

Transnational mapping and analysis of the maturity level in the circular plastics industry

Deliverable D.1.1.1

Responsible Partner: TZ Horb

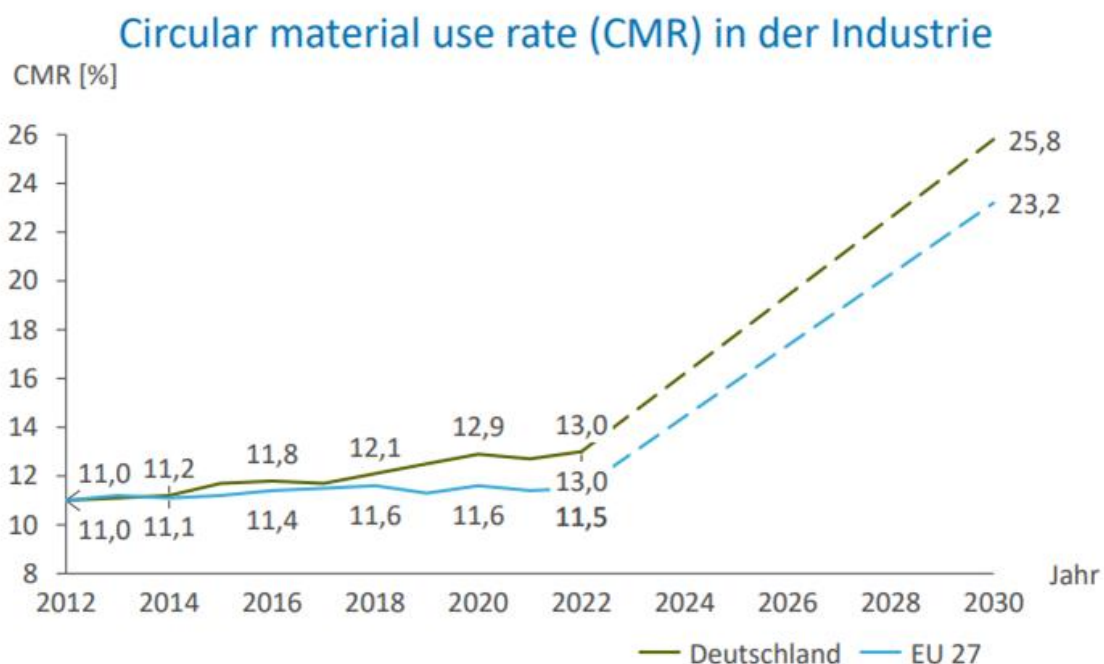
Document Content

Introduction to the Plan C- Project	2
.....	3
Scope of the analysis in the Plan-C project	4
Hungary	5
Austria	6
Czech Republic	8
Germany	9
Slovakia	11
Moldova	14
Bosnia and Herzegovina	15
Serbia	17
Romania	19
Overview of EU Laws, Regulations, and Directives Related to the Circular Economy Action Plan (Plan C)	20
Conclusion	23

Introduction to the Plan C- Project

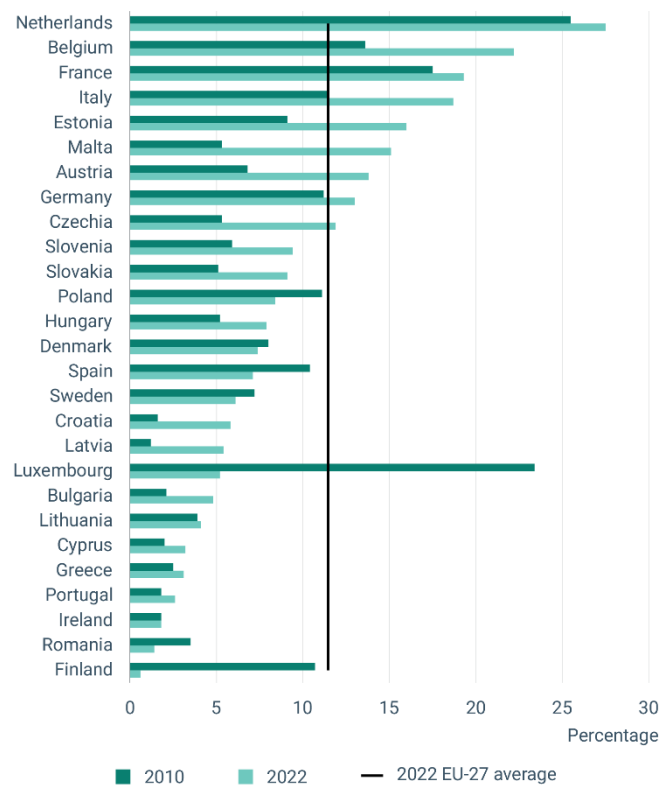
Plan C aims to promote sustainable development in the Danube Region by addressing socio-economic and environmental challenges, particularly in the plastics industry. The initiative involves 14 partners from various Danube countries working to transform the plastics value chain towards circularity. Key efforts include transnational cooperation, technology transfer, and co-creation of circular prototypes. The project seeks to boost competitiveness, increase recycling rates, and develop circular solutions for the plastics and machine industries. The final goal is to enhance circular economy practices across at least 70 organizations, contributing to the EU's recycling targets and sustainable development goals.

