ website stipulates electronic and electrical equipment must not contain hazardous substances, must be disassembled easily and fit for reuse and recycling of both material and components, while recycled materials must have use priority. The register for producers of electrical and electronic equipment, batteries and accumulators is not yet publicly accessible through the Fund website. The costs for waste electrical and electronic equipment is 0,3 EUR per kg per category of electrical and electronic equipment and 1,11 EUR per kg for portable batteries and accumulators.

General characteristics of stakeholder perception along the extended producer responsibility waste streams

Innovation in general

In Hungary, innovation culture is present and usually linked to improvement of existing products. There is a high perception that environmental innovation and improvements are linked to higher costs, which cannot be validated in market prices, limiting efforts to make products and production greener than the benchmark set by technical regulation and legislative obligations.

Though Slovakia has a high share of high-technology exports, primarily due to multinational companies operating in the country, the number of research centres is low, as is the number of Slovak SMEs innovating in-house.

Stakeholders emphasize that due to foreign ownership, producing companies have little influence on the design of the final product. Financial and personnel resources

are low, as is the availability of highly qualified R&D workers. The market demand for eco-innovative products is low.

Although environmental issues or eco-innovation initiatives were not recognised as a key innovation driver, the investigation revealed that a number of companies are aware of the concept of eco-design, new materials and circular economy principles. Similarly as in group 1, the stakeholder mentioned barriers limiting eco-innovation efforts such as inconsistent legislation and insufficient information regarding the use of recycled/new materials.

The Czech Republic has a good ranking on the eco-innovation scoreboard. According to stakeholder perception, EPR schemes motivate companies during the final stage of the product life cycle.

Due to increased emphasis on innovation during the waste management phase, the collective schemes for WEEE have launched an initiative to focus producer attention also on the design stage.

Stakeholders also mentioned that they recognised increased motivation for eco-innovation from the strengthening of consumer environmental awareness, linking entrepreneurial success with improving company reputation and upholding core social values.

Stakeholders stressed a lack of funding for advanced, environmental technologies.

In Croatia there is an elevated interest in the opportunities being recognised in the bio-based economy and recycled materials.

Croatian stakeholders stressed a lack of cooperation between economic operators and research institutions

Digitalisation & Innovation

In Hungary, companies are aware of the importance of digitalisation, linking it primarily to innovation having the potential to reduce costs for logistic operations.

"Public waste collectors are looking into new logistics solutions, RFID systems, apps and other digital opportunities to increase public awareness on waste issues.

In Slovakia and in the Czech Republic, the importance of digitalisation was recognised and linked as a driver to the development of new business models, delivering services instead of products. Waste collection services have begun inserting sensors into waste containers supporting real-time monitoring and optimizing waste collection. Digitalisation is also a good tool to improve logistical operation. Private organisations seem to have more experience with digitalisation than public ones and digitalisation is no only an important factor supporting innovation, but also an instrument providing daily operational support in companies.

Innovation opportunities and challenges for packaging and packaging waste

As in the previous group, the complexity of circular economy principals was emphasised as an obstacle linked to the conflicting requirements of different legislative aspects to circular economy goals. A typical example is product safety and functionality, which producers must adhere to, i.e. biodegradable packaging coming into contact with food, must correspond to food safety requirements and provide food protection. Consumer preferences were also mentioned as a limiting factor.

In Slovakia, stakeholders felt that the opportunities to reuse packaging were more or less limited to local markets, due to high collection costs for packaging waste and its preparation for reuse.

In case of new/recycled materials, the Slovak and Czech stakeholders mentioned the higher prices of these materials, as well as concerns related to their reliability and material purity, hindering their wider use. PROs and recyclers also emphasised the negative influence of bio-based plastic material on the quality of recycled plastic if the entered the wrong waste stream at end-of-life.

In Croatia, stakeholders stressed that the current system for packaging places too much emphasis on plastic beverage bottles and the operation of a deposit scheme. The system is disproportional allocating roughly 75 % of the financing to treat 1/3 of the waste stream consisting of beverage packaging and the other 25 % for financing to treat the remaining 2/3 of the packaging waste stream. The current system does not stimulate companies to innovate, recycle or develop technologically.

A glass recycler in Croatia stressed lack of incoming glass packaging waste, which could be attributed also to inadequate waste separation in households, which should pay more if the rate of mixed waste from individual households is higher.

Innovation opportunities and challenges for waste electrical and electronic equipment & waste batteries and accumulators

The concern for conflicting circular economy opportunities and product safety was especially highlighted in the case of electrical and electronic equipment with reference to the use of new materials, especially bio-based ones and reduced functional characteristics of recycled materials (plastics)

Conclusions for Group 2

The group is highly diverse with regard to how the challenges and opportunities presented by eco-design and design for a transition towards a more circular economy are perceived. The eco-innovation index has clearly registered a shift towards eco-design in the Czech Republic, while Hungary and Croatia are listed towards the bottom of the eco-innovation scoreboard for 2016.

Stakeholders highlighted that in order to support the application of circular economy principles, raising environmental awareness and thus increasing demand for eco-innovation is crucial.

The perception of the stakeholder with regard to opportunities available through focus and introduction on eco-design, mirror the eco-innovation scoreboard[xlviii], with Hungary dropping down to the second last, or 27th of the 28 countries ranked.

Foreign ownership was mentioned as a deterrent for eco-innovation as, research and development units are located elsewhere, redirecting innovation and eco-innovation activities from the countries with a high rate of foreign owned business organisations. Due to this, innovation is more oriented towards smaller incremental measures, which can be observed and implemented with lesser resources.

Conflicting legislative requirements at EU level were also noted in this group of countries, emphasising a need to find a common approach to reconcile opposing requirements to avoid potential market barriers, due to different prevailing criteria from country to country.

