German Federal Environment Ministry's Advisory Assistance Programme (AAP)

Project: Waste Stream Management and 'Zero Waste' in Turkey

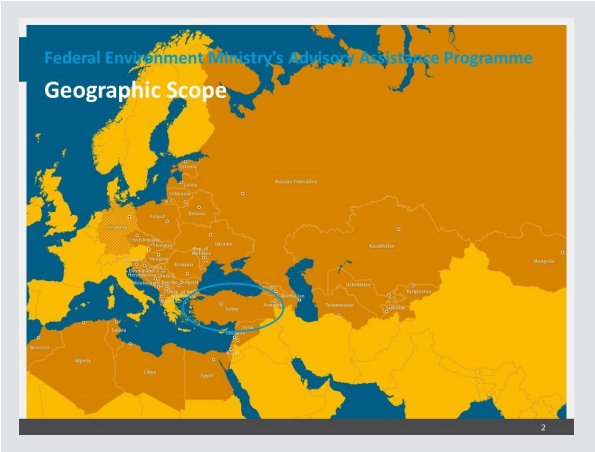
REPUBLIC OF TURKEY
MINISTRY OF ENVIRONMENT,
URBANIZATION AND CLIMATE CHANGE

Part 2B: Recycling and Recovery of Plastic and other non-hazardous Wastes

September — November 2021

Web-Seminar Booklet

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
Umwelt Bundesamt
INFRASTRUKTUR & UMWELT
Professor Böhm und Partner



The Project

Waste Stream Management and 'Zero Waste'" in Turkey is a project financed by the German Federal Environment Ministry's Advisory Assistance Programme (AAP) and supervised by the German Environment Agency (UBA). Under this project, which started in 2020, in the third part 2B, virtual experience exchanges are conducted on the topic "Recycling and Recovery of Plastic and other non-hazardous Wastes" from Sep. until Nov. 2021 with the Ministry of Environment, Urbanisation and Climate Change of the Republic of Turkey and other interested Turkish stake-holders.

The pursued impact is to enhance the competences and capacities of the MoEU, which is the responsible entity for legislation and control of waste management in the country. Furthermore, the knowledge and management capacities of relevant stakeholders in waste treatment sector are strengthened.

Implementation Organisation

INFRASTRUKTUR & UMWELT Professor Böhm und Partner (IU)

Since 1988, IU has been successfully implementing circular economy and waste management projects in Germany and worldwide. IU supports government institutions, regional bodies and municipalities in advancing their solid waste management strategies and implementing integrated solutions. IU has also experts in the areas of energy, climate protection and urban development, flood and heavy rainfall management and adaption to climate change.

In addition to technical expertise, IU provides experience in the areas of participation and communication, project and financial management, organisational and capacity development as well as organising and conducting conferences and workshops on a regular basis, both in person and online.

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Umwelt Bundesamt

This project is financed by the German Federal Environment Ministry's Advisory Assistance Programme (AAP) for environmental protection in the countries of Central and Eastern Europe, the Caucasus and Central Asia and other countries neighbouring the European Union. It is supervised by the German Environment Agency (UBA). The responsibility for the content of this publication lies with the authors.

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REQUIREMENTS FOR WASTE MANAGEMENT OPERATIONS

The leading European directive on waste management is the European Waste Framework Directive. In Germany, waste management is regulated by numerous regulations under the "Circular Economy Act" (KrWG). Regarding waste management operations, the "Registration and Permit Ordinance" (AbfAEV) deals with collectors, transporters, traders and brokers of waste. In short, the ordinance implements the requirements of operators handling non-hazardous waste to obtain a registration while for hazardous waste a permit is mandatory.

Dredging sludge is not only regulated under KrWG but besides other regulations also the "Federal Soil Protection and Contaminated Sites Ordinance" (BBodSchV). Dredging sludge is defined as material which was excavated during river development or its direct surroundings or excavated from rivers and treated for further use. In case, sediments without hazardous properties are being relocated only, they are not declared as dredging sludge under der KrWG. Dredging sludge can be used or is being landfilled, depending on its properties and declarations.

The aim of this web-seminar was to stimulate discussion on the German rules and regulations as impulse for legislation in Turkey.

AGENDA
06./07. September 2021

Dr. Joachim Wuttke | SJW Consulting
Registration and Permit Ordinance — AbfAEV

Prof. Dr.-Ing. Rüdiger Schultz-Sternberg | University of Applied Sciences Eberswalde Faculty Landscape Management and Nature Conservation
Legal Requirements for Dredging Sludge Management and Disposal

The Speakers

Dr. Joachim Wuttke studied chemistry at the Ruhr University of Bochum, where he completed his doctorate in organic photochemistry. He is active as a consultant and lecturer, particularly on issues of transboundary waste shipment and waste classification. Prof. Dr. Schultz-Sternberg holds a doctorate in landscape ecology. He is a consultant at the Brandenburg State Environmental Agency and holds a professorship for soil protection at the Eberswalde University for Sustainable Development.

Summary

Dredging Sludge

Dredging sludge is according to waste law, material that within the framework of watercourse development, maintenance, new construction or expansion measures has been removed from or processed in bodies of water. It may consist of sediments and subhydric soils of the bottom of the water body, topsoil, subsoil or subsoil in the immediate vicinity of the watercourse bed, or topsoils in the banks and floodplain areas of the water body. The regulations of the "German Circular Economy Act" do not apply to sediments used for the purpose of the management of water bodies or relocated for land reclamation within surface waters, provided the sediments are shown not to be hazardous. Dredging sludge needs to be analysed and declared after its contents of hazardous substances. Its disposal is based on the waste management hierarchy, nevertheless, the principles of protection of water and soil need to be followed. Dredging sludge may be either used in soil-like applications, in technical structures or is being landfilled. Further requirements arise from the "Federal Soil Protection and Contaminated Sites Ordinance". This includes parameters as TOC, PCB and EOX. Depending on the soil type, different material values and different applications are possible. In general, landfilling of sufficiently drained dredging sludge may only be considered where a treatment is neither technically nor economically reasonable. Dredging sludge also needs to be documented, registered and its quality assured.

