

MOVECO

THE DANUBE GOES CIRCULAR

Cross-Country Road Map to Accelerate Transition Towards
a Circular Economy in the Danube Region

– Austria, Germany, Slovenia –

Prepared by MOVECO | April 2019



CONTENT

1. Executive Summary.....	1
2. Methodology – Three Stages and Stakeholders of the Circular Economy.....	2
3. Introduction – Circular Economy, Eco Innocation, and Waste Management.....	3
4. Common Measures for Implementing the Transnational Strategy.....	6
5. Austria.....	11
5.1. Providers of Secondary Raw Materials – Waste Management Operators.....	13
5.2. Procurers of Secondary Raw Materials – Producers and Distributors.....	15
5.3. Household and B2B Consumer.....	17
6. Germany.....	19
6.1. Providers of Secondary Raw Materials – Waste Management Operators.....	20
6.2. Procurers of Secondary Raw Materials – Producers and Distributors.....	23
6.3. Household and B2B Consumers.....	25
7. Slovenia.....	27
7.1. Providers of Secondary Raw Materials – Waste Management Operators.....	29
7.2. Procurers of Secondary Raw Materials – Producers and Distributors.....	32
7.3. Household and B2B Consumers.....	35
Imprint.....	37

1. EXECUTIVE SUMMARY

In December 2015, the European Commission launched an ambitious Action Plan to support the transition towards a circular economy. The Action Plan proposed a number of measures, which are currently in different phases of implementation. These measures include an amended waste legislation framework, adopted at EU level at the end of May 2018. A European strategy on plastics was published in the beginning of 2018 and new rules for so-called single use plastics were negotiated at the end of 2018.

During the next two years, each country must implement the new legislation to comply with the requirements of the modified waste directives. Measures from these adopted directives, together with the Directive on single use plastic items, are largely targeted at packaging and will require additional measures for efficient transposition into national legislations.

From a linear to a circular economy

The MOVECO project realized the challenges described above and the pressing needs of fostering the transition from a linear to a circular economy. It understood that circular economy approaches need to be implemented in strategic documents of national and regional public authorities. Responding to these needs, MOVECO developed Cross-Country Road Maps that help to improve policy framework and to promote understanding of circular economy in the Danube region and in its innovation group of Austria, Germany, and Slovenia.

Efficient management of plastic waste presents one of the greatest common challenges within this innovation group, especially with regard to single use plastic packaging, which coincides with the main EU and global environmental issues.

High collection rates of mixed packaging generate materials not desirable for material recovery. Separate collection, extracting materials before they enter household waste streams, keep the material flow cleaner but can be more complicated. Due to inconsistent quality and quantity of recycled plastics, the market for recycled plastics lacks stability for procurers of these materials.

Most of the companies performing plastic recycling are SMEs. The number of plastic recycling installations are higher in Austria and Germany. Both countries also have incineration facilities with heat recovery to treat waste, which may compete for materials with recycling facilities.

A key issue for better recycling is to keep material flows clean, through improved separate collection and prevention of cross contamination. More focus needs to be set on quality, not just on quantity. Waste management targets on product categories

MOVECO helps to improve policy framework and to promote the understanding of circular economy in the Danube region

could capture hidden rare, valuable, and critical materials, instead of material waste streams focused on recycling only high mass, base materials. A stable market for recycled plastics, based on improved quality of collected wastes, needs to be created, connecting and networking the whole value chain to improve design for better waste management. The market needs to be supported with transparent framework conditions for tracking material flows within the production value chain. EPR costs must transparently reflect actual waste management costs per product category, encouraging producers to better understand product waste management implications during product design. Inter alia, cooperation within the Danube region should implement circular economy business models and exchange of good practice. Green public procurement should provide a model encouraging demand of recycled plastic products, while educating consumers, who need to be included in all of these activities, especially with regard to raising awareness and spreading information.

2. METHODOLOGY – THREE STAGES AND STAKEHOLDERS OF THE CIRCULAR ECONOMY

The Cross-Country Road Maps are important deliverables of the MOVECO project. The aim of the Road Maps is to implement "The Danube Goes Circular. Transnational Strategy to Accelerate Transition Towards a Circular Economy in the Danube Region", also developed by MOVECO. For this reason, the Road Maps focus on the three waste streams discussed by the Transnational Strategy (PPW, WEEE, WB&A). The Strategy has also identified three stages of the circular economy, encompassed by competitiveness and innovation. These stages include 1. production and consumption, 2. waste management, and 3. secondary raw materials. Our Road Maps focus on these stages where the „field work“ for waste management and recovery takes place. The Strategy has identified stakeholders who are involved in these stages. These stakeholders include a.) providers of secondary raw materials (waste management operators), b.) procurers of secondary raw materials (producers and distributors), and c.) household and B2B consumers. In order to implement the Strategy, the Road Maps discuss each country along these stakeholders.

The development of the Road Maps was a multi-step process. On a partner meeting of May 2018 in Munich, partners were introduced into the know-how of writing road maps. They agreed to focus on realistic recommendations in order to translate and implement the Transnational Strategy in cross-country contexts. They further decided to include relevant stakeholders in the Road Map preparation and to get their endorsement.

Focus on realistic recommendations

In August 2018, partners responsible for the Strategy and the Road Maps, met for a two-day international staff exchange, in Belgrade.

During the staff exchange, the relationship between the Strategy, the Road Maps, and the prospective Action Plan, and their harmonisation and integration were discussed.

Include relevant stakeholders

Additionally, a matrix of recommended measures and actions that can be applied to the Road Maps were prepared, and a Road Map template was developed. In September, road map leaders had a skype meeting where content structure of the Road Maps and the planned timetable for their development were finalized. In early October 2018, we had a two-day skype training, during which all project partners were introduced to the Road Map template, and the time schedule for road map development between October 2018 and February 2019. The project partners were also instructed on how to translate measures and actions from the Strategy into the Road Maps. In addition, each innovation group had trilateral (online) meetings and discussions during the development its own Road Map. Further, cross-country workshops and stakeholder forums to receive feedbacks from stakeholders have been arranged.

MOVECO identified three innovation groups, namely innovation leaders, moderate innovators and modest innovators. Innovation leaders include Austria, Germany, and Slovenia. These countries are discussed in this Cross-Country Road Map. Moderate innovators are Croatia, Hungary and Slovakia, while Bulgaria, Romania, and Serbia are modest innovators. These three innovation groups were established by MOVECO using the European Union's (eco)-innovation scoreboards and index¹.

Readers interested in the other six countries are referred to Cross-Country Road Maps of the other two innovation groups.

3. INTRODUCTION – CIRCULAR ECONOMY, ECO INNOVATION, AND WASTE MANAGEMENT

Municipal waste makes less than 10% of the total waste generated in the EU. Due to its complex nature, resulting from the mixture of different waste streams, a wide range of materials and levels of cross contamination, municipal waste presents an exceptional challenge to our current society with regards to a more efficient use of resources.

Due to the “take, make and throw away” linear economic model, an alarming rate of resources in waste is still lost to landfills, incineration and inefficient recovery. Retaining the value of materials, hidden in waste, especially municipal waste, within the economy for as long as possible is the main rationale behind the idea of a circular economy. The perception of raw materials is widening, adding new definitions and characteristics to the existing known technical

Valuable resources in wastes are lost

¹For more information see MOVECO's report „Extended Producer Responsibility Schemes and their Influence on Innovation in the TransDanube Region. Executive Summary.” December 2017. Deliverable D.3.1.3, prepared by Antonija Božič Cerar.

attributes of individual materials. A list of critical materials, which could hamper industrial production and development, due to Europe's dependency on their imports from regions outside the European Union, has been compiled at EU level.

Materials are not only being ranked according to their possible detrimental effects on human health and the environment, but also on their suitability for recovery operations and recycling. High-level recycling is particularly relevant for retaining critical raw materials contained in WEEE waste streams within the economy. Volume-based targets may inadvertently encourage the uptake of low-quality recycling, or downcycling of e.g. contaminated mixed household waste, if not complemented by additional legislation. While the goal of the circular economy transition is to maximise the 'value' of materials retained within the economy, efforts toward achievement of current targets may lead to investments in processing high volumes of waste, but with low value.

“Your trash is my treasure” – Waste should be perceived as a valuable resource

Since the adoption of the Circular Economy Action Plan by the European Commission in December 2015, a number of measures from the Action Plan have been set into motion. The report from the European Commission on the implementation of the Circular economy Action Plan in March 2019, recognises that circularity has opened up new business opportunities, given rise to new business models

and developed new markets. In 2016, circular activities such as repair, reuse and recycling generated almost € 147 billion in value added while standing for around € 17.5 billion worth in investments. Waste should be perceived as a valuable resource. Currently, recycled materials on average only meet less than 12% of EU demand for materials.