The regional mapping and analysis of the circular plastics industry's maturity in each Danube region will be compiled into a transnational evaluation. This includes the entire plastics value chain, from material sourcing to recycling. The analysis aims to identify good practices and assess challenges and opportunities to enhance technology transfer and awareness of circular solutions in the plastics industry across the Danube Region.



The graph titled "Circular Material Use Rate (CMR) in the Industry" illustrates the percentage of circular material use in the industry for Germany and the EU 27 from 2012 to 2022, with projections extending to 2030. Circular material use rate (CMR) refers to the proportion of materials recovered and reused in production processes, contributing to sustainability and resource efficiency. The data, sourced from Eurostat and the European Court of Auditors, reveals a gradual increase in CMR for both Germany and the EU 27 over the years, with significant projected growth by 2030. The graph highlights Germany's performance relative to the EU average, showcasing trends and anticipated improvements in circular economy practices within the industrial sector.

Both Germany and the EU 27 have shown a gradual increase in the use of circular materials in industry from 2012 to 2022. Germany's CMR has fluctuated slightly but remains below the EU 27 average as of 2022. However, projections indicate a significant increase in CMR for both Germany and the EU 27 by 2030, reaching 25.8% and 23.2% respectively. This suggests a strong commitment and anticipated progress towards enhancing sustainability and resource efficiency within the industrial sector across Europe.



Source: Eurostat, European Court of Auditors

Considerable differences in Circular Material Use Rates (CMURs) are observed among countries, ranging from 27.5% in the Netherlands to 0.6% in Finland in 2022. This variation reflects significant structural differences in countries' recycling capacities and levels of material consumption. In the Netherlands and Belgium, over 20% of the material used was recycled, with the Netherlands already surpassing the EU's 2030 target for CMUR.

Since 2010, CMURs have increased in 20 out of 27 countries. Notable absolute increases (over five percentage points) occurred in Malta, Belgium, Italy, Austria, Estonia, and Czechia. Countries such as Latvia, Croatia, Malta, Bulgaria, Czechia, and Austria more than doubled their CMURs between 2010 and 2022. Conversely, significant decreases in CMURs were observed in Finland, Luxembourg, and Romania.

The data indicates a positive overall trend in the adoption of circular material use across Europe, with most countries improving their recycling rates and integrating more recycled materials into production. However, the disparities among countries highlight the need for tailored policies and investments to enhance recycling capacities and reduce material consumption uniformly across the EU. While some countries are leading the way and even surpassing future targets, others lack significantly, necessitating focused efforts to boost their CMURs and achieve more balanced progress towards circular economy goals.

Scope of the analysis in the Plan-C project

The analysis covers the current status, Shortcomings, barriers, transformation potentials, good practices, and failures in the circular plastics industry. It focuses on policies, technologies, and business models. Conducted via desktop research and interviews/workshops with regional experts and companies, it builds on existing knowledge and previously identified good practices.

The scope of the status quo and good practices/failures analysis in the dimensions policies/business support, technologies/knowledge, and business models/practices was aligned with the topics identified as a result of the identification of good practices and lessons learned (D.1.1.1) and the capitalisation workshops (D.1.1.3).

Hungary

Hungary's waste management and environmental protection policies are aligned with EU directives, focusing on transitioning to a circular economy and enhancing sustainability. Key components include:

1. Goals and Objectives:

- Emphasis on environmental protection, climate adaptation, and waste reduction through the Climate and Nature Protection Action Plan (KTA).
- Targets for recycling and reuse, integrating extended producer responsibility (EPR) to manage waste costs.