> *In Germany, for large projects, the usage of dredging sludge is planned preliminarily per project. There is no exception for the treatment of dredging sludge, classified under the legal waste management framework. But, if used inside the waterbody – it is within the subject to the Federal Water Act. It's allowed to be applied in the waterbody, as sediments are being transferred due to natural currents, but if being extracted, it underlies the waste management legislation.*
>
> **Prof. Dr. Schultz-Sternberg**

Registration and Permit Ordinance -AbfAEV

The need for the component authority to keep records of waste collectors, transporters, traders and brokers is based on Article 26 of the "Waste Framework Directive" and according to the "German Circular Economy Act". It is being implemented through the "Ordinance on registration and Permission" (ABfAEV). As basic principle, waste collector, transporters, traders and brokers of non-hazardous waste require a registration while for hazardous waste, a permit is required. Collectors, transporters, traders and brokers are natural or legal persons which deal on a commercial basis or within the framework of commercial enterprises. There are some exceptions for public waste management companies, take-back schemes by manufactures and other sectors, where no permit is required. There are requirements for liability of the owner of the company and the management personnel, such as technical knowledge and professional qualifications according to their area of work. The ordinance also provides information on the registrations and applications form. There is also the possibility for (voluntary) electronic submission.

Discussion & Conclusion

In the discussion, the audience was interested if the liability of the waste producers come to an end – which happens only after final disposal in Germany. Insurances of other guarantees are common for waste brokers and traders. The need to clearly define the stakeholders and their rights and duties became clear. Summarising, for Turkey, the Registration and Permit Ordinance and also corresponding implementation aids are of great interest.

In Turkey, dredging sludge from the sea is the main area of application, where the concentrations of salt make the use of the material outside the sea on land difficult. But, it's technically possible to wash out the salt. In general, it is advisable to have the treatment of any dredging sludge rather on site in order to reduce transportation costs.

For Turkey and the Ministries responsible for waste management legislation, knowledge exchange and new impulses on the rules and regulations is beneficial for the further development and refine the current legislation.

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WASTE MANAGEMENT: REFUSE-DERIVED FUELD (RDF)

In the scope of the previous project part 2A of the AAP Project „Waste Stream Management and 'Zero Waste' in Turkey“, "Waste Law Definitions and Refuse-Derived Fuels for Cement Kilns" a guideline for "Preparation of Refuse-Derived Fuels (RDF) for Use in the Cement Industry in Turkey" was prepared. Its aim is to support the work of the Turkish Ministry of Environment, Urbanisation and Climate Change, to strengthen technical expertise and to support awareness, networking and transparency. The guideline also includes recommendations and useful aids. In this web-seminar, the guideline was again presented and discussed by one of the authors. Furthermore, to draw an even greater picture of RDF in Turkey, the Turkish Cement Manufacturers' Association gave insights on the current practical situation of RDF material usage in the cement industry and to complement the session, a German company specialised on waste treatment and recycling facility presented the process of municipal solid waste to RDF on a case study in Suleymaniyah. Summarising, the use of RDF in cement kilns has great potential in Turkey. But, only with high quality RDF material produced in close cooperation between the waste treatment plants producing RDF and the cement industry being willing and able to substitute fuel, the positive outcomes of reduced emissions of methane and CO_2 and reduced dependency of primary materials are reached. Overall, networking, cooperation, providing incentives and improving quality assurance mechanisms and the legal framework are recommended as a way forward to strengthen RDF production and use in Turkey.

AGENDA
14./15. September 2021

Jan Reichenbach | INTECUS GmbH Waste Management and Environment-Integrating Management
Guideline on RDF Production for Cement Industry

Canan Derinöz Gencel | TÜRKÇİMENTO Environment and Climate Change Manager
Production and Use of RDF - Current Situation and Practices in Turkey

Jan Gressmann | Eggersmann Anlagenbau GmbH
MSW to RDF – the Right Thing the Right Way Case study Suleymaniyah

The Speakers

Jan Reichenbach has about 25 years experience in international consultancy. He participated in various activities on RDF, among others a pan-European business exploration project for establishing virtual waste-derived fuel marketplaces. Canan Derinöz Gencel has been the Environment and Climate Change Manager of TÜRKÇİMENTO (Turkish Cement Manufacturers' Association) for many years. Jan Gressmann is experienced in the design of composting and biological stabilisation plants in Germany and abroad, including Turkey.

Summary

Production and Use of Refuse Derived Fuel - Current Situation and Practices in Turkey

TÜRKÇİMENTO is the Turkish Cement Manufacturers' Association representing its members of the Turkish cement sector. In 2020, the TÜRKÇİMENTO manufacturers had a clinker capacity of 94 million tons clinker and 115 million tons cement. 50 % of the costs in cement productions are fuel, 30 % are power related. Both, alternative raw materials and alternative fuels based on quality criteria and regulations are considered to safe resources, reduce imports and the carbon footprint. But, this also adds investment, maintenance and staff costs. According to TÜRKÇİMENTO data, in 2020 1.87 million tons of alternative raw materials and 1.15 million tons of alternative fuels were used by the cement industry. While in the EU, the waste usage ration in the cement industry was 46 %, in 2020 it was 8.5 % in Turkey.

Guideline on the Production of Refuse-Derived Fuels for the Cement Industry

The AAP project "Waste Stream Management and 'Zero Waste' in Turkey, Part 2A Waste Law Definitions and Refuse-Derived Fuels for Cement Kilns" was running from July 2020 until June 2021. In the scope of the project, the guideline "Preparation of Refuse-Derived Fuels (RDF) for Use in the Cement Industry in Turkey" was prepared and is available in Turkish and English. It deals with sources for RDF production, quality requirements and assurances, management, technical options for RDF preparation for cement kilns and recommendations for improving the RDF status and utilisation in Turkey. The guideline shall strengthen technical expertise with international benchmarking, support networking and raise awareness.

> *RDFs are an important component for establishing a modern and functional waste management and Turkey is in a sufficiently good position to further expand this segment.*
>
> **Dipl.-Ing. Jan Reichenbach, INTECUS GmbH**

MSW to RDF - the Right Thing the Right Way: Case Study Suleymaniyah

According to the Eggersmann FUEL concept, MSW is converted to RDF by mechanical pre-treatment (shredding), biological drying in membrane covered pressure aerated lanes and refinement (decompacting, screening, heavy/light separation, magnets, etc.). Usually, more than 80% of mixed municipal solid waste is suitable as RDF if sufficient dry. Initial MSW moisture of 50% - 60% has to be reduced to 20% moisture before separation of combustible from inert. Such a plant with more than 1,000 t/d capacity is located in Suleymaniyah, Kurdistan Region of Iraq, where MSW from the region is being processed into RDF used in a cement kiln in the vicinity. Approximately 3 tons of RDF replace 1 ton heavy fuel oil. The annual reduction of CO_2-emissions through this facility is comparable to the emissions of a city with 100,000 inhabitants. Due to the involvement of the cement producer in the RDF production, the cement kiln profits from reduced impact of fuel price fluctuations on cement production cost.