Most of this group of countries still have issues with high rates of municipal waste still being directed to landfills, which is also reflected in the efforts invested mainly in the waste end of the product cycle, with less priority on the design phase of product life.

Existing EPR schemes, practice and their effect on innovation in group 3

GROUP 3: Bulgaria, Romania, Serbia, Montenegro and Moldova

The innovation scoreboard prepared in 2017 ranked Serbia amongst moderate innovators. Bulgaria and Romania were ranked as modest innovators. Romania and Bulgaria were ranked as countries catching up with Eco I on the latest Eco-innovation scoreboard. No additional information was found for Serbia, Moldavia and Montenegro with regard to these categories.

According to the Environmental Implementation Review[xlix] published in the beginning of February 2017, by the EU Commission, Bulgaria and Romania exhibited the least resource productivity, with the highest share of GDP in EURO per kg of resource. Serbia was ranked between Bulgaria and Romania.

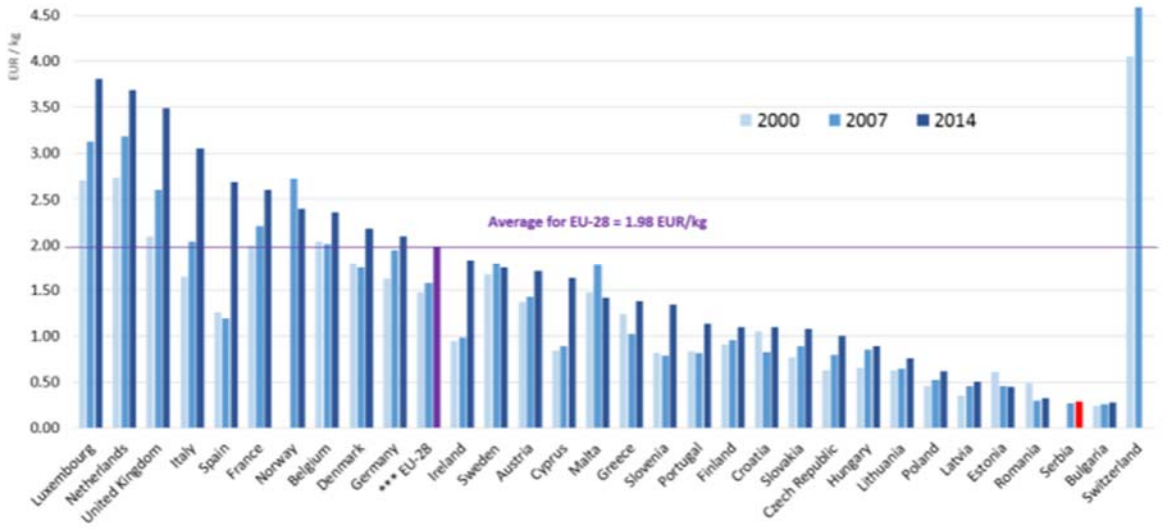


Figure 26: Resource productivity[l] (GDP/DMC), participating countries and EU-28 (2000, 2007 and 2014)

Both Bulgaria and Serbia have made progress according to the 2016 EU data[li] with regard to resource efficiency. Romania remains at the bottom of the list. The latest data, from 2015 and 2016 reveal resource productivity indexes still below the EU average of 141. Serbia has a resource productivity index of 133, Bulgaria 120 and Romania far below with an index of 64,4. Similar indexes were not available yet for Montenegro and Moldavia.

The Environmental Implementation Review[lii] reported over half of the municipal waste ending up in landfills in Bulgaria, almost 2/3 of generated municipal waste ending up in landfill in Romania, around 20 % of municipal waste is recycled in Bulgaria and extremely low recycling levels in Romania.

The EPR schemes in each country situated in group 3

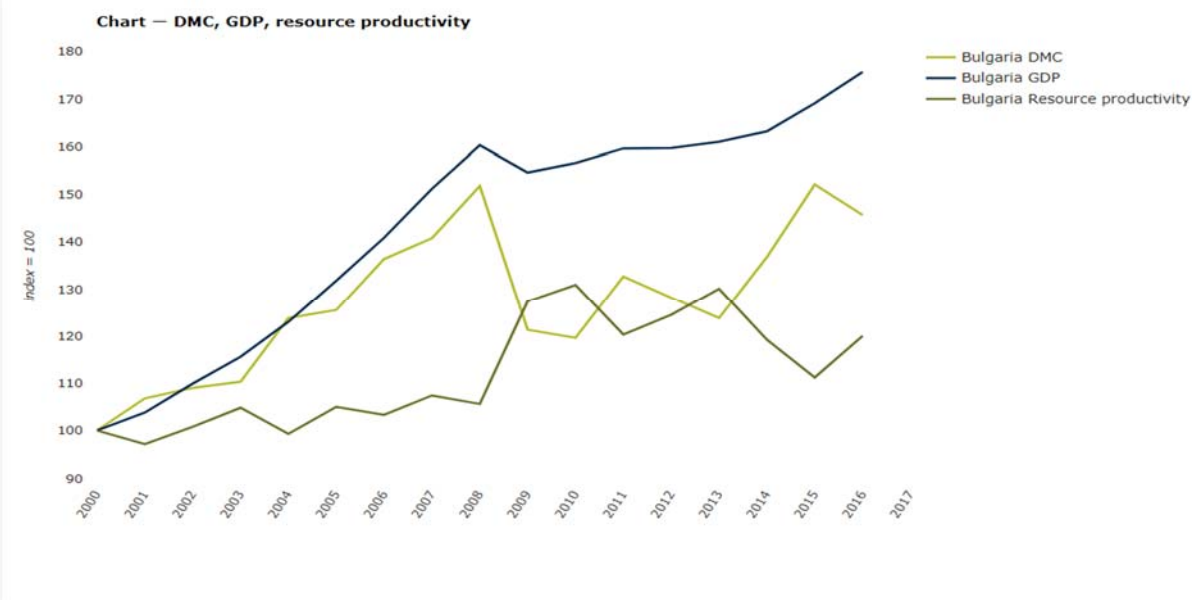


Figure 27: Resource productivity Bulgaria[liii]