Efficient waste management systems are an essential building block of a circular economy. In July 2018, a revised waste legislative framework entered into force to modernise waste management systems in the Union and to consolidate the European model as the most effective in the world. The framework defines new ambitious recycling rates, simplification and harmonisation of definitions, reinforced rules and new obligations for separate collection, strengthened waste prevention and waste management measures and minimum requirements for extended producer responsibility.

Extended producer responsibility ascertains producers to be responsible for financial, technical and organisational management of postconsumer waste streams. This strategy is based on the assumption that this responsibility will influence the design of new products in a manner, which will reinforce more effective waste management after the product has been discarded by the consumer.

Implementing recycling measures must be accompanied with measures to increase the use of secondary raw materials

Extended producer responsibility is expected to be expanded to a wide range of consumer goods in the future. The current legislative framework requires implementation obligatory extended producer responsibility measures for packaging and waste packaging, (waste) electrical and electronic equipment, (waste) batteries and accumulators, and end-of-life vehicles. Future waste management will not be orientated only on recycling targets, but will also be

reinforcing waste prevention measures such as durability, reusability, reparability and the presence of critical materials.

Recycling measures will need to be implemented in conjunction with measures to increase the use of secondary raw materials. The interface between chemicals, product and waste legislation needs to be clarified to improve substance traceability and information flows. Access to information about presence and composition of hazardous substances in waste streams is key to improve dismantling and decontamination techniques facilitating better recovery. It is necessary to identify not only hazardous materials, but also valuable materials, especially critical materials which are currently slipping through the cracks, due to focus on bulk secondary materials such as steel, copper and aluminium.

In the beginning of 2018, an EU strategy for Plastics in a Circular Economy was presented as an additional measure in the Action Plan. The strategy sets out a number of objectives with recommended measures for their achievement. One of these objectives is that all plastic packaging placed on the EU market by 2030 is reusable or recyclable. Extended producer responsibility schemes must be altered to facilitate design for recyclability through “eco-modulation” of producers’ fees.

Extended producer responsibility schemes should aim at design for recyclability

New rules on Single Use Plastic items address the ten most found items on EU beaches, which include a number of packaging items such as plastic bottles and their caps, plastic carrying bags, and food and beverage containers. The rules introduce new measures to reduce consumption of food containers and beverage cups made of plastic through specific marking and labelling. From 2030 onwards, 30% of recycled plastic must be incorporated into new plastic bottles, while 90% of plastic bottles will need to be collected separately, and bottle caps will need to stay attached to the bottles during their whole life cycle. Better eco-design requirements will lead to support for eco-innovation.

Circularity will remain a pillar of the Cohesion Policy over the 2021-2027 programming period. The European Commission’s proposal for a new European Regional Development Fund and Cohesion

Fund places the circular economy on the list of priorities in EU's efforts for a greener, smarter Europe, excluding investments in landfills and facilities for the treatment of residual waste.

MOVECO has built bridges between policy makers, R&D organisations, enterprises, and the public for the transition to a circular economy

Experience from our project emphasizes disparities not only between the three determined innovation groups, but also within each individual group. Higher recycling rates are linked to higher waste generation; qualities of recycled materials, especially plastics need to be improved through better separate collection and improved waste management infrastructure.

Potential to exploit these opportunities in the Danube region lies 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.

MOVECO closed loops

The MOVECO project has forged a strong transnational partnership to prepare a transnational strategy for the transition towards the Circular Economy within the Danube region and roadmaps for their implementation in different innovation regions. In doing so, MOVECO worked towards its ambition to close the loop and has built bridges between policy makers, research and development organisations, enterprises, and the public for the transition to a circular economy.

4. COMMON MEASURES FOR IMPLEMENTING THE TRANSNATIONAL STRATEGY

During the next two years, by the end of 2020, each EU member country must implement a new legislation to comply with the requirements of the modified waste directives, adopted at EU level at the end of May 2018. Measures from these adopted directives, together with the so-called

MOVECO has identified possibilities to harmonize requirements for PROs

Directive on single use plastic items, are largely targeted at packaging and will require additional measures for efficient transposition into national legislations. Due to this, we have focused on this waste stream in our cross-country roadmap. The main problems lie in the field of waste plastic packaging, which coincides with the main EU and global environmental issues.

MOVECO has identified possibilities to harmonize requirements for PROs. All three countries, Austria, Germany and Slovenia, have competitive PROs for the three waste streams. Slovenia collects high waste packaging quantity rates, but the quality of this material is lower and the collected mixed packaging is not a material with value, but remains a waste stream not desirable for material recovery. A lot of this material ends up in energy recovery installations. Germany has a deposit system for single use beverage packaging, extracting this packaging waste before it enters the household waste stream, keeping the material flow cleaner. Austria has a packaging system, which provides cleaner material streams from waste, but it is questionable if they will be able to achieve the anticipated 90% collection rate for plastic bottles, set out in the new Directive on single use plastic, which was forged under the recent Austrian EU presidency.

The situation regarding recycling infrastructure is varying. Most of the companies performing plastic recycling are SMEs. There are only a handful of plastic recycling installations in Slovenia, with only one SME recycling plastic bottles, importing input for their recycling process. The number of plastic recycling installations are higher in Austria and Germany. Both countries also have incineration facilities with heat recovery to treat waste, which is not suitable for material recovery. Due to inconsistent quality and quantities of recycled plastics, the market for recycled plastics lacks stability for procurers of these materials, while prices of secondary materials are dictated by the price of oil and suppliers of competitive virgin plastic materials.

4.1. RECOMMENDED MEASURES FOR PROVIDERS OF SECONDARY RAW MATERIALS (WASTE MANAGEMENT OPERATORS)

- Keep the product material streams clean, to keep them circulating as materials, products and/or product components within a circular economy.
- Finance eco-innovative technology in waste management infrastructure.
- Connect and network the whole value chain to improve design for better waste management.
- Establish transparent framework conditions for tracking material flows within the production value chain.
- Enforce transparent and easily understandable guidelines for clearer regulation and uniform implementation of technical quality standards supporting the transition to a circular economy.
- Create a market for recycled plastics, based on improved quality of collected wastes.
- Provide a business environment supporting circular economy measures in SMEs. Educate and raise awareness on circular economy issues at political level so public administration can act as a partner to the business community.

4.2. RECOMMENDED ACTIONS FOR PROVIDERS OF SECONDARY RAW MATERIALS

- Optimise and improve waste collection to keep material streams uncontaminated and increase their value.
- Focus on quality, not just quantity. Waste management targets on product categories, to capture hidden rare, valuable and critical materials, instead of material waste streams focused on recycling only high mass, base materials.
- Support R&Ds' research on improving of recycled material quality and increasing the added value of recycling.
- Support reuse and preparation for reuse, where the product does not yet fulfil the definition for waste.
- EPR costs must transparently reflect actual waste management costs per product category, encouraging producers to better understand product waste management implications during product design.
- Incorporate digitalisation to provide waste operators access to information on waste configuration, dismantlement, especially for WEEE and content of hazardous as well as valuable materials and how to retrieve them.
- R&D of new materials and material combinations in products must include a game plan for future waste management.
- Improve cooperation among member states regarding interpretation of legislation, i.e. definitions and understanding of waste, by-products and end-of-waste, exchange of good practice.
- Green public procurement should serve as an example, encouraging demand of recycled plastic products.
- Provide an information and support network for SMEs through existing business support organisations. Help SMEs with optimisation and improvement of existing recycling and waste management processes through increased innovation management in this sector.
- Apply fiscal measures such as tax relief, green tax reform to support the circular economy in the business community.
- Reduce exports of recyclable waste materials to non-EU countries.

4.3. RECOMMENDED MEASURES FOR PRODUCERS OF SECONDARY RAW MATERIALS (PRODUCERS AND DISTRIBUTORS)

- Connect and network the whole value chain to improve design for better material and component circulation.
- Establish transparent framework conditions for tracking material flows within the production

value chain, from production of new products and their components onwards.

- Enforce transparent and easily understandable guidelines for clearer regulation and uniform implementation of technical quality standards supporting the circular economy.
- Create a stable quality and quantity supply of recycled plastics to the market.
- Provide a business environment supporting circular economy measures in SMEs.
- Educate and raise awareness on circular economy issues in public administration, so public administration can act as a partner to the business community.