Discussion & Conclusion

In Germany, the production of RDF and its use in cement kilns developed over time, with now many years of experience. Mostly, it developed based on business to business relationships. Experience was and is driven by the industry to ensure sufficient quality of the RDF. In Turkey, however, the potential of RDF as an alternative fuel in the cement industry has not yet been fully exploited. Close collaboration between the waste treatment sector and the cement industry could generate synergies for production of high-quality RDF material and in consequence reduces CO2 and methane emissions, reduces waste amounts to be landfilled and increases the independency of cement producers in terms of the conventional fuel price. Nevertheless, it is of great importance, that quality of RDF as alternative fuel for cement kilns is ensured. For example, in the case of old textiles; firstly, they are difficult to process and secondly, chlorine contained in particularly cheap textiles should be reduced to a minimum during cement production.

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REPUBLIC OF TURKEY
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SPENT LI-BATTERIES: COLLECTION AND RECYCLING, RECOVERY

Mobility is changing from fuel-based engines towards electric vehicles (EV). With rising numbers of EVs in Germany and also emerging in Turkey, the demand for means of reuse and recycling of car batteries and a corresponding regulatory framework is inevitable for circular economy. The web-seminar therefore focused on spent Li-ion batteries, the German legal framework, up– and recycling of Li-ion batteries and options for reuse, as well as the associated risks and challenges.

In Germany, producers of portable batteries are obligated through the extended producer responsibility (EPR) to ensure the whole disposal-path of waste batteries. For producers of battery packs for EV, participating in take-back-schemes is voluntary. Once the capacity of a EV battery is below 70 %, it usually reaches its end-of-life in the EV. However, these batteries are still very valuable and can be reused as second-life batteries in other applications.

Recycling of Li-ion batteries is currently an important task and expected to get even more demanding with rising numbers of EV. In 2040, recycling of Li-ion batteries could secure 46 % of the demand for these batteries. In a regulation drafted by the European Commission, up to 80 % of lithium shall be recovered from spent batteries and other materials like nickel, cobalt and copper have to be recovered up to 95 %.

AGENDA
20./21. September 2021

Dr. Reiner Sojka | ACCUREC Recycling GmbH
Lithium-Battery Recycling

Björn Bischoff | Umweltbundesamt III 1.2
Legal Requirements and Future Changes

Dr. Núria González-García | Betteries AMPS GmbH
Repurposing electric vehicles batteries into mobile, modular and multi-purpose storage systems

The Speakers

Dr. Reiner Sojka completed his doctorate at the Institute for Metallurgy at the TH Aachen University. He is co-founder and managing partner of ACCUREC Recycling GmbH. **Björn Bischoff** is a lawyer and works at UBA at Section III 1.2 Extended Producer Responsibility – electrical equipment, vehicles and batteries, heading the subsection on basic principles as well as legal and technical supervision. **Dr. Núria González-García** got her PhD in Computational Chemistry in Barcelona. She is Head of Research and Technology at Betteries AMPS GmbH with the mission of strengthening the IP of the company through the development of new innovative technology.

Summary

Legal Requirements and Future Changes

The European Batteries Directive (206/66/EC) is implemented in Germany through the Batteries Act (BattG) from June 25, 2009, which was last amended in November 2020. Furthermore, the Commission Regulation (EU) No. 493/2012 on the Calculation of Recycling Efficiencies of Recycling Processes of Waste Batteries and Accumulators is implemented directly. Under the EPR, producers, incl. importers and distributors, which are placing batteries on the market first, are financially and organisationally responsible for design and labelling of products, public information, collection, take-back, sorting, recycling, recovery, disposal and respective logistics. Producers need to register with the Stiftung Elektro-Altgeräte register (Stiftung EAR). Take-back schemes for portable batteries have a collection target of 50 %, which needs to be reported transparently. In case of automotive and industrial batteries, the distributors have to provide reasonable means of returning waste batteries to the end-user at no charge. Consequently, they are in charge of recycling the batteries and reporting about collection and recycling.
End of 2020, a proposal of EU-COM for new regulations on batteries was published. Its objectives are to strengthen the internal market through fair competition, to support circular economy and to reduce the ecological and social impact of batteries in the whole life-cycle. Also a minimum of recycled content of cobalt, lead, lithium and nickel is foreseen. There are further demands for certain battery types, such as large electrical vehicle or rechargeable industrial batteries, such as a carbon footprint declaration and a electronic exchange system with a battery passport.

Lithium-Battery Recycling

In Europe the EV market is expected to grow in the coming years. ACCUREC prepared a prognosis for the period 2016 to 2030, which provides insights on capacity and tonnage of Li-ion batteries on the European market: Assuming an average development dynamic, in 2030 more than 33 Million (PH)EVs with Li-ion batteries of more than 2.5 Million tons are expected on the European market. The starting point in 2016 was a little more than 0.5 million (PH)EVs. The expected annual battery tonnage ready for recycling is estimated at more than 0.7 million tons in 2040.

> *Only control and dedicated recycling of electric vehicles secures the secondary raw material supply.*
>
> **Dr. Reiner Sojka, Accurec Recycling GmbH**

Li-ion batteries are composed of the container, cathode and anode, a separator, copper, other material and approximately 10 % of electrolyte, which are highly inflammable — some even at room temperature. In addition, there are two components that generate fluorine-hydrogen, a highly toxic acid gas, which is generated during processing. Due to the electrolytes, there is a risk of fire during transportation and storage, which therefore requires high safety standards and close monitoring.
ACCUREC has developed the following process steps for Li-ion battery recycling: Pre-processing, which means sorting by chemistry and safety aspects for consumer cells and packs and dismantling for EV battery packs. The following step for both streams is thermal pyrolysis and as final step mechanical separation in a multi-step treatment to extract the steel, copper and aluminium fraction. The remaining Ni-Co-concentrate is commonly known as “black mass”. The following hydrometallurgy processing shall reduce impurities and generate high quality metals and metal sulphates. The future expectation of this refining process of the European Commission drafted regulation is, that up to 80 % of lithium are recovered and other materials like nickel, cobalt and copper have to be recovered up to 95 %. However, there is currently no facility which can perform this high yields, which gives a high pressure on research and development and subsequently also a high investment need for implementation for this industrial processes. According to a study by Öko-Institut e.V., the recycling industry is able to cover 3.5 % of the cobalt and 4.4 % of the lithium demand for the production of new batteries in 2030. However, this share can increase to 20 % for cobalt and 46 % for lithium by 2040.