2. Implementation and Legislation:

- National Waste Management Plan (OHT) updates align with EU directives, promoting resource efficiency and job creation through the National Prevention Program (OMP).

3. Challenges and EPR System:

- Challenges include insufficient recycling rates for industrial and household waste, addressed through mandatory EPR for specific products starting July 2023.

4. Technology and Knowledge Providers:

- Diverse range of providers including environmental service associations, universities, and innovative companies like Poliloop and Cellugy.

5. Business Models and Practices:

- Initiatives like UgrinPack-Erdősi Kft.'s bio-composting pilot demonstrate innovative approaches to waste collection and recycling.

6. Recycling Processes:

- Current limitations in recycling infrastructure, aiming to develop facilities capable of producing food-grade recyclates as part of the Hungarian Waste Management Plan 2021-2027.

Hungary is actively progressing towards a circular economy model, leveraging policy frameworks, innovative technologies, and collaborative initiatives to address current challenges and achieve sustainable waste management goals.

Austria

Austria's 2023 waste prevention program focuses on promoting a circular economy, reducing single-use plastics, and encouraging reusable packaging, especially in the beverage industry, to enhance environmental sustainability and support effective waste management.

- **Waste Management and Packaging Regulations:**
 - Laws like Abfallwirtschaftsgesetz AWG and Verpackungsverordnung VVO include reusable quotas for beverage packaging and integrate the EU Single Use Plastics Directive.
 - Focus on reducing single-use plastics and enhancing recycling infrastructure.
- **Waste Prevention Program (2023):**
 - Introduced 90 regulations targeting various sectors, emphasizing plastic reduction and promoting reusable packaging.
 - Goals include implementing reusable quotas for beverage packaging and banning single-use plastic bags.
- **Circular Economy Strategy and Actions:**
 - Austrian Circular Economy Strategy focuses on reducing packaging, promoting sustainable product design, and increasing secondary raw material usage.
 - Initiatives like the Action Plan Microplastics 2022-2025 and EU Plastics Strategy are integrated into national policies.
- **Waste Management Practices and Funding:**
 - Utilization of Yellow Bag/Container System for efficient collection and recycling of packaging waste.
 - Funding and support from agencies like FFG and BMK for innovation, technology development, and compliance with waste regulations.
- **Technology and Knowledge Providers:**
 - Organizations like Circular Economy Forum Austria and FH BFI Vienna offer educational programs and advocacy for circular economy principles.
 - Institutions such as Montan Universität Leoben and TU Wien contribute expertise in polymer recycling and sustainable processes.
- **Business Models and Practices:**
 - Companies like OMV, Borealis, and MGG Polymers lead in chemical and mechanical recycling technologies.
 - Initiatives like Vöslauer and Miraplast demonstrate sustainable product design and recyclable packaging solutions.
- **Industrial Groupings and Networks:**
 - Networks such as Kunststoff Cluster and Circular Futures advocate and support circular economy initiatives across sectors.

- Organizations like ARA and VOEB provide infrastructure and consultancy for waste management and resource efficiency.
- **Shortcomings and Barriers for Transformation:**
 - Challenges include enhancing recycling-friendly design, improving input material quality through separate collection, and increasing the use of recyclates in manufacturing.
 - Education, regulatory incentives, and consumer awareness are identified as critical factors for overcoming barriers to achieving circular economy goals.

Overall, Austria's approach integrates regulatory frameworks, technological innovations, and collaborative efforts across sectors to advance towards a sustainable circular economy by 2050.

Czech Republic

The Czech Republic's waste management and environmental protection efforts are guided by several key policies and support mechanisms:

1. **Legislation and Policies:**

- The Waste Act emphasizes waste prevention and promotes environmental and health protection.
- The Act on Limiting the Impact of Selected Plastic Products focuses on reducing plastic waste.
- The National Waste Management Plan (2015-2024) outlines strategies for waste handling and prevention.

2. **Business Support and Funding:**

- Programs like OP TaK and OPZP provide EU funds to support innovation and sustainability in Czech businesses.
- The Technology Agency of the Czech Republic supports R&D initiatives, focusing on circular economy principles.