The quantity of generate municipal waste was below EU average for Bulgaria with 404 kg of generated municipal waste per capita in 2016, Romania with 247 kg of

generated municipal waste per capita in 2015 and Serbia with 268 kg of generated municipal waste per capita in 2016. The quantity of municipal waste generated in Montenegro in 2015 was 533 kg per capita, which is well above the EU average of 480 kg of municipal waste generated per capita. No similar data was found yet for Moldavia. Of the municipal waste generated Bulgaria recycled the most with 92 kg per capita of municipal waste being recycled, 14 kg per capita of this waste was recycled in Romania and 1 kg per capita in Serbia. Bulgaria landfilled 260 kg per capita in 2016, Romania 178 kg per capita in 2015, Serbia landfilled 211 kg per capita and Montenegro landfilled 488 kg of municipal waste in 2015. No information was available for Moldavia.

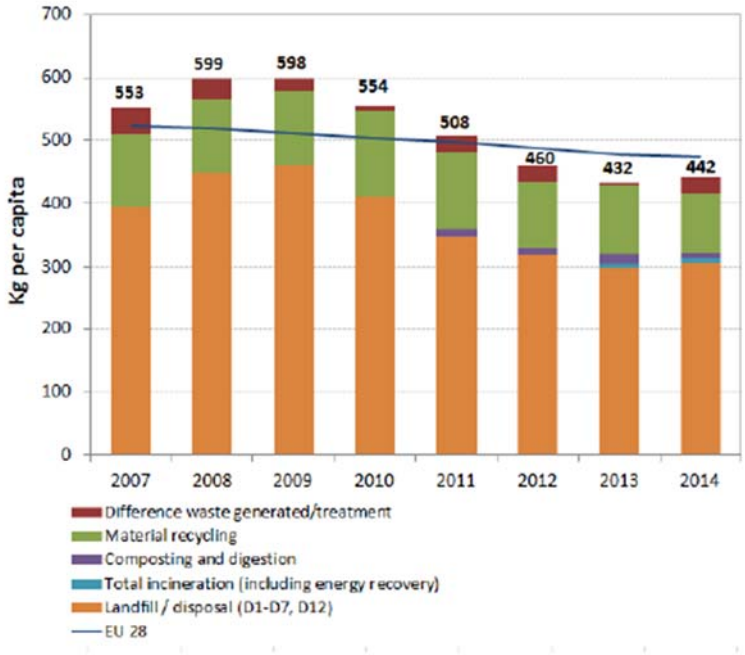


Figure 28: Municipal waste by treatment the Bulgaria 2007-2014[liv]

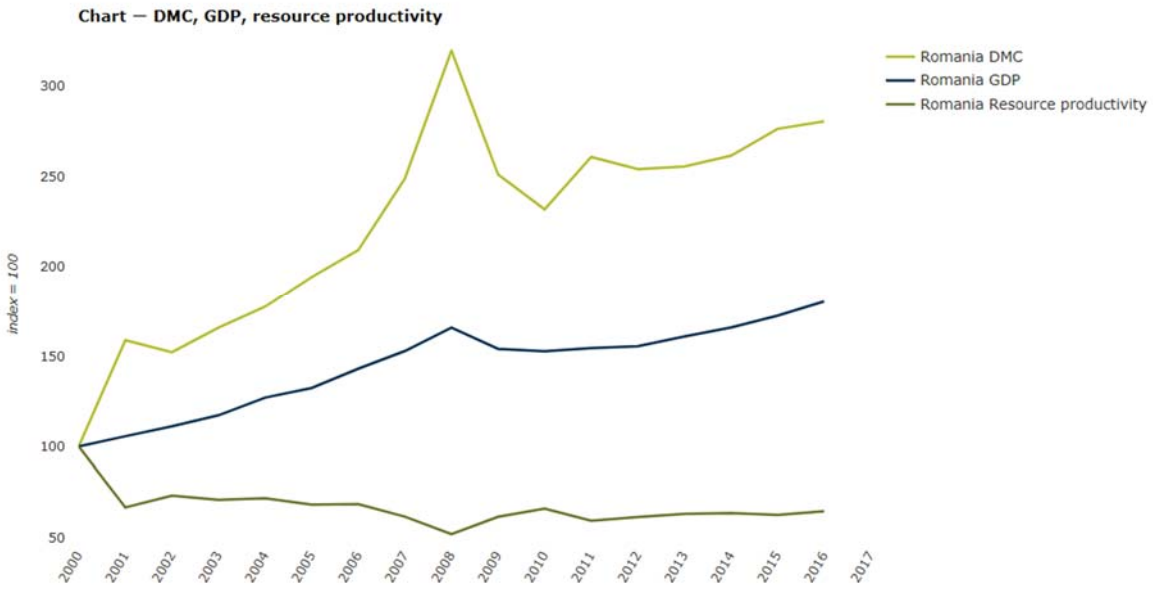


Figure 29: Resource productivity Romania[lv]