Repurposing electric vehicles batteries into mobile, modular and multi-purpose storage systems

Recycling of Li-ion batteries is an important topic. However, reusing them is the preferred option in line with the principles of circular economy. The number of electric vehicles and in consequence the amount of used EV batteries is rising. In the same time, the need to access affordable and clean energy is growing. When the EV batteries are released from the electric vehicle, they still have a capacity of at least 70 %. The Betteries AMPS GmbH is a company based in Berlin, which developed a second-life model for EV batteries: Suitable batteries are being upcycled into so-called betterPacks— battery packs with a capacity of 2,3 kWh that can be used for up to 5 years, when it is estimated that the real end-of-life will be reached. The betterPacks can be easily combined to increase the storage capacity of the system and adapt to the specific use-case needs, such as e-mobility (smaller e-vehicles such as 3- and 4-wheelers). Furthermore, betteries provides a complete system solution: the batteries can be charged by wind, solar, or grid, and be used to power both AC- and DC-appliances. betteries will operate in a "Battery-as-a-Service" business model in which the batteries are not sold but rented. This will facilitate the market uptake by reducing the initial investment required thus making them competitive with C-intensive solutions. The in -house developed IoT platform enables real-time remote monitoring of the battery usage and performance, thus providing fleet operators with relevant information. In addition, the incorporation of a ML-analysis tool will support the incorporation of Predictive Maintenance capabilities further enhancing our exploitation strategy. The battery packs are designed to meet the needs of demanding markets, such as remote tourism, disaster relief, mini grids, productive use and transportation. The second life batteries provide a clean alternative to fuel-based generators and allow to avoid 10 tons of CO_2 with one generator (betterGen). The reuse of batteries could not only safe resources but could also support SDG 7 “Affordable and Clean Energy” as an outcome and has an impact on many other SDGs.

Discussion & Conclusion

Recycling of EV batteries will be a future challenge worldwide: For recycling and reuse, separate collection of batteries is a basic requirement. In Germany, through the EPR system, a take-back scheme for household batteries is well established with boxes to collect the end-of-life batteries, for example in supermarkets. A deposit system is not common. In terms of automotive batteries, there is a deposit and refund system for batteries, outside the vehicle, which are for example changed by the customer, in place.

Recycling of Li-ion batteries is not an easy topic. Collection, transportation and storage needs high safety levels to prevent any incidents. But, with proper recycling techniques, there is potential to recover valuable secondary raw material. While developing recycling systems, the industry is identifying problems and initiating R&D activities. Besides pilot plants, there are first medium sized plants with market capacity implemented. Once the waste stream is increasing, scaling up of recycling capacities shall be initiated. Today there is under capacity in recycling Li-ion batteries, but on the other hand many investments are planned that could lead to an overcapacity if all projects are realised. In ACCUREC’s recycling facility at least 50 % of Li-batteries are imported, about 5 to 10 % from outside Europe indicating that there is not sufficient recycling capacities in other countries.

Currently, there are not many electrical cars on the road in Turkey. Hence, the information of the web-seminar is tackling the challenge of recycling EV batteries at an early stage. The second life for EV batteries can earn the recycling industry some time to engage even more in research and development. Lower battery capacity also increases the risks, therefore only until a certain capacity, battery reuse is advisable. Installing recycling capacities in Europe and Turkey are desirable to ensure the availability of secondary raw material and reduce importing dependencies.

An electrical vehicle battery project is ongoing in Turkey, implemented by the Ministries of Energy, Environment and Industry of Turkey. This project involves various activities such a charging infrastructure. One sub-activity is EV battery recycling and reuse with a working group tackling this topic, where this knowledge exchange presents to be useful.

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REPUBLIC OF TURKEY
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LABELING PLASTIC RECYCLATES AND RECYCLING PLASTIC PRODUCTS

The Blue Angel (The German Ecolabel) has been awarded since 1978 and is the worlds first environmental label. Around 1,600 companies use it for about 20,000 products in 100 product groups. Big groups are amongst others paper products.

The tasks of criteria development, decision making and compliance are distributed among four institutions, which strengthens transparency, independency and credibility. Also all criteria are published and available online.

The aim of the Blue Angel for products made from recycled plastics is the strengthening the sales and thus the recycling of post-consumer plastic waste. This increases resource efficiency and reduces greenhouse gas emissions. Typical products include e.g. waste bins, flower pots or buckets. In terms of the use of post consumer plastic recyclates (PCR), possible hazardous substances need to be analysed which makes PCR currently not applicable in every product group.

Eco labelling is an interesting topic for Turkish stakeholders and the MoEU. Eco labels can help the consumer to make environmentally friendly purchasing decisions. The discussion in the web-seminars showed, that setting criteria for products is challenging and needs clear specifications.

AGENDA
04. /05. October 2021

Dr. Johanna Wurbs, Susanne Spies | Umweltbundesamt III 1.3
German Eco-Label Blue Angel: Overview on Labeling System's Actors, Tasks and Function

Dr. Olaf Wirth | Ökopol—Institut für Ökologie und Politik GmbH
German Eco-Label Blue Angel: Examples for the use of post consumer plastic recyclates (PCR)

Henrike Buttner | RAL gGmbH (Certification Body for the German environmental label Blue Angel)
Products made from recycled plastics (DE-UZ 30a)

The Speakers

Dr. Johanna Wurbs is the head of the "Ecodesign, Environmental Labelling, Green Procurement" Department. Susanne Spies works in this division, which is responsible for issues relating to the environmental labelling of products and services. Dr. Olaf Wirth studied biology and completed his doctorate in technical microbiology at Hamburg Harburg Technical University. He is partner of Ökopol GmbH. Henrike Buttner works for RAL gGmbH, which is responsible for awarding the Blue Angel label.