4.4. RECOMMENDED ACTIONS FOR PRODUCERS OF SECONDARY RAW MATERIALS

- Promote inter alia cooperation within the Danube region to
 - Transfer and (re)use products, which do not yet need to be discarded as waste; recycled secondary materials;
 - Transfer end-of-waste streams for which EU and national guidelines have been adopted;
 - Produce by-products complying with industrial symbiosis requirements to substitute the usage of new raw materials with materials already in the economic material cycle. This should be done through the MOVECO platform (www.danube-goes-circular.eu) and in cooperation with other platform providers.
- Support R&Ds' researching the improvement of recycled material quality increasing the added value of recycled materials.
- R&D of new materials and material combinations in products must include a game plan for future waste management.
- Green public procurement should provide a model encouraging demand of recycled plastic products.
- Statutory requirements for minimum quotas of recycled materials in new products, where this does not endanger human and environmental health and safety.
- Provide information and support networks for SMEs, through business support organisations to:
 - Make information on environmental legislative demands, stemming from extended producer responsibility in different countries more accessible to SMEs, wishing to expand markets. Organise "Circular hot spots", offering SMEs all needed information to expand on foreign markets, changing business strategies (going circular), finding investors or appropriate funding on national or EU level, to raise their circular business performance, finding 'circular' business partner, etc.

- Help SMEs to integrate circular economy principles into company innovation management systems.
- Reward innovation supporting circular economy initiatives
- Apply fiscal measures such as tax relief, green tax reform to support the circular economy in the business community.

4.5. RECOMMENDED MEASURES FOR CONSUMERS AND HOUSEHOLDS

- Keep product value chains clean to increase quality and quantity of recycling.
- Promote transition from waste to resource management among consumers and the wider society, through consume incentives.
- Educate and raise awareness to promote importance of circular economy principles among the general public.
- Promote circular business models extending life of products, through “access instead of ownership”, reuse and preparation for reuse.

4.6. RECOMMENDED ACTIONS FOR CONSUMERS AND HOUSEHOLDS

- Producers and retailers should provide more accessible information to consumers about product design in order to be able to repair or upgrade products.
- Improve waste collection to keep material streams uncontaminated and increase their value, by stimulating consumers via Pay-As-You-Throw (PAYT) or deposit systems. Stimulate consumers to be more proactive in separate waste collection.
- Support reuse and preparation for reuse, where the product does not yet fulfil the definition for waste.
- Determine, implement or prepare quality standards for reuse.
- Determine, implement or prepare technical guidelines repair and maintenance.
- Green public procurement should provide a model encouraging demand of recycled plastic products.
- Include circular economy concepts in nationwide campaigns for the general public and education at all education levels.
- Apply fiscal measures such as lower VAT for “green/circular” products with verified product credentials regarding circular economy and environmental claims.

5. AUSTRIA

REGULATORY AND POLICY FRAMEWORK

The Waste Management Act 2002 (AWG) is the legal basis for waste management in Austria.

The Ordinance on the Avoidance and Utilization of Packaging Waste (Packaging Ordinance) establishes a redemption obligation for sales, packaging and transport packaging. There is an obligation to either reuse or recycle the returned packaging. In order to fulfil the withdrawal and exploitation obligations, packers and distributors (all trading levels) can use a third party (comprehensive collection and recycling system).

The ‚AWG‘ Law Amendment Packaging 2013 has laid the foundations for the establishment of fair competition in the waste management of household packaging, while maintaining the existing quality of separate collection and recycling as well as the extensive implementation of producer responsibility.

In 2005, the Ordinance on the Prevention of Waste, Collection and Treatment of Waste Electrical and Electronic Equipment (EAG-VO) has transposed EU law and guaranteed the free return of electrical appliances from private households at collection points.

The battery regulation governs the collection and utilization of all used batteries. The Ordinance on the Prevention of Waste, Collection and Treatment of Waste Batteries and Accumulators was published in 2008 and updated with the Batteries VO Nouvelle 2015. The Battery Ordinance regulates the requirements for the collection or reuse of the different types of batteries.

DATA

Table 1 shows data on households and electrical and electronic equipment waste.

Table 1 Federal waste collection for selected waste groups, 2015:

Waste category	Quantity (tonnes)	Proportion (%)
Wastes from households and similar establishments	3 728 000	6.4
Electrical and electronic equipment	71 000	0.1

Source: Austrian Federal Environment Agency

Table 2 shows data on packaging waste in 2015.

Table 2 Volume of packaging waste, 2015 (tons)

Paper, paperboard, cardboard	553 267
Glass	274 485
Metal	56 840
Plastic	294 888
Wood	89 352
Other	42 414
Total	1 311 246

Source: Federal Waste Management Plan 2017.²

WEEE is collected through collection centres for recoverables or sometimes through municipal bulky waste collection, through stationary and mobile municipal problematic substance collection centres and by specialist retailers and disposal companies. Regarding WEEE from private households, a free-of-charge take-back option exists.

In 2015, approximately 80 246 tonnes of WEEE were collected by registered collection points. Table 3 shows the proportions for the individual equipment categories.

Table 3 Quantities of WEEE collected in 2015

Equipment category	Amount (tonnes)	Ratio (%)
Large Equipment	20.283	25
Refrigerators and freezers	12.773	15
Visual display units (VDUs) incl. Cathode-ray tube equipment	15.295	20
Small electrical Equipment	30.978	39
Lamps	917	1
Total	80.246	100

Source: See Table 2.

Waste portable batteries are collected through stationary and mobile municipal problematic substance collection centres as well as through trade and industry by means of separate collection boxes. As regards the final consumer of waste portable batteries, a free-of-charge take-back option exists. Industrial and automotive batteries are collected through the vehicle trade or automotive workshops, as well as through disposal companies, and sometimes through

² Federal Waste Management Plan 2017. Part 1 und 2. Federal Ministry for Sustainability and Tourism. Vienna, December 2017. <https://www.bmnt.gv.at/umwelt/abfall-ressourcen/bundes-abfallwirtschaftsplan/BAWP2017-Final.html>; accessed 3 January 2019.

municipal collection points for recoverables. Furthermore, a free-of charge take-back option exists for the final consumers of automotive batteries.

5.1. PROVIDERS OF SECONDARY RAW MATERIALS – WASTE MANAGEMENT OPERATORS

CHALLENGES

The recycling or recovery rates specified in Table 4 relate to the packaging volume. Here, net packaging masses are considered that are materially or energetically recovered. On top of the thermal recovery of packaging that is collected separately, energetic recovery also accounts for the incineration of packaging (that were not collected separately) in the residual waste in incineration plants featuring energy recuperation.

Table 4 Recycling and recovery of packaging waste in Austria 2015 (%).

		Recovery
Paper, paperboard, cardboard	84,9	97,7
Glass	85,6	89,5
Metal	87,2	87,2
Plastic	33,6	100
Wood	18,1	100
Other	25,9	100

Source: See Table 2.

There are currently around 40 plants available for the initial treatment of WEEE. Table 5 shows recovery, reuse and recycling rates of WEEE.

Table 5 Recovery, reuse, and recycling rates of WEEE in 2015 (as ratio of collected quantity)

Equipment category	Recovery rate (%)	Reuse and recycling rate (%)
Large household appliances	91	86
Small household appliances	93	74
IT- und T equipment	93	77
Home electronics	93	81
Lighting equipment	93	74
Gas discharge lamps	95	94
Tools	92	75
Toys, leisure and sports equipment	93	4
Medical devices	91	74
Surveillance and recording equipment	93	75
Dispensers	91	89

Source: See Table 2.

A portion of the (potential) volume of WEEE is not collected via registered collection points. This may be due to the following reasons. First, WEEE is supplied to the Austrian waste management industry via other collection channels as registered collection points. WEEE is collected

A portion of the (potential) volume of WEEE is not collected via registered

together with scrap iron at bulky waste collection points, for example. The average proportion of WEEE in mixed municipal waste is only around 1%. Second, WEEE is frequently not handed over for collection immediately at the end-of-use, but is instead stored.

Third, working equipment (e.g. visual display units) are exported abroad and reused there. Finally, WEEE is shipped illegally to neighbouring countries through organised collections directly from households.

WB&A is sorted in one plant only. In one plant, WB&A is disassembled beforehand. The sorted portable batteries are shipped from Austria for further treatment. In one further plant, lead storage cells are opened up mechanically, plastic components and acid are separated and the lead-containing components are moved directly to the associated secondary lead works for reclamation. In 2015, the average recycling efficiencies regarding portable batteries and accumulators exceeded 80% in all three categories of portable batteries (lead-acid, nickel-cadmium, other).