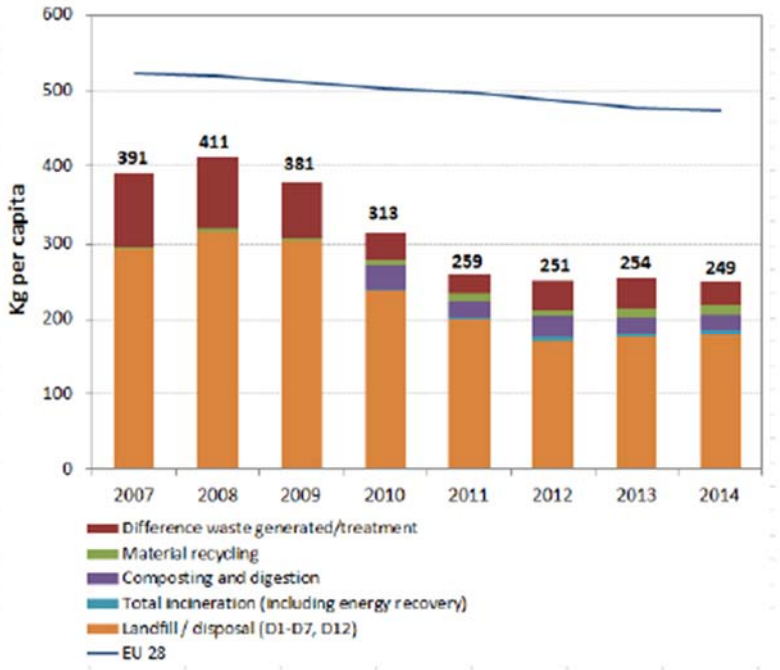


Figure 30: Municipal waste by treatment the Romania 2007-2014[lvi]

The EPR schemes in each country situated in group 3

This group is most difficult to compare, as it is difficult to find relevant, common indicators for the whole group and the legislation of current non EU members is still evolving. In Romania and Bulgaria, a number of producer responsibility organisations provide their services under competitive conditions. Both national reports state that the introduction of PRO systems has been beneficial for waste management and especially increased recycling. In Bulgaria, the legislation was updated in 2013 and 2015 with the expectation that waste management will improve. The data collected by Eurostat for 2016 notes there has been an improvement in the country's resource efficiency index, while 260 kg of municipal waste was still reported as being sent to landfill. State strategic documents up to 2020 draw measures for Bulgaria to join the "moderate innovator" group during this period.

Serbia, Montenegro and Moldova, still on the threshold to the EU, are not included in most of the index ratings and comparisons available to EU countries for benchmarking. All three countries are investing efforts in activities to lay the foundation for compliance with EU waste legislation demands, such as determining industrial and municipal waste quantities, required infrastructure for municipal waste collection and treatment, diversion from landfill, capacity building and legislation alignment.

The legal framework on waste management is partially aligned in Montenegro. In order to further align with the acquis, amendments to the law on waste management were adopted in 2015 and 2016. Considerable efforts are needed to ensure implementation of the national strategy for waste management until 2030 and the 2015-2020 national waste management plans. Special attention needs to be given to the implementation of local waste management plans, to waste separate collection and recycling as well as to the strengthening of financial and administrative capacities at local/municipal level. Implementation of the waste law must be strengthened, in particular in the area of illegal waste disposal and

temporary disposal sites[lvii]. From the national report received from Montenegro it appears a lot of efforts are being invested into municipal infrastructure for collection in order to support the implementation of extended producer responsibility.

Regarding waste management, there is a good level of alignment with the EU's principal waste directives in Serbia, with recent progress made regarding the waste framework, landfill and industrial emissions directives. Implementation remains at an early stage, with some progress noted in increased rates of municipal waste collection and sanitary landfilling. The national waste management strategy and municipal waste management plans need to be updated to reflect the new legal provisions on e.g. waste minimisation and waste separation at source, and to include quantitative targets for waste recovery and recycling. Increased efforts are needed to close Serbia's non-compliant landfills more quickly and invest in waste separation and recycling. A national integrated waste management plan and additional economic instruments for special waste streams need to be developed[lviii]. In Serbia six PROs for packaging and packaging waste operate under competitive conditions. PROs for electrical and electronic equipment are not yet established. Quantities of electrical and electronic equipment, batteries and accumulators placed on the market in Serbia must be reported to the Environmental Protection Agency, while fees for these products are paid into the Green Fund.

Moldova is in the process of establishing a legislative and infrastructural framework to support better alignment with EU acquis demands. The waste management strategy of the Republic of Moldova for 2013-2017 contains goals to implement EPR compliance schemes for five waste streams, including packaging and packaging waste, waste electronic and electric equipment, batteries and accumulators.

A waste law was put in place in 2016. Nineteen product categories are subject to environmental tax set as a percentage of the product price. Plastic packaging, including polyethylene and PVC (bulk), paper, cardboard, tetrapack packaging (bulk), batteries, lead-containing products and electric bulbs. The plastic packaging tax is very broadly interpreted by the Customs service and is levied on all kinds of

packaging regardless of size. The OECD report states Moldova's system of environmental product taxes is that it does not target or affect producer or consumer behaviour but essentially serves to generate revenue for the National Environmental Fund. The tax on packaging bears a very high administrative cost but no real impact. It does not stimulate a shift to imported products using less packaging. Though competitive schemes exist for each waste stream, where extended producer responsibility is being enforced, no clearing houses exist yet.

Extended producer responsibility has a strong connotation with waste management. Probably due to the increased efforts these countries are investing to improve waste infrastructure and waste management in general.

How the systems work for packaging and packaging waste

In Serbia producer responsibility organisations have been established for packaging. Six PROs for packaging and packaging waste operate under competitive conditions. Quantities of electrical and electronic equipment, batteries and accumulators placed on the market in Serbia must be reported to the Environmental Protection Agency, while fees for these products are paid into the Green Fund that became operational on the 1st January 2017, as a body within the Environmental Ministry. The Green Fund is envisioned as a budgetary fund serving to finance the preparations, implementation and development of programs, projects and other activities in the field of preservation, sustainable use, protection and improvement of the environment. The Green Fund will help in financing the recycling industry

Up to 80 % of raw materials for the recycling industry, scrap paper, iron, PVC, bottles, batteries has been collected until now, by unregistered collectors of secondary raw materials. The national platform plan to include these of collectors and incorporate them in the legal business system by local self-governments during 2017.