Summary

German Eco-Label Blue Angel: Overview on Labeling System's Actors, Tasks and Function

Eco labels provide two main instruments: On the one hand, pushing the promotion and implementation of respective criteria - on the other hand, creating demand in the market. On international level EN ISO 14024 provides guidance on the design and set-up of criteria-based schemes for product labelling, for voluntary systems. The Global Ecolabelling Network (GEN) is a non-profit association of ecolabelling organisations, whose guideline provides orientation in line with EN ISO 14024.

The German Eco-Label, Blue Angel, is owned by the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection. It defines award guidelines and appoints the Environmental Jury. The Federal Environment Agency is responsible for assessing proposals for new product groups as well as developing and updating of Blue Angel criteria. Developing criteria is also supported by external research projects. The Environmental Jury is the decision making body with representatives of all relevant sectors. RAL gGmbH is responsible for compliance and concludes contracts with companies on the use of the Blue Angel label. The product groups of the Blue Angel reach from paper products to cleaning agents and household electrical devices. In general, award criteria take into account the whole life cycle of a product. Evidence can be provided by e.g. declarations or laboratory tests. All criteria set by the Environmental Jury are publicly available. Only the best 20-30% of the products in a product group qualify for the label.

German Eco-Label Blue Angel: Examples for the use of post consumer plastic recyclates (PCR)

While the use of pre-consumer recyclate requires less processing efforts, the processing of post consumer recyclate is more difficult due to high efforts on processing and sometime only limited usability. The Blue Angel label for PCR shall increase visibility and create a market pull. The product group labelled in accordance with DE UZ-30a shall contain at least 90 % of plastic, of which at least 80 % shall be PCR. Depending on the use, potential hazardous substances in PCR must be limited. In this respect, it is essential that the PCR is derived from verified sources. For children's toys, for example, the standards set for PCR are particularly high.

Products made from recycled plastics (DE-UZ 30a) - RAL gGmbH

The verification process for Blue Angel labelling of products made from PCR starts with the application and general information of the applicant and the product, such as its material composition. Likewise, the recycling company needs to be certified by neutral, professionally suitable third party inspectors. The verification of the production companies is also carried out by neutral, professionally suitable auditors. Then the recycling material itself needs to be tested in an accredited testing laboratory and it needs to be ensured that no additives, such as biocides or other harmful chemicals are used. Upon certification, an annual re-examination is required.

Discussion & Conclusion

In general, eco labels for packaging, observing a multitude of different criteria are possible and useful but need to clearly identify what they are referring to. The easier, the information can be obtained from the label, the easier it is for the consumers.

Minimal criteria are specified for the product groups but explicit data for each products regarding savings are not easy to be obtained. The Blue Angel is a comprehensive label, considering many issues, which is more challenging in communication, other than a label considering only one aspect.

The use of PCR increases resource efficiency but on the other hand, origin of the material needs to be transparent and high quality demands regarding hazardous substances need to be met. Labelling products made from recycled plastic with the Blue Angel shall strengthen their sales and promote products, which have a high content of PCR.

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WASTE MANAGEMENT: SELECTED TECHNOLOGIES FOR DISCUSSION

Chemical-physical treatment of solid and/or pasty waste is listed as one of the best available techniques in the BREF on waste treatment (EU Commission, 2018). This process is applied to treat various types of mainly hazardous waste.

Physical and mechanical treatment of waste is most common in recycling facilities, while chemical recycling is only used on lab- and pilot-plant scale. Nevertheless, chemical recycling processes like solvolysis, liquefaction/pyrolysis, or gasification enable the recovery of substances from waste, that would otherwise be incinerated or disposed of.

The IPPC Waste Management Project in Turkey aims to evaluate the waste processing plants, their compliance with IPPC regulations and preparation of sector guidelines. In summer 2021, a survey on the waste treatment facilities in the country was conducted to update the current inventory.

Recycling of PET bottles is an important issue: for standardized PET-bottles there are well established recycling-systems in the EU, which enable an economically viable operation of recycling facilities. In Germany and other EU-member states a high return rate is being achieved through various collection systems. This ensures a steady input flow for the recycling facilities.

The aim of this web-seminar is to give an overview of selected treatment technologies to be discussed by stakeholders from the Turkish recycling industry and stakeholders from Turkish Ministries.

AGENDA
13./14. October 2021

Dr. Julia Vogel | Umweltbundesamt III 2.1; III 2.4
Chemical Recycling as part of the circular Economy?

Prof. Ulkü Yetis | METU
Turkish Waste Treatment Landscape

Jochen Ebbing | Lobbe Industrieservice GmbH & Co. KG
Physical-Chemical Treatment

Timo Angerstein | Veolia PET Germany GmbH
PET-Bottle-to-Bottle Recycling or Plastic Recycling in Germany

The Speakers

Dr. Julia Vogel works for the UBA in the fields of waste treatment technologies and waste treatment transfer. Prof. Ülkü Yetiş has been a Professor at METU since 1998 with award winning research. Jochen Ebbing works for Lobbe, a company that provides decontamination, disposal and industrial services. Timo Angerstein is a Sales Manager for Veolia PET Germany GmbH, a leading company on the European PET recycling market.

Summary

Chemical Recycling as Part of the Circular Economy?

Only around a third of post-consumer plastic waste in the EU is being recycled for its materials. That leaves about 19 million tons of plastic annually that are currently disposed of or used for energy recovery. Chemical recycling is not the same as mechanical recycling, but can be considered to be part of material/feedstock recycling if it is used as a raw material for new products. Several projects have aimed to develop chemical reprocessing methods in order to recover more of the materials, that are currently lost to disposal and energy recovery, but largely remained at the lab- or pilot-plant scale. While there are some established methods for chemical recycling, challenges remain in ensuring the recovery of the substances used for the recycling processes itself, the limitations of input streams for the individual methods and making the operation of large-scale facilities using these methods economically viable. There is also a need for a legal definition of chemical recycling.