3. **Technologies and Knowledge Providers:**

- Organizations like Czech Plastic Cluster and CYRKL facilitate innovation and collaboration in recycling and material sourcing.
- Companies such as REMAQ and REPLAST are involved in advanced material processing and plastic recycling technologies.

4. **Challenges and Transformation Potential:**

- Significant opportunities and challenges arise from recent EU legislative acts, such as the EU Taxonomy, which set stringent criteria for waste management and circular economy practices.
- Modernizing waste sorting and recycling technologies to meet EU standards is crucial for maintaining competitiveness and complying with new regulations.

Overall, the Czech Republic is actively working to enhance its waste management infrastructure and technologies, supported by robust legislative frameworks and strategic funding initiatives aimed at fostering sustainability and circular economy practices.

Germany

Germany's waste management policies and business support mechanisms, particularly in Baden-Württemberg (PP TZ Horb), are structured around comprehensive legislation and strategic initiatives promoting circular economy practices and environmental sustainability.

Policies and Legislation:

1. **Circular Economy Act (2012):** Promotes circular economy principles, resource conservation, and environmentally sound waste management. Recently aligned with the revised Waste Framework Directive, emphasizing waste prevention and increased recycling.
2. **KrWG (Closed Substance Cycle Waste Management Act):** Focuses on promoting circular economy practices and environmentally sound waste management.
3. **AVV (Waste Catalogue Ordinance):** Standardizes the classification of different types of waste for effective management.
4. **AbfAEV (Notification and Authorization Ordinance):** Regulates procedures for waste collectors, carriers, traders, and brokers.
5. **NachwV (Waste Disposal Records Ordinance):** Mandates record-keeping requirements related to waste disposal activities.
6. **AbfBeauftrV (Waste Management Officer Ordinance):** Defines roles and responsibilities for waste management officers.
7. **EfbV (Specialist Waste Management Companies Ordinance):** Addresses specialized waste management entities, technical inspections, and waste management associations.

Strategic Initiatives and Programs:

1. **Baden-Württemberg Climate Protection Act:** Focuses on reducing greenhouse gas emissions and integrating resource efficiency and circular economy practices.
2. **Circular Economy Strategy:** Promotes sustainable resource management, recycling, and the use of renewable materials across various sectors.
3. **Resource Efficiency Program:** Supports industrial sectors in adopting resource-efficient technologies and processes.
4. **Circular Economy Initiative Baden-Württemberg:** Drives innovation in resource management and supports circular economy projects.
5. **Sustainable Development Strategy:** Integrates circular economy principles into broader sustainable development goals.
6. **Regional Waste Management Plans (Abfallwirtschaftspläne):** Emphasize waste prevention, recycling, and effective disposal strategies.

Funding Schemes and Business Support:

1. **KfW Bankengruppe:** Offers various funding programs supporting sustainability, energy efficiency, and innovation.
2. **Environmental Innovation Program (Umweltinnovationsprogramm):** Supports large-scale environmental projects exceeding legal requirements.
3. **Zukunftsinvestitionsprogramm (Future Investment Program):** Funds future-oriented investments in green technologies and sustainable infrastructure.
4. **Central Innovation Program for SMEs (ZIM):** Supports R&D projects in SMEs, including those focused on sustainability and circular economy.

Technologies and Knowledge Providers: Germany boasts leading technology providers and research institutions driving innovation in sustainability and circular economy:

- **Siemens AG, SAP SE, Bosch Group:** Leaders in automation, digitalization, and sustainable technologies.
- **Fraunhofer Institute, Max Planck Society, Technical University of Munich (TUM):** Conduct cutting-edge research in renewable energy, green technologies, and sustainable manufacturing.

Role Model Companies and Practices:

- **Recycling Network Germany (RNG), Trigema, Werner & Mertz (Frosch), ALBA Group, Remondis:** Exemplify sustainable practices in recycling, resource efficiency, and sustainable material sourcing.
- **Eko-Plastic, Schrott24, STEINERT:** Innovate in recycling technologies and solutions.

Industrial Groupings and Networks:

- **BDI, DIHK, VCI, UTCB, bvse e.V., ARE e.V., DGAW e.V., CEID:** Foster collaboration, innovation, and policy advocacy in sustainability and circular economy.
- Networks such as Kunststoff Cluster (Innonet) support circular economy initiatives across sectors.