Companies with obligations to manage packaging and packaging waste can decide to transfer their responsibility to one of the six PROs, and submit an annual report to the Environmental Protection Agency. Costs are based according to material type

and quantity. The price is roughly 0.0084 EUR per kg, with a 50% higher price per kg of plastic, a roughly 10 % lower price for paper and cardboard and an approximately 10 % higher price for glass, metal and wood per kg.

Companies in Serbia can also opt to organize their packaging waste management individually and submit a report to the Environmental Protection Agency.

Companies may also choose to submit their annual report to the Environmental Protection Agency and pay a fee to the Ministry responsible for environmental protection.

A similar system seems to be in place in Bulgaria for packaging. PRO members are exempt from paying a product fee. A company may choose to manage waste through an individual scheme or it can pay a product fee to the state Enterprise for Management of Environmental Protection activities (EMEPA). Reporting to EMEPA, regarding quantities placed on the market, if the company has joined a collective producer responsibility organisation, reporting to EMEPA is part of the service provided by the organisation. The fee paid directly to EMEPA is published in the official state journal, and is usually higher than the costs paid to a collective PRO for packaging waste management.

The Ministry for Environment may decide to arrange an audit in any stakeholder organisation along the waste value chain. Usually companies generating smaller amounts of packaging waste choose to pay the product fee to EMEPA, so this can be perceived almost as a lump sum arrangement for companies, where packaging quantities put on the market are erratic and low. Incomes generated by EMEPA are small and are used to improve local municipal infrastructure. The product fee is paid according to the weight of individual packaging materials put on the market and is highest for plastic and composite materials. PROs must collect and treat packaging waste quantities in accordance with their market share. Collective and individual PROs are monitored and controlled by the Executive Environmental Agency and 16 regional Inspectorates for Environment and Water. PROs send technical and

financial reports, which are audited by independent certifies auditors annually. The Executive Environmental Agency manages the National Waste information Systems, which include several waste registers. With regard to packaging there is a register of entities placing plastic bags on the market. From the 1st of January the National Waste Information System will be available online.

Romania enforces extended producer responsibility through competitive PROs. In addition to EPR requirements, a tax is paid for packaged good placed on the market. An Eco-tax is also demanded for plastic bags, amounting to 0,1 EURO per bag. Currently 12 collective extended producer responsibility schemes have been approved for packaging and packaging waste in Romania. The websites of each PRO provide general information concerning their services, while the final details are only available to partners. PROs also offer services to help companies optimize packaging waste management. The Ministry for Environmental and Forestry performs monitoring and enforcement in collaboration with the Environmental Agency, Inspectorate and Environmental Fund.

How the systems work for electronic and electric waste, batteries and accumulators

In Bulgaria, all the existing PROs for waste electrical and electronic equipment and batteries and accumulators operate collective schemes under competitive conditions supported by contracts. Both the PROs for packaging and for electrical and electronic equipment are non-profit. In Romania, all the existing PROs for waste electrical and electronic equipment and batteries and accumulators operate collective schemes under competitive conditions

In Romania a tax is collected for portable batteries and accumulators, when they are placed on the market.

In Serbia, PROs for waste electronic and electrical equipment have not been implemented, though private companies are taking initiative and have begun collecting waste electrical and electronic equipment so it can be treated appropriately.

In Moldova a bilateral pilot project is being carried out with Slovakia to develop an EPR scheme for waste electronic and electrical equipment. A collective scheme would imply the establishment on a voluntary basis. An agreement would be signed between producers in a collective scheme, through a producer responsibility organisation and municipalities on the conditions and financing of WEEE collection. Producers of the PRO would also be responsible for offering take-back points in stores selling electric and electronic products. The government's role would be limited to monitoring and enforcement by the State Environmental Inspectorate.

General characteristics of stakeholder perception along the extended producer responsibility waste streams

Innovation in general

The stakeholders in Bulgaria stressed the need for measures and incentives to support eco-innovation, suggesting reduced taxation, additional funding, green public procurement. The stakeholders also recognised the need for increased transparency of PRO operation to ensure financial and material flows are congruent. They also proposed the introduction of pay as you throw fees and fees for waste, which would motivate business to reduce, re-use, recycle etc. Current fees to manage waste are applied according to property value.

In Romania, eco-design does not seem to be a primary driver. Companies facing strong global competition state that this has a greater influence on eco-design than extended producer responsibility.

Innovation & Digitalisation

Economic operators are aware of the importance of digitalisation, but there is not enough support for its broader implementation. There is a lack of R&D organisations able to support the process.

Innovation opportunities and challenges for packaging and packaging waste

The stakeholders in Romania alerted to existing issues that still need to be resolved in order to improve the operation of the system. The issues are lack of infrastructure for selective collection and complicated legislation, which is difficult to understand.

In the case of glass packaging, recyclers pointed out that the costs to collect the waste glass is the same, as the costs of the finished product, so evidently the fees collected by PRO, do not finance the costs for recycling.

All countries stated lack of infrastructure to support the efficient operation of waste management. Due to this, there is a higher focus on waste and its management than on eco-design.

In addition to the lack of waste management infrastructure and in some cases also of supporting legislation, there is also a lack of knowledge, know-how, and awareness raising to incentivize citizens, while appropriate financial support is also a large problem.

Innovation opportunities and challenges for waste electrical and electronic equipment & waste batteries and accumulators

In Romania a problem of illegal collection and disassembly of waste electrical and electronic equipment.