IPPC - Waste Management

In November of 2020 a project of evaluating the Turkish waste processing landscape in the context of the concept of Integrated Pollution Prevention and Control (IPPC) started. Its purpose is the

> "*Determination of the Best Available Techniques (BAT) in waste management activities for the prevention of air, water and soil pollution or, where it cannot be prevented, for their reduction as well as for the minimisation of the hazardous properties of waste and of waste quantities; further determination of the application costs of such measures and preparation of IPPC regulation drafts regarding such activities.*"
>
> Prof. Ulkü Yetis, METU

The project started with a survey of Turkish waste management facilities in which 891 out of 3170 facilities took part. It became clear, that there are a lot of facilities are large enough to fall under the IPPC regulations. The percentage of facilities that operate compliant with the Best Available Techniques vary strongly between different sectors. The cost of establishing the Best Available Techniques in all facilities has yet to be determined by the study.

Chemical-Physical Waste Treatment

Hazardous waste is defined in the EU DIRECTIVE 2008/98/EC. It covers all waste types that have one or more hazardous properties. Hazardous waste gets converted into less harmful substances by chemical and/or physical treatment. The treatment varies depending on the type of waste processed, therefore knowledge of the waste characteristics is needed. To ensure legally compliant hazardous waste management, a combined tracking system from waste generator to end disposal has to be applied. Effective separate collection according to substance groups during in-house collections offers a maximum of safety against accidental chemical reactions and is the prerequisite for targeted treatment.

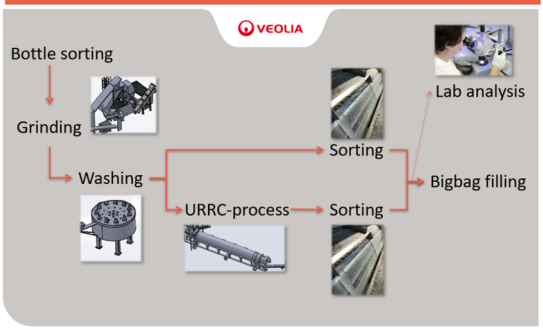
> *Effective separate collection of hazardous waste starts with the waste producer at the point of generation. Correct separation according to substance groups already during in-house collection offers a maximum of safety against accidental chemical reaction*
>
> **Jochen Ebbing, Lobbe**

Veolia PET Recycling

The recycling of PET-bottles is an example of an almost closed circle of material flows in which the same material undergoes several lifecycles before being disposed of or reused in other ways. Veolia is one of Europe's largest companies dealing with the recycling of PET-bottles and operates four major facilities in Germany, Norway, Sweden and Switzerland. The recycling of PET-bottles is an example of an almost closed circle of material flows in which the same material undergoes several lifecycles before being disposed of or reused in other ways.

The European Safety Association (ESA) determines the standards for food grade recycling. An important component of these standards is the 95% rule: For an end product to be classified as food grade, at least 95% of the input stream must come from food packaging. This is difficult to achieve from ordinary household waste, which is why Veolia focuses on input streams out of deposit systems. Veolia operates in countries with well-established collection systems in which the return rate of PET-plastic bottles is relatively high. In Scandinavia, every new bottle design is checked for recyclability, and only fully recyclable bottles are allowed on the market.

Simpliefied production flow



Source: Timo Angerstein, Veolia PET Germany GmbH

Discussion & Conclusion

Chemical recycling will not replace other recycling methods but could be a valuable addition to mechanical recycling and waste incineration in the process of making the economy more circular. The industry still has to develop the processes and technology necessary in order to make chemical recycling profitable. Future research will have to show to what extend chemical recycling can have environmental benefits in comparison to mechanical recycling.

Turkey is in the process of ensuring that the infrastructure is prepared in a way, that the waste management sectors can operate in accordance with the IPPC regulation in the future. The main objective is to ensure that the waste processing sector in Turkey complies with the Best Available Techniques. The survey and evaluation process are notably being done by the Turkish ministries and the Middle East Technical University.

If not managed properly, hazardous waste can pose existential risks for environmental and human health. Various hazardous waste types need special treatment. Knowledge of the input materials is obligatory and a laboratory is a key part of the infrastructure of a waste treatment facility. Furthermore, well-educated and trained personnel as well as a tracking system to ensure legally compliant management are needed. During the discussion, the question came up, if there are criteria in Germany defining the point at which a substance does no longer qualify as waste. Germany uses the criteria as defined in the IPPC. If after a waste treatment process the waste status does not apply anymore, its product can be sold on the European market.

Regarding PET-recycling, the question remained, why new bottles are not made out of 100% recycled bottles but always have some new feedstock material in their input stream. To ensure a continuous production of bottles with the same quality, a certain percentage of new PET has to be added because the polymer chains of old PET-bottles get shorter during every recycling loop they go through. According to a Norwegian study, a maximum of 80% of the input stream can stem from recycled plastic. In Turkey, deposit return schemes are also a relevant topic.

An important challenge in Turkey is the availability of high-quality waste material for example for the recycling of PET for the food packaging industry. During the discussion, it became evident, that in terms of the best technology for recycling, various aspects in the whole process need to be considered.

Source: INFRASTRUKTUR & UMWELT

Web-Seminar Info

German Federal Environment Ministry's
Advisory Assistance Programme (AAP)

Project: „Waste Stream Management and 'Zero Waste' in Turkey“

Part 2B: Recycling and Recovery of Plastic and other non-hazardous Wastes

REPUBLIC OF TURKEY
MINISTRY OF ENVIRONMENT,
URBANIZATION AND CLIMATE CHANGE

PACKAGING AND SINGLE-USE PLASTIC (SUP) WASTE IN GERMANY

The EU–Directive 2019/904 on the Reduction of the Impacts of Certain Plastic Products on the Environment came into force in July 2019. In Germany the directive is realized through a number of regulations. The Directive includes requirements for the reduction of consumption, the design of new products and the separate collection of plastic bottles. Certain products will be banned from the European market, others will have to be labeled with information about the potential harm caused by the packaging. Producers of plastic packaging will be bearing the costs connected to the disposal of their packaging in public spaces as part of their extended producer responsibility (EPR).

In Germany, the EPR of packaging producers is monitored by the Central Agency Packaging Register (ZSVR). The agency is a private organization which is entrusted with statutory duties. They established a register for all producers on the basis of the LUCID-database. The reference data of a company is stored combined with information about the amounts and types of packaging produced.

During the COVID-19 Pandemic, more plastic than usual has been used in Turkey partially because single-use plastic products are seen as very hygienic. This shows that plastics have valuable characteristics which make plastic products a popular choice for consumers. Packaging producers and producers of plastic products will have to come up with alternative materials and packaging designs to meet the demand for specific items that are currently mostly offered in a plastic version. Especially, if stricter regulations will apply in the future.