Shortcomings and Barriers:

- Challenges include inconsistent policies, limited sustainable material availability, technological limitations in processing, and inefficient waste collection systems.
- Opportunities lie in enhancing policy frameworks, investing in sustainable material development, advancing recycling technologies, and improving public engagement.

In summary, Germany's robust legislative framework, strategic initiatives, funding schemes, and collaborative networks underscore its commitment to advancing circular economy practices and sustainability across industries, promoting innovation and environmental stewardship.

Slovakia

Policies and Business Support:

- **Legislation and EU Directives:** Slovakia aligns its waste management laws with EU directives focusing on packaging waste and single-use plastics. These regulations set recycling targets and promote extended producer responsibility (EPR).
- **National Circular Economy Strategy:** Slovakia's strategy targets various sectors including plastics, emphasizing resource efficiency, waste reduction, eco-design, and recycling incentives.
- **Investment in Recycling Infrastructure:** Significant investments aim to enhance recycling facilities, improving collection, sorting, and recycling capabilities. Public awareness initiatives promote participation in recycling programs.
- **Collaboration and Partnerships:** The Slovak government collaborates with stakeholders to tackle plastic pollution through consultations, public-private partnerships, and joint initiatives.
- **International Engagement:** Active participation in international agreements facilitates knowledge exchange, funding access, and contributions to global sustainable development goals.
- **Environmental Focus:** Emphasis on sustainable production and trade practices to minimize environmental impact and achieve waste-free production.

Year	Act	Description	National Law
1994	Directive 94/62/EC on packaging and packaging waste	Aims to harmonize measures for packaging waste management, prevent environmental impact, ensure market function.	Yes
2015	Directive (EU) 2015/720 on lightweight plastic carrier bags	Addresses concerns about 'oxobiodegradable' bags, calls for environmental impact assessment.	Partially
2015	Circular Economy Action Plan	Comprehensive approach to plastic waste management.	Not
2018	European Strategy for Plastics in a Circular Economy	Updates 1994 Directive, increases recycling targets.	Not
2018	Directive (EU) 2018/851 on waste	Introduces Extended Producer Responsibility (EPR) schemes.	Partially
2019	Directive (EU) 2019/904 on single-use plastics	Prohibits market placement of certain single-use plastics.	Not
2019	The European Green Deal	Roadmap for no net greenhouse gas emissions by 2050.	Not
2020	New Circular Economy Action Plan	Proposes recycled content requirements and waste reduction measures.	Not
2020	Decision on taxes on nonrecyclable plastic	Imposes fees for non-recycled plastic packaging.	Not
2020	European Pact against Plastics	Sets common objectives for a circular plastics economy.	Not
2021	Guidance on single-use plastic products	Provides implementation guidelines for Directive (EU) 2019/904.	Not
2022	Regulation on recycled plastic materials in food contact	Ensures safe recycling processes for food contact materials.	Not

Technologies and Knowledge Providers:

- **Key Institutions:** Include the Institute of Natural and Synthetic Polymers, Polymer Institute of the Slovak Academy of Sciences, and VUCHV focusing on research and development in plastics.
- **Material Sourcing:** Companies like Chemosvit Fibrochem, ENVIROCARE, General Plastic, and SK-TEX engage in sourcing raw materials sustainably.
- **Waste Collection and Sorting:** Over 60 waste management companies operate regionally, supported by entities like Remarkplast Compounding and ELEKTRO RECYCLING.
- **Recycling Process:** Companies such as Kuruc Company spol. s r.o. and VUCHV utilize advanced technologies for plastic recycling.
- **Reintegration of Recycled Plastics:** Research and development efforts at Slovak Technical University and Slovak Academy of Sciences focus on reintegrating recycled plastics into production.
- **Product Design:** Companies like Kuruc Company spol. s r.o., VUCHV, and SK-TEX contribute to designing products with recyclability in mind.

Business Models and Practices:

- **Mass Production and Custom Manufacturing:** Utilizing technologies such as injection molding, extrusion, and 3D printing to meet industry needs efficiently and sustainably.
- **Sustainability Practices:** Increasing use of recycled materials, implementing circular economy principles, and adopting closed-loop systems.
- **Innovation:** Developing new materials, techniques, and product designs to enhance sustainability and efficiency.
- **Quality Control and Global Supply Chains:** Ensuring compliance with standards and regulations, managing global supply chains for resilience and efficiency.

Role Model Companies and Networks:

- **General Plastic, a.s.:** Leading in PET recycling, managing sourcing, processing, and recycling activities.