All countries stated lack of infrastructure to support the efficient operation of waste management. Due to this, there is a higher focus on waste and its management than on eco-design.

In addition to the lack of waste management infrastructure and in some cases also of supporting legislation, there is also a lack of knowledge, know-how, and awareness raising to incentivize citizens, while appropriate financial support is also a large problem.

Conclusions for Group 3

The countries in group 3 still lack the infrastructural and/or legislative framework for the extended producer responsibility schemes to work efficiently. It is no surprise that the focus of all the stakeholders is more centred on waste management than on the design at the beginning of the product cycle.

In addition to the lack of waste management infrastructure and in some cases also of supporting legislation, there is also a lack of knowledge, know-how, awareness raising to incentivize citizens, while appropriate financial support is also a large problem.

PROs working for profit are more interested in the end phase of product life and waste management than stimulating eco-design to minimize waste.

References

[i] https://www.eea.europa.eu/publications/circular-economy-in-europe/at_download/file
[ii] http://ec.europa.eu/environment/eir/index_en.htm
[iii] http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_sl
[iv] https://ec.europa.eu/environment/ecoap/indicators/index_en
[v]http://ec.europa.eu/eurostat/documents/3217494/7827738/KS-EI-16-001-EN-N.pdf/bbb5af7e-2b21-45d6-8358-9e130c8668ab
[vi] https://www.eea.europa.eu/soer-2015/countries-comparison/waste
[vii] https://www.eea.europa.eu/soer-2015/countries-comparison/waste

[viii] http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=tsdpc240&language=en

[ix] BMUB 2016; Digitalisierung der GreenTech-Branche lohnt sich, Pressemittelung Nr. 297/16, berlin

[x] http://ec.europa.eu/environment/resource_efficiency/documents/factsheet_en.pdf

[xi] https://www.eea.europa.eu/airs/2016/resource-efficiency-and-low-carbon-economy/resource-efficiency

[xii] http://ec.europa.eu/eurostat/statistics-explained/index.php/Material_flow_accounts_and_resource_productivity

[xiii] http://ec.europa.eu/eurostat/documents/3217494/7827738/KS-EI-16-001-EN-N.pdf/bbb5af7e-2b21-45d6-8358-9e130c8668ab

[xiv] https://www.eea.europa.eu/data-and-maps/daviz/dmc-gdp-resource-productivity-population-1#tab-chart_1_filters=%7B%22rowFilters%22%3A%7B%7D%3B%22columnFilters%22%3A%7B%22pre_config_category%22%3A%5B%22DMC%22%3B%22GDP%22%3B%22Resource%20productivity%22%5D%3B%22pre_config_ugeo%22%3A%5B%22European%20Union%20(28%20countries)%22%5D%7D%7D

[xv] https://www.eea.europa.eu/data-and-maps/daviz/dmc-gdp-resource-productivity-population-1#tab-chart_1_filters=%7B%22rowFilters%22%3A%7B%7D%3B%22columnFilters%22%3A%7B%22pre_config_category%22%3A%5B%22DMC%22%3B%22GDP%22%3B%22Resource%20productivity%22%5D%3B%22pre_config_ugeo%22%3A%5B%22European%20Union%20(28%20countries)%22%5D%7D%7D

[xvi] http://ec.europa.eu/eurostat/statistics-explained/images/1/1b/Resource_productivity_-_GDP_DMC_by_country%2C_2000-16_%28Index_2000_%3D_100%29.png

[xvii] http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_sl

[xviii] file:///C:/Users/cerar/Downloads/EIS2017_Executive_summmary_en.pdf

[xix] https://ec.europa.eu/environment/ecoap/indicators/index_en

[xx] https://www.eea.europa.eu/soer-2015/countries-comparison/waste

[xxi] https://www.eea.europa.eu/themes/waste/municipal-waste/municipal-waste-management-across-european-countries

[xxii] https://www.eea.europa.eu/soer-2015/countries-comparison/waste

[xxiii] https://www.eea.europa.eu/themes/waste/municipal-waste/municipal-waste-management-across-european-countries

[xxiv] ttp://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=tsdpc240&language=en

[xxv] https://www.eea.europa.eu/data-and-maps/daviz/dmc-gdp-resource-productivity-population-1#tab-chart_1_filters=%7B%22rowFilters%22%3A%7B%7D%3B%22columnFilters%22%3A%7B%22pre_config_category%22%3A%5B%22DMC%22%3B%22GDP%22%3B%22Resource%20productivity%22%5D%3B%22pre_config_ugeo%22%3A%5B%22European%20Union%20(28%20countries)%22%5D%7D%7D

[xxvi] http://ec.europa.eu/environment/eir/index_en.htm

[xxvii] http://ec.europa.eu/eurostat/web/waste/municipal-waste-generation-and-treatment-by-treatment-method

[xxviii] https://www.eea.europa.eu/data-and-maps/daviz/dmc-gdp-resource-productivity-population-1#tab-chart_1_filters=%7B%22rowFilters%22%3A%7B%7D%3B%22columnFilters%22%3A%7B%22pre_config_category%22%3A%5B%22DMC%22%3B%22GDP%22%3B%22Resource%20productivity%22%5D%3B%22pre_config_ugeo%22%3A%5B%22European%20Union%20(28%20countries)%22%5D%7D%7D

[xxix] Eurostat, Municipal waste and treatment, by type of treatment method, accessed October 2016

[xxx] https://www.eea.europa.eu/data-and-maps/daviz/dmc-gdp-resource-productivity-population-1#tab-chart_1_filters=%7B%22rowFilters%22%3A%7B%7D%3B%22columnFilters%22%3A%7B%22pre_config_category%22%3A%5B%22DMC%22%3B%22GDP%22%3B%22Resource%20productivity%22%5D%3B%22pre_config_ugeo%22%3A%5B%22European%20Union%20(28%20countries)%22%5D%7D%7D