AGENDA
20. October 2021

Gunda Rachut | Stiftung Zentrale Stelle Verpackungsregister – ZSVR (Central Agency Packaging Register)
Institutional & Legal Structure and Activities of German Coordination Center for Packaging Waste

Juliane Rode | Umweltbundesamt III 1.6
Germany's Implementation of Single Use Plastic Directive

The Speakers

Gunda Rachut became the chairman of the Stiftung Zentrale Stelle Verpackungsregister in 2017. She studied law in Osnabrück and Strasbourg. For 20 years, until 2012, she was one of the managing partners of cyclos Gmbh, the largest expert organisation in the field of packaging waste.

Juliane Rode works for the German Environment Agency in Enforcement of the Packaging Act (VerpackG)" Division, Division III 1.6 "Plastics and Packaging”.

Summary

Institutional & Legal Structure and Activities of German Coordination Center for Packaging Waste

In Germany the principle of EPR has been applied since 1993. Tense competition and low prices almost caused the recycling market to collapse in 2014. At that point it was not clear which producers financed the system and if they were including all of the packaging they produced. It has to be noted, that in Germany's federal system the responsibility for waste management lies with the states. The Central Agency Packaging Register (ZSVR) was established as a foundation under German civil law and has been entrusted with statutory duties by the Packaging Law. It was founded by several producer associations to ensure the participation of all producers in the system. So far, the register has increased the participation rates in all sectors to over 70%. Core of the register is the LUCID database. All producers of packaging for non-industrial usage have to register. The master data of each registered company is accessible to the public. To this day more than 200.000 producers have registered. The agency decides according to established guidelines on a case to case basis if an item qualifies as packaging and if its producer has to pay for recycling. There are financial incentives in place to promote recycling-friendly design. The assessment is based on the unfilled packaging as a whole including all related packaging components. The assessment process is structured in three criterions: sorting infrastructure, sortability and compatibility.

Germany's Implementation of Single Use Plastic Directive

A lot of plastic waste is still getting disposed in the environment, of which a big part consists of single-use plastic items and packaging. 86% of the plastic waste consists of ten single-use plastic items, the so called „top litter items". To prevent this type of pollution, the EU approved the Directive (EU) 2019/904 On the Reduction of the Impact of Certain Plastic Products on the Environment. The directive requires final distributors of to-go food and beverage containers to offer customers reusable containers as an option. Also, certain plastic products such as cigarette buds, wet wipes and hygiene pads have to be marked as containing plastic and therefore being potentially harmful for the environment. Regarding EPR, producers are bound to bear the costs of the disposal of certain packaging, fishing gear and other plastic products in the public space. It is planned to install a single-use plastic fund with the purpose of organizing the financing, registration and reporting. 77% of all plastic bottles by weight have to be recycled by 2025, by 2029 it will have to be 90%. From 2022 on, every plastic bottle will have to be part of a deposit system excluding only milk and milk products.

Discussion & Conclusion

Before the ZSVR was established in Germany, the producers were operating without a centralized strategy and control mechanism which led to an instable recycling system that had to be reformed. With the ZSVR in place and their database registering more and more of the producers on the market, a strong foundation for an effective monitoring and recycling system has been laid in Germany. Return rates have already increased on a national level. Through the comprehensive database and perpetual monitoring of waste amounts and types valuable information is gained and irregularities are noticed easier. Foreign companies, notably a lot of Chinese companies, are starting to reach out to German partners as authorized representatives in order to register with the ZSVR due to the pending regulation of online marketplaces.

With the Directive 2019/904 the European Union introduced a new set of regulations of single-use plastic for its member states to convert into national law. It focuses on products with a short lifespan that often get disposed shortly after being purchased and therefore often end up in the environment because they are not getting disposed properly. The Directive tackles the issue of plastic pollution from several angles by prohibiting the sale of certain products, requiring shops to offer reusable options for the same price and marking harmful products for customers to identify. The question remains, which kind of materials could be used as a substitute for plastic in single-use products. It is also not clear yet if products made out of wood or other materials are less harmful to the environment than plastic products.

Web-Seminar Info

German Federal Environment Ministry's
Advisory Assistance Programme (AAP)

Project: „Waste Stream Management and 'Zero Waste' in Turkey“

Part 2B: Recycling and Recovery of Plastic and other non-hazardous Wastes

REPUBLIC OF TURKEY
MINISTRY OF ENVIRONMENT,
URBANIZATION AND CLIMATE CHANGE

PACKAGING WASTE: CALCULATION AND RECYCABILITY

In order to create incentives for the production of recyclable packaging, the consideration of ecological criteria in the calculation of fees for Producer Responsibility Organizations (PROs) in Germany has been made mandatory in 2019. The PROs have to report on their fee modulation and the resulting share of packaging waste that is put into high-quality recycling. To ensure a uniform methodological basis for determining recyclability with a view to modulation in a competitive market, a minimum standard for determining the recyclability of packaging gets published every year .

PROs play a central role in the waste management industry, linking packaging producers, the private end users, recycling, sorting and collecting companies and the ZSVR. The PROs have themselves formed a joint body to collectively handle and finance certain tasks. The fee calculation is based on the operational and additional costs, which are very different for the three main waste categories glass, paper and light weight packaging.

The recyclability of packaging can be determined with various methods that must follow the above mentioned minimum standard. One factor for the assessment of a packaging item is the definition of recyclability. For example, it is not sufficient that the materials could theoretically be recycled. A packaging item is only considered recyclable if the recycling infrastructure is available on an industrial scale.

AGENDA
15./16. November 2021

Dr. Anja Gerdung | Umweltbundesamt III 1.6
Fee Modulation According to Recycability, the German Experience

Markus Pache | Landbell AG for Packaging Scheme
Fee Calculation for Packaging Waste

Sandra Beckamp | Institut cyclos-HTP GmbH & Co.KG
Setting of Criteria and Standards for Recycability

The Speakers

Dr. Anja Gerdung has been working for the Federal Environmental Agency since 2016. She is assigned to the legal and technical supervision of the ZSVR, developing and, inter alia, legal instruments for the extended producer responsibility. Markus Pache is the head of sales for packaging compliance in Germany at Landbell GmbH since 2019. Sandra Beckamp started working for cyclos-HTP in 2019 and has been the CEO of the institute. She is also a publicly appointed and sworn expert on packaging disposal.