RECOMMENDED MEASURES

In accordance with Waste Management Act 2002, the federal measures intended to fulfil the various provisions derived from the objectives and principles of the Act shall be outlined in the Federal Waste Management Plan. This relates to provisions for:

- reduction in volume, pollutant content, and adverse environmental and health impact of waste
- promotion of preparatory activities for reuse, recycling, and other waste recovery methods
- environmentally-friendly and economically purposeful recovery of waste
- disposal of unavoidable or non-recoverable waste
- shipment of waste either to or from Austria for recovery or disposal

RECOMMENDED ACTIONS

The various options and means that are available to fulfil the provisions are as follows:

- logistical and organisational measures and the preparation and creation of the necessary technical basis
- publicity and provision of information, along with advice and training
- the public sector acting as a role model
- international cooperation (especially within the EU)
- market-based instruments and financial incentives
- voluntary agreements

5.2. PROCURERS OF SECONDARY RAW MATERIALS – PRODUCERS AND DISTRIBUTORS

CHALLENGES

Companies do not implement circular economy measures

The most relevant obstacle that prevents companies from taking measures to optimize resources, first and foremost are the investment costs to be spent on circular economy measures. The second one is the amortization period for circular economy measures, which is also used in the investment calculation. A lack of human resources is the third priority. Companies also do not implement circular economy measures because of lack of know-how or lack of advice.

RECOMMENDED MEASURES

Successful implementation of circular economy also requires that a company with its employees stands behind the idea of such projects.

- The involvement of the employees in the projects is essential.

In addition, employees have a lot of potential to identify improvements in the production process.

- Employee training on the topic of circular economy can make a further contribution to this by giving employees new perspectives and sensitizing them to the topic.

RECOMMENDED ACTIONS

In product development and design lays the biggest leverage for resource saving, as this step is at the beginning of the product life cycle. Decisions made at this stage affect all other phases - procurement, manufacturing, use and recycling.

- In the design phase, all these phases (procurement, manufacturing, use and recycling) have to be reflected.

Product design requires a high level of creativity and a vision, especially with regard to the use and possible further use or reuse of a product.

- This preparation should be used and appreciated.

It also pays off to develop new production methods or to substitute critical or expensive raw materials. In particular, renewable raw materials (e.g. wood) have great potential to replace classic materials (e.g. steel, concrete).

- By means of computational methods, precise models can also be developed that show which loads individual components are subjected to, in order to dimension them in a targeted manner while at the same time eliminating excess material.

Life Cycle Costing (LCC) is a cost management method that considers the development of a product from the product idea to the withdrawal from the market (product life cycle), i.e. from the "cradle to the grave". Only the negative payment flows (expenditures) are of interest, the revenues are neglected. Positive aspects of the process are the consideration of the lifecycle, the possibility to identify trade-offs, and the combinability with LCA methods.

- Life Cycle Costing should be used.

Total Cost of Ownership (TCO) is essential to calculate all the costs of investment. TCO produces a bill that contains not only the cost of the purchase but also all aspects of the subsequent use (energy costs, repair and maintenance) of the relevant components. TCO is therefore a design aspect during the product development phase and helps to understand and influence the reasons for the decision of the customer.

- Thus, known cost drivers or hidden costs may be identified in advance of an investment decision.

Although it was common practice to outsource productions a few years ago, a rethinking process is currently taking place. With regard to the multiplicity of production processes that companies have optimized and developed over many years, it can be said that every single company, even within a single industry, is unique.

- Therefore, measures for increasing circular economy must be "tailor-made" for each company.
- In order to substantially increase circular economy, it will be even more necessary to produce secondary raw materials of the appropriate quality for production.

5.3. HOUSEHOLD AND B2B CONSUMER

CHALLENGES

Important impact of private households

Consumers shall determine which needs have to be satisfied and to what extent. They choose the products and decide which products shall succeed on the market. As a result, households have an important influence on the environmental effects of the entire life cycle as well as on the efficiency and sufficiency of the Austrian national economy. Awareness of this must be reinforced.

RECOMMENDED MEASURES

- Measures are designed to disseminate knowledge to households concerning opportunities for waste prevention, repair and reuse and to strengthen the motivation to utilise existing waste prevention potentials and to cover their needs through more resource-conserving consumption.
- In the medium term, the quantity of waste generated by households, in particular the volume of PPW, should rise at a slower rate than population and disposable income.
- An increase in the amount of information provided through waste disposal consultancy for establishing sustainable purchasing and usage behaviour.
- Information campaigns on waste prevention opportunities, in particular through consumer behaviour which is geared to quality of life.

- Waste disposal consultancy training in the packaging sector through the packaging coordination centre; promoting the issue of waste prevention.
- The further development and implementation of enhanced information and motivational campaigns, including for migrants.
- A review of the use of social media, including with respect to timely responses in the case of false reports.
- The promotion of repair options (e.g. repair networks, repair cafés), including corresponding information provision.
- Raising awareness of the issue of reusable drinks packaging at consumer level, or through a reuse initiative on the part of trade.
- Raising awareness of waste prevention, in particular regarding disposable carrier bags and coffee capsules.
- An awareness-raising campaign concerning the fact that the delivery of unsolicited postal mails can be avoided by affixing corresponding stickers to the postbox.
- Raising awareness for and consider eco-labelling when making purchasing or service related decisions.
- Extension or updating of the guidelines concerning the awarding of the Austrian Ecolabel.
- Exchanging information in the context of stakeholder platforms concerning waste prevention.

RECOMMENDED ACTIONS

- The population is to be informed continuously of the waste prevention opportunities.
- It is necessary to promote awareness of sustainable consumer behaviour and waste management concerns.
- A key measure of waste prevention programme's public relations work is the activity organised across Austria by the municipal environmental and waste consultants who will exert their influence in public bodies such as schools and kindergartens as well as in small and medium-sized enterprises.
- A greater incentive is required to actually implement sustainable, needs-oriented consumption, inter alia, through direct contact with the waste consultants.
- Information and motivational campaigns must be tailored to the different target groups.
- Measures for raising awareness for the advantages of reusable packaging (beverages) to promote the enhanced use of reusable packaging.

6. GERMANY

REGULATORY AND POLICY FRAMEWORK

The Act to Promote Circular Economy and Safeguard the Environmentally Compatible Management of Waste is the most important Act in regards to waste management and circular economy.

The respective law on WEEE is called in short “ElektroG”, and the last revision was in 2015.³ There are two supplementary ordinances for the fee structure and for the restriction of hazardous substances in EEE.⁴ The respective law for B&A was last revised in 2015⁵. The respective law for PPW replaced the former ordinance on the 1st of January 2019. This new packaging law has a couple of renewals, which should support the transition to a circular economy. For instance, the duty of dual systems regarding awareness raising of end consumers is strengthened and this duty needs to be monitored by authority. Another example is the “Ecological Structure of the Participation Payment” which states that the dual systems are obligated to design their license fee structure in a way that companies benefit when putting a packaging on the market that is either made from recycle or renewable sources or which can be recycled to a very high percentage under the current sorting and recovery practices.

In Germany, a combined usage of EPR and DRS exist. The DRS of plastic beverage bottles are separated from the EPR system. This deposit refund system for single-use beverage containers is defined in the packaging law.

DATA⁶

As to PPW, the quantity of waste packaging produced increased to 18.2 million tons in 2016 from 13.6 million tons in 1996. Since 2005, the German target in the compulsory-deposit beverage segments (beer, water) is that at least 80% is packed in multiple-usable packages or in ecologically

³ BMU (2015): ElektroG. Elektro- und Elektronikgerätegesetz. <https://www.bmu.de/themen/wasser-abfall-boden/abfallwirtschaft/abfallpolitik/elektrog/>; last access 17 December 2018.

⁴ BMU (2015): Elektro- und Elektronik-Altgeräte: <https://www.bmu.de/themen/wasser-abfall-boden/abfallwirtschaft/abfallarten-abfallstroeme/elektro-und-elektronik-altgeraete/>; last access 17 December 2018.

⁵ Bundesministerium der Justiz und für Verbraucherschutz (2009): Gesetz über das Inverkehrbringen, die Rücknahme und die umweltverträgliche Entsorgung von Batterien und Akkumulatoren, <http://www.gesetze-im-internet.de/battg/index.html>; last access 17 December 2018.