[xxxi] http://ec.europa.eu/environment/eir/index_en.htm

[xxxii] http://ec.europa.eu/environment/eir/index_en.htm

[xxxiii] https://www.wko.at/site/mehrsprachige_info/Information-on-the-Austrian-Packaging-Ordinance-2014.html

[xxxiv] https://www.elektro-ade.at/impressum/

[xxxv] https://www.elektro-ade.at/impressum/

[xxxvi] BMUB 2016; Digitalisierung der GreenTech-Branche lohnt sich, Pressemittelung Nr. 297/16, berlin

[xxxvii] https://www.eea.europa.eu/data-and-maps/daviz/dmc-gdp-resource-productivity-population-1#tab-chart_1_filters=%7B%22rowFilters%22%3A%7B%7D%3B%22columnFilters%22%3A%7B%22pre_config_category%22%3A%5B%22DMC%22%3B%22GDP%22%3B%22Resource%20productivity%22%5D%3B%22pre_config_ugeo%22%3A%5B%22European%20Union%20(28%20countries)%22%5D%7D%7D

[xxxviii] http://ec.europa.eu/environment/eir/index_en.htm

[xxxix] http://ec.europa.eu/eurostat/web/waste/municipal-waste-generation-and-treatment-by-treatment-method

[xl] https://www.eea.europa.eu/data-and-maps/daviz/dmc-gdp-resource-productivity-population-1#tab-chart_1_filters=%7B%22rowFilters%22%3A%7B%7D%3B%22columnFilters%22%3A%7B%22pre_config_category%22%3A%5B%22DMC%22%3B%22GDP%22%3B%22Resource%20productivity%22%5D%3B%22pre_config_ugeo%22%3A%5B%22European%20Union%20(28%20countries)%22%5D%7D%7D

[xli] http://ec.europa.eu/environment/eir/index_en.htm

[xlii] https://www.eea.europa.eu/data-and-maps/daviz/dmc-gdp-resource-productivity-population-1#tab-chart_1_filters=%7B%22rowFilters%22%3A%7B%7D%3B%22columnFilters%22%3A%7B%22pre_config_category%22%3A%5B%22DMC%22%3B%22GDP%22%3B%22Resource%20productivity%22%5D%3B%22pre_config_ugeo%22%3A%5B%22European%20Union%20(28%20countries)%22%5D%7D%7D

[xliii] http://ec.europa.eu/environment/eir/index_en.htm

[xliv] https://www.eea.europa.eu/data-and-maps/daviz/dmc-gdp-resource-productivity-population-1#tab-chart_1_filters=%7B%22rowFilters%22%3A%7B%7D%3B%22columnFilters%22%3A%7B%22pre_config_category%22%3A%5B%22DMC%22%3B%22GDP%22%3B%22Resource%20productivity%22%5D%3B%22pre_config_ugeo%22%3A%5B%22European%20Union%20(28%20countries)%22%5D%7D%7D

[xlv] http://ec.europa.eu/eurostat/web/waste/municipal-waste-generation-and-treatment-by-treatment-method

[xlvi] http://ec.europa.eu/environment/eir/index_en.htm

[xlvii] http://ec.europa.eu/environment/eir/index_en.htm

[xlviii] https://ec.europa.eu/environment/ecoap/indicators/index_en

[xlix] http://ec.europa.eu/environment/eir/index_en.htm

[l] http://ec.europa.eu/environment/eir/index_en.htm

[li] https://www.eea.europa.eu/data-and-maps/daviz/dmc-gdp-resource-productivity-population-1#tab-chart_1_filters=%7B%22rowFilters%22%3A%7B%7D%3B%22columnFilters%22%3A%7B%22pre_config_category%22%3A%5B%22DMC%22%3B%22GDP%22%3B%22Resource%20productivity%22%5D%3B%22pre_config_ugeo%22%3A%5B%22European%20Union%20(28%20countries)%22%5D%7D%7D

[lii] http://ec.europa.eu/environment/eir/index_en.htm

[liii] https://www.eea.europa.eu/data-and-maps/daviz/dmc-gdp-resource-productivity-population-1#tab-

chart_1_filters=%7B%22rowFilters%22%3A%7B%7D%3B%22columnFilters%22%3A%7B%22pre_config_category%22%3A%5B%22DMC%22%3B%22GDP%22%3B%22Resource%20productivity%22%5D%3B%22pre_config_ugeo%22%3A%5B%22European%20Union%20(28%20countries)%22%5D%7D%7D

[liv] http://ec.europa.eu/environment/eir/index_en.htm

[lv] https://www.eea.europa.eu/data-and-maps/daviz/dmc-gdp-resource-productivity-population-1#tab-chart_1_filters=%7B%22rowFilters%22%3A%7B%7D%3B%22columnFilters%22%3A%7B%22pre_config_category%22%3A%5B%22DMC%22%3B%22GDP%22%3B%22Resource%20productivity%22%5D%3B%22pre_config_ugeo%22%3A%5B%22European%20Union%20(28%20countries)%22%5D%7D%7D

[lvi] http://ec.europa.eu/environment/eir/index_en.htm

[lvii] https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/pdf/key_documents/2016/20161109_report_montenegro.pdf

[lviii] https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/pdf/key_documents/2016/20161109_report_serbia.pdf

Annex 1

The interview template and interview instructions

The template is primarily targeted at producers, importers, but the topics may be adapted according to the practices and needs of other organisations, PROs can be dealing with one or more material waste stream, they may have different environmental practices and objectives that may support innovation and eco-design, this is true also for waste management activities.