Summary

Fee Modulation According to Recyclability, the German Experience

In general, the EPR (Extended Producer Responsibility) fees are negotiated between PROs and the packaging producers. They act within a competitive market-based system. Common criteria for fee modulation are the mass, material and composition of the packaging. Nevertheless, since 2019 it is prescribed by law, in Section 21 para.1 no.1 Packaging act, that ecological criteria must be included in the fee modulation in a way that incentivizes the use of secondary material, the use of renewable resources and packaging design with the highest possible recyclability. The formulation of legal requirements for certain increases and decreases of the participation fees was waived, as this would be an encroachment on the freedom of the system and would thus violate German antitrust law. Hence, PRO operators are free to give a bonus or malus depending on the type of packaging or find other fee related models to meet the objectives of the law.

The PROs are obliged to report annually to the Central Agency Packaging Register (ZSVR) and the German Environment Agency about their modulation of ecological fees and the relative part of packaging that they put into high -quality recycling. Furthermore, a minimum standard for determining the recyclability of packaging is defined in Section 21 para. 3 Packaging Act in order to provide the system with a uniform framework for their calculations.

The minimum standard must be applied in order to foster transparency and to prevent green-washing and the competition of methodologies. The minimum standard includes three criteria, which are as follows: The availability of sorting and recycling infrastructure, the sortability and separability of the packaging and the absence of incompatible packaging components. It was found that no PRO has set any malus fees due to price competition with their competitors. Hence, only bonuses were granted for favourable packaging designs. However, their application and extent were low because they would reduce the fee income for an operator. Thus and to facilitate an effective implementation, authorities and PROs are currently in discussions on how to harmonize the criteria and methodology for a level playing field and final impact (e.g. via a malus only approach that feeds a central fund which finances awareness raising campaigns and R&D).

Fee Calculation for Packaging Waste

As a PRO, the Landbell Group helps obliged companies to fulfil extended producer responsibility operations. Founded in 1995, Landbell was the first company outside the existing PRO monopoly in Germany to be granted a nationwide licence in 2006.

PROs such as Landbell play an important role in the German market. The initial distributers, manufacturers, retailers and importers report their packaging volumes to the PRO. In return, the PRO fulfils the obligation of the distributers on their behalf and provides documentation. The volume reports and volume flow documents are sent to the ZSVR. The ZSVR compares the reports with reports sent directly from the distributers, who have to register with the ZSVR. The PROs have to fulfil operational tasks such as collecting, sorting and recycling. They ensure the payment of disposal companies and documentation of the volume flows. The PROs are organized in an agency that coordinates joint tasks such as the installation of consumer awareness program and media campaigns. The financing of this agency and of the ZSVR is organized jointly. The waste collection process and the municipality costs, which include cleaning of collection sites and installing educational programs, are also financed jointly. Waste sorting and recycling are negotiated and financed individually.

Collection costs for glass paper and light weight packaging (LWP) are much different because these three waste categories are also collected differently. LWP consist of metals, plastics and composite materials require an additional sorting step. For glass and paper, the recycling step generates revenue whereas for LWP this step generates additional costs. For glass and paper there are no costs for sorting. The most significant operational cost factor for all waste types is the collection process. The biggest additional cost factor are the municipality costs. In Germany recycling costs for glass are the lowest and for LWP they are by far the highest. Total costs divided by the participated volumes lead to the netto fee.

Setting of Criteria and Standards for Recycability

The Institue cyclos-HTP GmbH was founded in 2014 as a company for the classification, evaluation and auditing of recyclability for packaging goods. They work with industry partners and universities on studies and solutions for all types of packaging.

In the cyclos-HTP-classification, recyclability refers to high-quality material recycling, in which virgin material is substituted. In order to be classified as recyclable, collection, sorting and recycling infrastructure capacities must be available for the specific type of packaging. Recyclability as a balance frame should indicate, how much recyclate can be generated, how much virgin material can be substituted.

> *Recyclability is the individual gradual suitability of a packaging or a product to factually substitute material-identical virgin material in the post-use phase; "factually" hereby means that collection and processing structures in industrial scale are available.*
>
> **CHI: Verification and examination of recyclability, cyclos-HTP (2019)**

For classification, design for recycling (D4R) guidelines, D4R-assessments and Recyclability Assessments (RA) can be used. The D4R-guidelines contain evaluation checklists, for the recyclability of each packaging component. The components are classified on a three-step ordinal scale with the three classifications being: Full compatibility, limited compatibility and incompatibility. Based on the D4R-guidelines, a D4R-assement can be done, which sums up the evaluation of the individual components. Recyclability assessments are more commonly used in science and technology because they give quantitative and qualitative results. As a descriptive method, RAs are applicable to all materials and do not require D4R guidelines. cyclos-HTP developed their own scientific based and field proven recyclability assessments based on physical processes such as those that take place in sorting and recycling plants. The assessment results are issued to producers in a certificate with national reference.

Discussion & Conclusion

PRO operators have to collect, sort, and recycle all packaging waste in their area, not only the packaging they have contracts for. Thus, an operator does not profit directly from incentivizing their producer to make recyclable packaging. In the competitive market with tensed pricing it is therefore not feasible for PROs to grant large bonuses for well recyclable packaging because their cost will not go down accordingly.

In Germany there are three waste streams that are collected separately: glass, paper and LWP. In Turkey there is an obligatory collection system, which only differentiates between recyclable, and non-recyclable waste. Additionally, there is a voluntary system where separate containers for glass, paper, plastic, metal, composite materials, compostable waste and all other waste are set up. Mostly, waste glass is not collected separately in Turkey because the cost of raw materials to produce glass is lower than the cost of secondary raw materials produced from the waste glass.

During the discussion uncertainties regarding the difference between recycled content and recyclability share were discussed. The recycled content describes the share of post-consumer material used in production of new products. This parameter is not considered for evaluation by cyclos-HTP because recyclability refers to the suitability of a product to be recycled after disposal. The RA certificates state the share of the recyclable content, which is recovered from the packaging assessed.

The main political goal of all regulations, evaluations and measures is to improve the packaging on the market so that it can be better recycled in its entirety, so that sorting and recycling facilities can do their job more easily and efficiently. It will become more and more relevant for packaging producers in Turkey to consider the design of their packaging and the costs connected to it, when they sell their products on the German/EU market.