⁶ Federal Environmental Agency BMU (2018): Verpackungsabfälle. <https://www.umweltbundesamt.de/daten/ressourcen-abfall/verwertungentsorgung-ausgewaehliter-abfallarten/verpackungsabfaelle#textpart-1> UBA (2018): Altbatterien. <https://www.umweltbundesamt.de/daten/ressourcen-abfall/verwertung-entsorgungausgewaehliter-abfallarten/altbatterien#textpart-1> UBA (2017): Elektronikgeräte in Deutschland. <https://www.umweltbundesamt.de/themen/abfallressourcen/produktverantwortung-in-der-abfallwirtschaft/elektroaltgeraete#textpart-1> BMU (2018): Elektro- und Elektronikaltgeräte. <https://www.umweltbundesamt.de/daten/ressourcenabfall/verwertung-entsorgung-ausgewaehliter-abfallarten/elektro-elektronikaltgeraete>; Alle abgerufen am 17. Dezember 2018.

advantageous one-way drinks packaging (like beverage carton). In 2016, only 44.2% was reached. The recycling rate of the waste generated in 2016 was 70.7%, in total 97.2% was recovered. Also in 2016, material recovery for various packaging categories were achieved in the following rates: glass – 85.5%, plastic – 49.7%, paper/carton – 88.73%, aluminium – 87.9%, steel – 92.1%, wood – 25.9%.

As to WA&B, 25% of the portable batteries were accumulators or rechargeable batteries (11 167 t) in 2015. The collected amount of waste batteries increased between 2016 (20 524 t) and 2017 by 513 tons. At the same time, the amount of portable batteries placed on the market slightly increased. Therefore, the collection rate decreased from 46.2% to 45.1%. 224 460 tons of waste batteries were treated in special recycling plants in 2016. Thus, 187 952 tons of secondary raw materials could be recovered.

As to WEEE 722 000 tons of electronic devices were collected in 2015, 623 000 tons (86.3%) from private households. The remaining amount (13.7%) derived from the commercial sector. Between 2006 and 2016, the municipal collection sites, producers and traders collected on average 8 kg of WEEE from private households per inhabitant and year.

HIERARCHY OF WASTE STREAMS

The hierarchy of the three waste streams can be defined by quantity or by importance of materials in the products. The hierarchy based on waste quantities is 1. PPW, 2. WEEE, 3. WB&A. Nevertheless, the issue of critical raw materials found in WEEE and WB&A is of very high concern, therefore, WEEE and PPW are of similar importance within this Road Map.

6.1. PROVIDERS OF SECONDARY RAW MATERIALS – WASTE MANAGEMENT OPERATORS

CHALLENGES

Sales market is missing for recycled materials for all waste streams, but especially in case of plastics. This concerns both recyclates for WEEE as well as packaging in the food and beverage

Waste operators lack information on product recyclability and material composition

sector. The current laws on PPW, WEEE and WB&A only require quantitative recycling targets while qualitative recycling targets are missing. 80% of all environmental impacts of a product during its lifecycle originate in its design phase. On one hand, product designers often lack information about the recyclability of products and materials. On the other hand, information for the waste

operators is missing regarding the materials built in a product and information about how to recycle them. For this reason, waste operators are depending on the product design.

Regarding PPW, many packaging materials are recyclable in theory. However, if recycling is not economically feasible, e.g. in the case of the bioplastic PLA (because of a lack of sufficient quantities for PLA), the material is not recycled in real. Besides lack of sufficient quantities, as this is the case for PLA, also consumer awareness is crucial for the acceptance of recycled materials in packaging. The design of packaging in the food sector is getting more complex, which makes it difficult to recycle. For example, active and intelligent packaging systems provide extended functionality but they cause challenges in sorting and recycling that results in impaired recycling yields and decreased quality of recycle. The prices of secondary materials are often almost as high as of primary materials. In fact, the market of secondary raw materials for plastics highly depends on the oil price and, currently, the low oil price does not support the usage of recycled materials. Challenge for medium-size waste operators in the packaging sector is the access to financial resources for investments in modern technologies, as the operators mainly have maximum two-year contracts with the dual schemes and therefore a lack of financial security. High recycling quality is not supported by EPR schemes. Leaving the EPR system to the free market always results in low recycling quality. Only in the case of the DRS, high quality of secondary raw materials (mainly for PET bottles) can be assured.

Improve financial security

As to WEEE, products and packaging are not designed for recycling. For this reason, it is very difficult and cost intensive to generate secondary raw materials with high quality. Qualitative recycling targets are missing in the current laws on WEEE. Important raw materials, like critical raw materials, are not addressed. The whole discussion about recycling rates needs to be differentiated, otherwise it is "playing with numbers without any positive impact"

As defined in the waste hierarchy, WB&A is of minor importance in Germany. Therefore, no specific challenges are listed here.

RECOMMENDED MEASURES

- Keep product value chain clean to increase quality and quantity of recycling by establishing support to enable better collection of waste. This measure is relevant for all waste streams.
- Promote financial resources for investing in waste management eco-innovative technology and waste management infrastructure.
- Connecting and networking the whole value chain to improve design for better waste management.
- Enable transparent framework conditions for tracking material flows inside production value

chain and encourage all involved stakeholders to collaborate.

- Create a market for recycled plastic materials.
- Enable information support for SMEs and other businesses.
- Law must support quality-based recycling.
- Test series for specific products and materials to evaluate actual recyclability and effects on secondary products.
- Development of awareness, information and communication between the disposal industry and packaging industry and R&D organisations.
- Matching of packaging development to recycling requirements.
- Marketing for the use of recyclable packaging.
- Taking recyclability into account when calculating the license fee for dual systems.
- EPR: Switzerland regulates the price by law and is therefore able to provide high-quality recycling and invest in research. In Germany, innovative recycling technologies, like decontamination of halogenated plastics, exist, but are not able to be implemented on an economic scale, as the price would be too high.

RECOMMENDED ACTIONS

- Focus on collection of product categories instead of material waste streams. Current goals focus on mainstream materials with higher mass flows, neglecting components and materials in small quantities (rare metals).
- Promote cooperation between regions in the Danube region to transfer waste of rarer product streams to the most efficient recycling facilities.
- Focus on optimising the recycling of entire products to extract critical raw materials and rare earth materials, currently lost with recycled base metal.
- Make a plan of investments in eco-innovative technology in waste management, also through EU funds and programmes.
- Optimisation and improvement of existing recycling process through introduction of innovation management targeting the recycling and waste management sector.
- Exchange good practices of organisation of transparent EPR schemes and establishing of clearing house using advantages of digitalisation with publishing on (trans)national (e.g. MOVECO project platform) or EU organised on-line platforms.
- Making the national legislation publicly available also in international and most commonly used language (English).
- Research and development of new materials and material combinations in products must

include a game plan for future waste management.

- Implement European Commissions' specific decision-making methodology to support the decisions on the recyclability of waste containing substances of concern.
- Implement European Commissions' guidance document on waste classification to have a common approach to hazardous waste and chemicals characterisation and classification.
- Improving the quantity and quality of recycled plastics, decreasing fluctuation in quality and quantity.
- Better waste management from collection onwards providing "cleaner" waste streams introduced into the recycling process.
- Reduce exports to non-EU countries.
- Companies are required to submit a disposal concept for their products to the authorities.
- BSOs support exchange between producers and recycling companies.

6.2. PROCURERS OF SECONDARY RAW MATERIALS – PRODUCERS AND DISTRIBUTORS

CHALLENGES

In product design, usage of secondary raw materials is of low importance

Producing companies are potential procurers of secondary raw materials in each of the three waste streams. However, when designing productions, the usage of secondary raw materials is of low importance.

When designing products, the main requirements still concern price, safety, handling, quality and space for product information, while price is considered as most important. In addition, the reduced and unknown quality of post-consumer waste, collected as household, municipal waste – compared to virgin material –, is often an obstacle for companies to use it.

As to PPW, another important aspect is the safety regulation for food packaging, especially when recycled materials are in contact with food. They must conform to food contact requirements which can be costly to verify and difficult to achieve. It also depends on the material, recycled glass or cans are not a problem. It is already common to have beverage bottles containing recycled PET. Solutions like multilayer packaging with a virgin inner layer were developed, but are not widely applied. However, experts hold that the usage of recycled materials in non-food products should be focused and promoted.