Before the interview the interviewer should prepare and gather general information about the interviewed organisation available from company websites and other public records. This will help the interviewer answer some of the organisation profile questions and prepare on which topics they need to focus on more during the interview.

After the interview, a short report linked to the template guideline and answers needs to be prepared.

Some partners opted to obtain answers through the organisation of focus group meetings / round tables, which initiated dialogue and exchange of views amongst relevant stakeholders. In this case, the template should be adapted according to the method of discussion and the target groups participating. After the event, a short recap report linked to the guideline should be prepared.

GENERAL				
NAME OF ORGANISTATION				
ADDRESS				
SIZE:	μ	S	M	L
ORGANISATION TYPE:				
PRODUCER / IMPORTER	PRO	WASTE COLLECTOR	WASTE RECOVERY OPERATOR	OTHER: (specify)

AREA OF RELEVANCE – PRO SCHEME			
PACKAGING	ELECTRONICS/ELECTRICAL	BATTERIES	OTHER: (specify)
Does the organisation produce a final product?			
Does the organisation produce a product component or semi-final product?			
Does the organisation have a systematic approach to innovation?			
Does the organisation consider environmental aspects within its innovation system?			
Are environmental concerns one of the primary drivers of innovation within the organisation?			
Is the organisation familiar with the concept of design for environment (DfE) or eco-design?			
Is the organisation in the process of creating new products and services supported by digital technologies?			
Will digitalisation have an effect on product waste management in your organisation? Is the company aware of the concept of reverse logistics and or the circular economy?			
Does the organisation participate in environmental public awareness campaigns?			
Does the organisation apply environmental declarations and labelling to its products/components and services			
What is the main raw material the organisation uses?(tick one or more): · Paper · Glass · Metals · Plastic · Bio-based / organic • Other			
Are you interested in other new materials (bio-based)?			
Have you noticed and increases of specific raw material prices?			
Is the product sold (locally, regionally, globally)?			
PRODUCER RESPONSIBILITY ORGANISATIONS			
Does the organisation manage it extended producer responsibility through one or more (local, regional, global) producer responsibility schemes, according to product market access?			

According to the organisation's understanding, the objective of extended producer responsibility is (tick one or more): • To cover costs of waste collection and treatment • To improve product design (DfE) and support innovation • To minimise the financial burden of waste products for public waste services and municipalities • To organise collection and recycling and redirect product waste streams away from public waste services and municipalities • To improve waste collection and treatment • To support transition to a circular economy
Is the cost to participate in the producer responsibility scheme (tick one or more):: • uniform with no consideration for environmental design • modified to consider product waste impacts through environmental design • paid after waste management – purchasing of tradable credits for recycled materials • partially covered through consumer deposit with purchase (advanced consumer disposal fee)? • Limited to recycling and recovery (any additional costs for transport and sorting are an extra charge
Do the PRO offer awareness raising, training or consultancy on DfE?
Is the organisation aware of product component/material and financial flow once they have put the product on the market i.e. transferred their EPR to PRO, and or after the product has been classified as waste?
Tick **one or more** of the following statements on how the PRO charges product waste management costs: • According to product weight • According to number of products placed on the market • According to raw material type • According to current product waste management costs • According to anticipated future product waste management costs • According to product dismantlement and recyclability • Extra costs are charged for auxiliary components/materials that have a negative effect on product recyclability

- Extra costs are charged for multilayer materials which are difficult to disassemble and/or recycle
- I do not know

Tick **one or more** of the following statements on possible savings which can reduce waste management costs:

Costs for PROs fee may be reduced (discounts are available) if:

- recycled materials are incorporated into the product/component design
- the product/component is easily dismantled to encourage preparation for reuse and recycling
- the product/component contains less harmful substances (harmful substances are removed/substituted)
- bio-based raw materials are used to produce the product/component
- preparation for reuse and recycling is available locally
- the product/component can circulate within a scheme supporting its multiple usage before it's classified as waste
- the product materials are easily recycled
- the recycled materials have a positive market value
- the company incorporates eco design measures into production
- I do not know

Tick one or more of the following statements on what full cost internalisation for extended producer responsibility currently includes and in the future should include:

- Waste collection
- Waste sorting and preparation for recycling
- Waste treatment/recycling
- Awareness raising campaigns
- Enforcement and monitoring
- R&D investment in DfE (Design for Environment or eco-design)
- Reduced cost according to recycled material value and circulation

ENVIRONMENTAL PRIORITIES

Has the organisation ever prepared an environmental life cycle assessment for any of its products/components or services?

If the organisation is placing packaged goods on the market, which packaging standards from the PWP directive do they apply?
If the organisation is placing EEE goods on the market, which EEE standards from the WEEE directive do they apply?
If yes, do the standards have any influence on innovation within the organisation with reference to DfE?
Which aspects of eco-design on a scale of 1 to 10 are most important to the company, with 1 being most important and 10 least important. The organisation does not need to rate all of the aspects from 1 to 10, and the marks may be repeated for different environmental aspects
- Substitution, removal of hazardous substances from products
- Reducing product weight through more efficient use of raw materials
- Reducing energy consumption in production processes
- Reducing energy consumption through product use stages
- Using recycled materials in products
- Using locally available raw materials
- Efficient/Easy product disassembly at lifecycle end
- Reuse and circulation of product components and/or packaging
- Participation in a product scheme, which supports reuse and preparation for reuse (i.e. pallets, IBC containers, electrical components…)
- Cooperation along the product value chain to ensure material reuse and circulation
- Reducing the product carbon footprint
- Reducing environmental impacts throughout the product lifecycle
- Production of durable (longer life) products/components
- Production of recyclable products
Comments/observations
i.e.: Has the organisation mentioned any services that would help improve innovation and/or make a transition towards a circular economy (and could be provided by business support organisations)?