RECOMMENDED MEASURES

- Promote financial resources for investing in waste management eco-innovative technology and waste management infrastructure.
- Enable transparent framework conditions for tracking material flows inside production value chain and encourage all involved stakeholders to collaborate.
- Create a market for recycled plastic materials.
- Enable information support for SMEs and other businesses.
- Enable clearer regulation.
- Educate and raise awareness in public administration and business community.
- Political leaders need to support an increased use of secondary materials by law instead of defining collection and recycling rates of waste, as this does not guaranty the replacement of virgin material.
- Design for environment can be implemented by laws and legal frameworks or on a voluntary basis, e.g. by voluntary certification schemes like the EPEAT standard in the IT sector which demands 25% of recycled plastics. This standard was supported by the US government. Governments can support design for environment in their public procurement requirements.
- Laws need to support high-grade application of recycled materials for example by tax reductions or reduced EoL costs.

RECOMMENDED ACTIONS

- Support R&D organisations developing eco-innovative technologies (production processes), new recyclable materials and improving the quality of recycled materials for products with higher added value and circular economy business models within the Danube region.
- Foster transparency and traceability of hazardous materials in waste streams (e.g. legacy substances) and substances of concern.
- Investigate and expand the use of European Commissions' feasibility study on the use of different information systems, innovative tracing technologies and strategies to share information on presence of substances of concern between producers and those who handle waste and prepare it for recovery.
- Foster transparency and traceability of critical but economically valuable materials for EU economy.
- Cutting the loss of valuable critical materials leaving the Danube region with better monitoring and control of exports to non-EU countries from the region.
- Cutting the loss of valuable critical materials leaving the Danube region by additional custom codes being implemented to ease controls at ports aiming to better distinguish used EEE from

WEEE.

- Setting statutory (legislative) targets or quotas for minimum recycled material content in new products. This requires introduction of substitution quota instead of recycling quota.
- Organise “Circular hot spots”, offering SMEs all needed information to expand on foreign markets, for changing business strategies (going circular), for finding investors or appropriate funding on national or EU level, to raise their circular business performance, and for finding ‘circular’ business partner, etc.
- Recognise, implement or prepare material and application specific end-of waste criteria to remove barriers for the free flow of secondary raw materials that are safe and good quality.
- Recognise, implement or prepare quality standards for recycled materials at national and transnational level.
- Recognise, implement or prepare technical guidelines on quality standards, standardised on EU level.
- Educate and create a basecamp of knowledge facilitators inside business support organisations (BSOs) to establish a level playing field and boost competitiveness of all Danube region countries.

6.3. HOUSEHOLD AND B2B CONSUMERS

CHALLENGES

The lack of awareness regarding the benefits of separate waste collection and recycling is prevalent in all the three waste streams. The challenges also include increasing volumes of the targeted waste streams, and the lack of knowledge of how to separate individual materials and where to deliver them. New products are of increasing complexity, with not enough information on how the consumer should manage the waste. Motivation of consumers to change their habits is also lacking.

Lack of awareness regarding the benefits of separate waste collection and recycling

WEEE and WB&A lack deposit-refund systems. Nevertheless, in the case of glass and plastic bottles, the systems work well in Germany and could therefore be a good example for other sectors or product groups.

As to WEEE, some products are designed in a way that it is difficult or not possible to repair them (e.g. mobile phones with non-replaceable batteries). There is no information or difficult to access it on how to repair products. Consumers also lack awareness regarding the possibilities of leasing, renting, repairing, sharing, etc.

RECOMMENDED MEASURES

- Keep product value chain clean to increase quality and quantity of recycling by establishing support to enable better collection of waste.
- Create a market for recycled plastic materials.
- Enable information support for SMEs and other businesses.
- Promote importance of shifting from waste to resource management among consumers and wider society.
- Educate and raise awareness in public administration and business community.
- Establish circular business model promoting reuse and refurbishment.
- Enable clearer regulation.
- Promote importance of circular economy principles among consumers.
- Laws and other initiatives against so-called planned obsolescence.
- Companies should provide information for consumers on the product design in order to be able to repair or upgrade products.

RECOMMENDED ACTIONS

- Increase separate collection and deposit schemes to ensure higher collection rates. Main focus must be on deposit schemes for WEEE and WB&A, since deposit scheme for beverage containers works well in Germany.
- Using green public sector procurement (GPP) to create demand for recycled content in plastic products by creating the circular criteria (% of mandatory recycled content in products procured in public sector). This may include printers, waste containers or bags, office supplies (e.g. text markers).
- Make assessment of enabling fiscal measures, including tax relief, green tax reform, lower VAT for “green/circular” products with exact criteria and classification developed regarding what “green/circular” products are.
- Organise national-wide campaigns (including schools) on importance of quality separate collection of household waste (also hazardous waste from household wastes) in order that less contaminated waste is prepared for recycling.
- Supporting new business models, like access instead of ownership, leasing systems for EEE (household appliances, printers).
- Organise training for public servants and future circular economy trainers, and training SMEs regarding circular economy thinking.
- Promote reuse by establishing deposit system for multiple uses, sharing economy models or access instead of ownership, especially in case of EEE (household appliances, printers, etc.).

- Prepare statutory targets for reuse.
- Exchange of good practices of deposit systems organisation taking advantages of digitalisation with publishing on (trans-) national or EU organised on-line platforms.
- Recognise, implement, or prepare quality standards for reuse.
- Recognise, implement, or prepare technical guidelines repair and maintenance.
- Organise national-wide campaigns (including schools) on importance of waste prevention, litter reduction, promoting reuse, repair, refurbishment

7. SLOVENIA

REGULATORY AND POLICY FRAMEWORK

Slovenia has an umbrella environmental protection act (ZVO-1).⁷ The environmental protection act serves as a framework, postulating the basic legislative demands and obligations relevant for the environment. Detailed obligations are determined in specific decrees. General rules and requirements set in the waste frameworks directive are stipulated in the decree on waste published in Official Journal of Republic of Slovenia.⁸ The decree applies to all waste, unless is otherwise specified by specific decrees for a particular type or stream.

In parallel to EU legislation, which has specific directives pertaining to packaging and packaging waste (PPW), waste electronic and electrical equipment (WEEE), and waste batteries and accumulators (WB&A), Slovenia has separate decrees targeting these waste streams. However, due to the stockpiling of collected waste packaging at collection sites provided by municipal services, a special Intervention Act was published in the Official Journal⁹ targeting management of municipal waste packaging and the waste graveyard candles. The Act will be in force until the end of 2019 and requires special measures to manage municipal waste packaging and the spent graveyard candles, which was not managed properly in accordance with the relevant existing packaging and waste packaging legislation and legislation for spent graveyard candles.

The specific decrees targeting the chosen waste streams are the decrees on management of packaging and waste packaging, on waste electrical and electronic equipment, and on management of batteries and accumulators and waste batteries and accumulators.¹⁰ These

⁷ Official Journal no. 41/2004, 20/2006, 49/2006, 70/2008, 108/2009, 48/2012, 57/2012, 92/2013, 38/2014, 37/2015, 56/2015, 102/2015, 30/2016, 42/2016

⁸ No. 37/2015, 69/2015.

⁹ No. 84/2018.

¹⁰ Official Journal no. 84/2006, 106/2006, 110/2007, 67/2011, 68/2011, 57/2015, 103/2015, 2/2016, 35/2017; Official Journal no. 55/2015, 47/2016; Official Journal no. 3/2010, 64/2012, 93/2013, 103/2015. The first two decrees

decrees are supplemented by two taxation decrees on environmental tax for pollution from waste packaging and waste electrical and electronic equipment.¹¹

DATA

In 2017, 274 317 tons of waste packaging were produced. This is roughly 24% of all collected municipal waste. Approximately 60% (153 606 tons) of waste packaging occurred in the manufacturing sector and service sector, while the remaining 40% (114 794 tons) was collected from households. Waste packaging is collected either as mixed waste packaging or separately according to packaging materials. In 2017, 34.5% of the packaging waste was collected as

mixed waste packaging; 32.5% consisted of paper and cardboard, 12.7% was glass, 9.8% was plastic, 7% was wood, and 3.5% other materials. Packaging waste occurring in the manufacturing and service sectors consisted of paper and cardboard predominantly (50%), while the waste packaging collected through household collection was classified as mixed predominantly (64%). Municipal waste collection services collected 141 108 tonnes of waste packaging.

In 2017, approximately 4 kg of waste electronic and electrical equipment were collected per capita, which is roughly the same value as in previous years. Due to lack of the necessary infrastructure and low level of EEE consumption, Slovenia was one of the countries that could decide to achieve a collection rate lower than 45% but higher than 40% of the average weight of EEE placed on the market in the three preceding years from 14 August 2016. For this reason, Slovenia could postpone the achievement of the collection rate, referred to in the second subparagraph of paragraph 1 until a date of their own choice that shall not be later than 14 August 2021.

Waste batteries and accumulators must not enter the municipal waste stream of mixed wastes and they must be collected separately. According to a recent European Commission study¹², Slovenia did not achieve the required collection rate in 2016.

implement the requirements from the PPW Directive, and the requirements from the WEEE and RoHS, respectively.

¹¹ Official Journal no. 32/2006, 65/2006, 78/2006, 19/2010; Official Journal no. 32/2006, 65/2006, 78/2008.

¹² Stahl, Hartmut et al. 2018: Study in Support of Evaluation of the Directive 2006/66/EC on Batteries and Accumulators and Waste Batteries and Accumulators. Final Report. 8 October 2018. Rotterdam: Trinomics. <http://ec.europa.eu/environment/waste/pdf/Published%20Supporting%20Study%20Evaluation.pdf>; accessed 14 January 2019.

HIERARCHY OF WASTE STREAMS

Although much progress has been made in all of three waste streams with regard to collection and at least pre-treatment operations, the increase and variety of the products entering these waste streams exceeds the capability and capacity of the waste management infrastructure in Slovenia, especially in terms of actual recycling. Problems are encountered in each of the waste streams. Low quality of collected plastic packaging waste increases management costs, leading to stockpiling of this waste in municipal collection yards. As mentioned by one of the PROs for WEEE, the waste infrastructure to manage this waste is underwhelming, while Slovenia missed its collection targets for WB&A. Nevertheless, the most pressing issues seem to be aggregating in waste packaging.

7.1. PROVIDERS OF SECONDARY RAW MATERIALS – WASTE MANAGEMENT OPERATORS

CHALLENGES

As to PPW, nearly 97% of the collected waste packaging streams is sent to recovery. From the data published by the national statistical office, it is difficult to establish the actual flow of material waste streams. It is evident that most of the plastic waste packaging collected separately from industry and services as well as packaging brought separately to recycling, in collection centres is recovered, though the actual figures on what type of recovery takes place are not evident.

Within the waste packaging stream collected from households, 64% are presented as mixed packaging, which was sent to be recovered. The material structure of this waste stream and what recovery they have been subject to is not clear.

Recycled plastics need to comply with food safety standards

In general, it can be assumed the quantities collected and recovered are relatively high. Not enough focus is put on quality, though. With the introduction of the single use plastics directive imposing the requirement of a collection rate exceeding 90% and 35% recycled plastic content in the new bottles from 2025 onwards, there is genuine concern that the recycled plastics will not be of sufficient quality for food contact, if the current systems remain unchanged.

In 2016, 51 operators were performing recovery operations for plastic waste packaging, but only twelve of them were actually performing material recycling (R3), amounting to less than 10% of this waste stream. Over half (65%) of the quantities undergoing recycling were imported from both EU and non-EU countries. Most of the waste underwent R12 and R13 recovery operations, preparatory operations, which must be followed by one of the other recovery operations.

Following R12 and R13 treatment processes, over 66% of the waste was sent across border for further recycling. This implies, there may be a question of quality of circulating material streams.

**Consumers face
uncertainties: Which
bottles can be returned?**

Slovenia has no facility to recycle glass packaging. From the experience of partner countries, these plants not only produce recycled materials but also incorporate them into new products (glass jars, bottles). Slovenia has a system to collect glass bottles in shops through a deposit scheme, so they can be

reused. It is the voluntary decision of the individual producer and shopping chain to cooperate in deposit scheme, which must be supported by a contractual agreement between involved parties. The consumers are not always aware which bottles can be returned and which shops they can be returned to. Producers cooperating in the deposit scheme for glass bottles still have to include these bottles in extended producer responsibility schemes together with the rest of the packaging placed on the market.

One facility for aluminium recycling has upgraded and digitalised its control of incoming waste stream quality, so lower quality of incoming streams, including waste packaging containing aluminium, can be employed to produce high quality grades of aluminium. At the moment, there is no service to repair Euro-pallets.

Several paper mills in Slovenia recycle waste paper. In general, there is no problem with the recycling of secondary cardboard packaging. Consumer packaging composed of paper and plastic cannot be efficiently recycled, either in a plastic recycling plant or a paper recycling plant as the additional materials decrease output yields and increase recycling costs. Paper and plastic packaging contaminated with food residues have a negative effect on the quality of recycled materials. There is also no facility to recycle composite packaging (Tetra Pack), as none of the existing paper mills can apply them as input in their recycling process.

As to WEEE, to date, Slovenia has achieved the 4 kg per inhabitant annual quota of collected WEEE. With the new targets set by the EU, which are determined according to percentage of sale it is expected that this will be much more difficult, especially with the second target stage, which has even higher targets. It is not clear how reuse and preparation for reuse of electrical and electronic equipment should be implemented practically, especially with regard to responsibility for product safety. 17 operators are registered as performing recovery operations, most perform disassembly, sorting and storage (R12 and R13). Only two perform actual recycling of minor quantities of specific WEEE, such as (mechanical) stripping of copper wire. All the pre-treated waste is exported for actual recycling.

As to WB&A, the situation is similar for batteries and accumulators, with the exception of lead acid car batteries, where there is one recycler and producer with a long-standing tradition, who not only recycles these batteries for the Slovenian market, but also imports them for recycling.

RECOMEMMENDED MEASURES

- Keep the product material streams clean to keep it circulating as a material or product within the economy.
- Finance eco-innovative technology in waste management infrastructure.
- Connect and network the whole value chain to improve design for better waste management.
- Establish transparent framework conditions for tracking material flows within the production value chain.
- Enforce transparent and easily understandable guidelines for clearer regulation and uniform implementation of technical quality standards supporting circular economy.
- Create a market for recycled plastics.
- Provide a business environment supporting circular economy measures in SMEs.
- Educate and raise public awareness on circular economy issues in public administration, so public administration can act as a partner to the business community.

RECOMMENDED ACTIONS

- Focus targets on product categories, instead of material waste streams. This is already being taken up at EU level, with the introduction of a separate collection target for plastic bottles in the Directive on single use plastics, requiring a 90% collection rate for single use plastic bottle. Nevertheless Slovenia must determine how to implement this requirement.
- Improve waste collection to keep material steams uncontaminated and increase their value.
- Determine feasibility of deposit schemes vs. extended producer responsibility schemes for single product categories.
- Support reuse and preparation for reuse, where the product does not yet fulfil the definition of waste.
- Promote inter alia cooperation within the Danube region to extend the lifespan of products, which do not yet need to be discarded as waste through reuse. Improve resource efficiency after products become waste, through repair, preparation for reuses and recycling. This should be done through the MOVECO platform¹³ and cooperation with other platform providers.
- Determine which new waste management technologies could be an opportunity for development in Slovenia due to anticipated changes in products with investment feasibility plan.
- Support R&Ds researching the improvement of recycled material quality increasing the added

¹³ www.danube-goes-circular.eu

value of recycling.

- EPR costs reflect actual waste management costs encouraging producers to better understand product waste management implications during product design.
- Develop digitalisation to support product traceability through the whole value chain so waste operators have access to information on waste configuration, dismantlement, especially for WEEE and content of hazardous as well as valuable materials and how to retrieve them.
- R&D of new materials and material combinations in products must include a game plan for future waste management.
- Better cooperation among European Union member states regarding interpretations of waste, by-products and end-of-waste; exchange of good practices.
- Green public procurement should provide a model encouraging demand of recycled plastic products.
- Statutory requirements for minimum quotas of recycled materials in new products, where this does not endanger human and environmental health and safety.
- Provide information and support network for SMEs through existing business support organisations.
- Help SMEs with optimisation and improvement of existing recycling and waste management processes through increased innovation management in this sector.
- Apply fiscal measures such as tax relief, green tax reform to support circular economy in the business community.

7.2. PROCURERS OF SECONDARY RAW MATERIALS – PRODUCERS AND DISTRIBUTORS

CHALLENGES

Steel and metal scrap, waste paper and cardboard, and glass are all highly recyclable. Few issues are evident with the quality of these recycled materials, which have been in circulation in closed loops for decades and even centuries due to the growing complexity of new products combining more and more different materials difficult to disassemble.

Producers of paper packaging must be very selective of the paper waste they introduce into their production stream as they can affect organoleptic properties (smell, taste), even though the packaging would otherwise fulfil food contact requirements.

Few issues are evident with the quality of these recycled materials

Slovenia has no facility to recycle glass packaging. Glass factories do reuse their own scrap and there are examples of industrial symbiosis, where clean glass scrap can be used as input to produce insulation. One facility for aluminium recycling has upgraded and digitalised its control of incoming waste stream quality, so lower quality of incoming streams, including cans, can be employed to produce high quality grades of aluminium.

Steel recyclers are not keen on introducing WEEE due to their higher copper contents and increasing contents of metals, which can have an adverse effect on steel quality. Now that electronic and electrical devices are becoming ever more complex with regard to their composition of metals, more care should be taken of the extraction of valuable precious, rare and critical materials before the materials from WEEE end up as scrap for steel production.

With the introduction of the Directive on single use plastics imposing the requirement of a collection rate exceeding 90% and 35% recycled plastic content in the new bottles from 2025 onwards, there is genuine concern that the recycled plastics will not be of sufficient quality for food contact, even if the 90% collection target is reached.

There is only one recycler for plastic bottles, an SME, but due to the low grade of quality of collected plastic packaging waste in Slovenia, the company must import their production input.

RECOMMENDED MEASURES

- Keep the product material stream clean to keep it circulating as a material or product within the economy.
- Connect and network the whole value chain to improve design for better material and component circulation.
- Establish transparent framework conditions for tracking material flows within the production value chain, from production of new products onwards.
- Enforce transparent and easily understandable guidelines for clearer regulation and uniform implementation of technical quality standards supporting circular economy.
- Create a market for recycled plastics.
- Provide a business environment supporting circular economy measures in SMEs.

RECOMMENDED ACTIONS

- Focus targets on product categories, instead of material waste streams.
- Reduce and replace hazardous substances from design onwards.
- Improve waste collection to keep material streams uncontaminated and increase their value.
- Promote inter alia cooperation within the Danube region to extend the lifespan of products,

which do not yet need to be discarded as waste through reuse. Improve resource efficiency after products become waste, through repair, preparation for reuses and recycling. This should be done through the MOVECO platform¹⁴ and cooperation with other platform providers.

- Support R&Ds researching the improvement of recycled material quality increasing the added value of recycling.
- EPR costs should reflect actual waste management costs encouraging producers to better understand product waste management implications during product design.
- Develop digitalisation to support product traceability through the whole value chain from production of new products and materials onwards.
- R&D of new materials and material combinations in products must include a game plan for future waste management.
- Green public procurement should provide a model encouraging demand of recycled plastic products.
- Statutory requirements for minimum quotas of recycled materials in new products, where this does not endanger human and environmental health and safety.
- Provide an information and support network for SMEs business support organisations.
- Make information on environmental legislative demands, stemming from extended producer responsibility in different countries more accessible to SMEs, wishing to expand markets.
- Help SMEs to integrate circular economy principles into company innovation management systems.
- Integrate circular economy aspects into innovation award scoreboards. The Chamber of Commerce and Industry of Slovenia annually awards innovative products and services. Points are currently added for environmental aspects of these products and services, but the added points are low in comparison to other points allotted to other product attributes.
- Apply fiscal measures such as tax relief and green tax reform to support the circular economy in the business community.

¹⁴ www.danube-goes-circular.eu

7.3. HOUSEHOLD AND B2B CONSUMERS

CHALLENGES

In Slovenia, legislation requires both B2B and B2C packaging placed on the market for the first time to join EPR schemes. B2B packaging consumers would prefer to extract their packaging from the management of EPR schemes as most sort their packaging carefully, increasing its value – it should not fall under waste classification and be managed as waste. This part to the packaging stream should be left to commercial transactions. B2B packaging end users report that they pay the same price per tonne by material to EPR schemes for secondary and tertiary packaging that is separately collected, clean and sorted on their industrial site; as per tonne of material for packaging they place together with their products on the market, B2C, ending up as consumer waste in household collection.

Though it is clear that the costs for consumer waste packaging cannot be compared to the collected waste packaging onsite, which may even have a positive value.

To which extent should households be financially responsible for waste management

The question arises to which extent households should be financially responsible for proper sorting and management of waste collected by public services. These services allot payment either according to the number of inhabitants living in a housing unit or they pay according to the volume of their collection bins. PAYT (Pay-As-You-Throw) systems have not been implemented, though the collection details are not uniform and differ from municipality to municipality.

There is a concern that if the standards for collection were too strict that some of the population could resort to illegal dumping.

In terms of reusable packaging (bottle circulation), the awareness is not as high as in Germany and Austria. Beverage producers can voluntarily enter a deposit scheme supporting the reuse of glass bottles. The most common beverage bottles in the scheme are for beer and wine.

Municipal services devote resources to public awareness campaigns. One of the five EPRs for WEEE has successfully applied for LIFE funding to implement public awareness campaigns.

Due to the varied household kerb collection systems and the growing complexity of products, confusion is evident on how to sort household waste properly. Nursery and primary schools put emphasis on awareness raising on environmental affairs. Older generations still value reuse and products with a longer life span. Due to changing consumer behaviour patterns, these values need to be integrated in line with changing products and lifestyles.

Uncertainties are evident on how to sort household waste properly

New business models, offering access instead of ownership are more acceptable for younger generations living in urban areas than to the older populations or people living in rural areas with less access to public transport and other services more accessible in densely populated areas.

RECOMMENDED MEASURES

- Keep the product material streams clean to keep it circulating as a material or product within the economy, through better collection.
- Establish transparent framework conditions for tracking material flows within the production value chain.
- Enforce transparent and easily understandable guidelines for clearer regulation and uniform implementation of technical quality standards supporting circular economy concepts.
- Promote transition from waste management to resource management among consumers and the wider society.
- Raise awareness among the general public.

RECOMMENDED ACTIONS

- Improve waste collection to keep material streams uncontaminated and increase their value, by stimulating consumers via PAYT or deposit systems. Define the role of consumers and households. Determine feasibility of deposit schemes vs. extended producer responsibility schemes for single product categories.
- Stimulate consumers to be more proactive in separate waste collection.
- Support reuse and preparation for reuse, where the product does not yet fulfil the definition for waste.
- Green public procurement should provide a model encouraging demand of recycled plastic products.
- Include circular economy concepts in nationwide campaigns and education for waste prevention, litter reduction, reuse, repair, refurbishment

IMPRINT

This document is a publication within the MOVECO project.

Full title: MOVECO – Mobilising Institutional Learning for Better Exploitation of Research and Innovation for the Circular Economy

Project duration: 12/2016–08/2019 Project code: DTP 1-349-1.1

Funding scheme: As part of the Danube Transnational Programme, MOVECO is an Interreg project, co-funded by the European Regional Development Fund (ERDF) and the Instrument for Pre-Accession Assistance (IPA).

Lead partner of the project

Chamber of Commerce and Industry of Slovenia Dimičeva 13

SI-1504 Ljubljana Slovenia www.gzs.si

Lead partner of this deliverable

Europa Consortium Regional Development Non-profit Ltd. Csengery u. 9.

H-8800 Nagykanizsa Hungary

<http://www.europaconsortium.eu/>

This document has been prepared by Siegfried Keplinger (Austria), Rosina Lohmeyer, Christina Zegowitz, Natalia García Mozo (Germany), and Antonija Božič Cerar (Slovenia) on behalf of all project partners of the MOVECO project (project identity: DTP 1-349-1.1).

The information and views set out in this document are those of the project partners of the MOVECO project and do not necessarily reflect the official opinion of the European Union/Danube Transnational Programme. Neither the European Union/Danube Transnational Programme institutions and bodies nor any person acting on their behalf may be held responsible for the use which may be made of the information contained therein.

Design

Cover design ©MOVECO 2019 and IDEEN DIE FRUCHTEN | www.ideen-die-fruchten.de

About MOVECO

“Your trash is my treasure”

This is the motto of the EU co-funded project MOVECO – Mobilising Institutional Learning for Better Exploitation of Research and Innovation for the Circular Economy. Sixteen partners from ten countries of the Danube region want to promote transnational cooperation to accelerate the transition to a circular economy.

The MOVECO consortium is working on topics like eco-design, producer responsibility and green innovation, supporting best practices in these areas.

Under the framework of the Danube Transnational Programme, MOVECO is an Interreg project, co-funded by the European Regional Development Fund (ERDF) and the Instrument for Pre- Accession Assistance (IPA).

The project duration is 12/2016–08/2019.



Scan the QR code or visit our website for more information:

www.interreg-danube.eu/moveco

www.interreg-danube.eu/moveco