- **Slovak Plastic Cluster:** Promotes collaboration and innovation in the plastics sector, highlighting companies like PR Krajné, s.r.o., ESOX-PLAST s.r.o., and others involved in sustainable practices.

Shortcomings and Barriers – Potentials for Transformation:

- **Challenges:** Complex national support structures, supply chain issues, and low citizen education on waste management.
- **Opportunities:** Support for recycled products in procurement, reduced VAT for recycled materials, and enhanced information sharing and education on waste management.
- **Material Sourcing:** Challenges in material flow and life cycle assessments present opportunities for improved material sustainability.
- **Waste Collection and Sorting:** Enhancements in modern weighing technologies and national regulations can streamline waste collection and sorting.
- **Recycling Process:** Addressing challenges with infrastructure and information Shortcomings through specialized recycling equipment and enhanced knowledge sharing.
- **Product Design:** Opportunities lie in fostering innovation through sustainable technologies and university collaborations to drive forward-thinking product designs.

In conclusion, Slovakia's efforts in plastic recycling and circular economy initiatives reflect a commitment to sustainability, leveraging legislative frameworks, strategic investments, and collaborative partnerships to address environmental challenges associated with plastic waste. Addressing current challenges and capitalizing on emerging opportunities will be crucial for further advancing these efforts towards a more sustainable future

Moldova

Policies and Business Support:

- **Environmental Legislation Benefits:** Moldova's environmental legislation protects public health, promotes good governance, and stimulates economic growth through investor confidence and job creation.
- **Challenges:** Moldova faces financial constraints, limited technical capacities, and incomplete transposition of European regulatory frameworks, hindering effective environmental management.
- **National Policies and Strategic Documents:** These include the Waste Management Strategy (2013-2027), focusing on legal frameworks, reuse, recycling, and infrastructure modernization. Other strategies address climate change adaptation, emissions reduction, and sustainable chemicals management.

Funding Schemes and Business Support Measures:

- **Relevant Funding Schemes:** Moldova offers funding through programs like the Energy Efficiency Fund, Rural Development Program, and National Environmental Program, supported by international institutions like the World Bank and European Union. These aim to boost green businesses and environmental projects.
- **Business Support Measures:** Organizations like the Organization for Entrepreneurship Development provide financial, technical, and training support to SMEs and entrepreneurs in the green sector, fostering resilience and sustainable growth.

Technologies and Knowledge Providers:

- **Key Providers:** Institutions such as the Ministry of Environment, Technical University of Moldova, and NGOs like E-Circular and EcoVisio play crucial roles in advancing sustainable practices. They offer expertise, research, and advocacy in environmental sustainability and circular economy principles.

Business Models and Practices:

- **Key Sectors:** Moldova's construction, agriculture, hospitality, retail, electronic equipment, and textile industries are pivotal in adopting circular business models. Challenges include low recycling rates and consumption of single-use plastics, while opportunities lie in compostable plastics and sustainable design practices.
- **Role Model Companies:** Companies like Beccara Ltd., Gelibert Ltd., and Autovoiaj Ltd. are exemplary in waste management and recycling, contributing to Moldova's circular economy goals.

Shortcomings and Barriers – Potentials for Transformation:

- **Challenges:** Moldova faces issues such as limited recycling infrastructure, energy-intensive processes, and insufficient demand for recycled plastics. Opportunities include developing local recycling facilities, enhancing waste collection systems, and promoting eco-design principles.
- **Strategic Opportunities:** Strategic investments, policy reforms, and technological advancements are critical for Moldova to achieve a sustainable and circular plastics economy. Addressing these challenges will lead to improved resource efficiency, reduced environmental impact, and sustainable economic development.

In conclusion, Moldova is actively working towards enhancing its environmental legislation and supporting green businesses to foster a circular economy. By addressing existing challenges and leveraging opportunities in technology, funding, and policy, Moldova can significantly advance its plastic recycling efforts and promote sustainable development across various sectors.

Bosnia and Herzegovina

Policies and Business Support:

- **Key Waste Management Documents:** Bosnia and Herzegovina has established comprehensive waste management laws and strategies including the Waste Management Law and the Federal Environmental Protection Strategy 2022-2032. These frameworks set legal standards and goals for sustainable waste management and environmental conservation.
- **Business Support Measures:** The country promotes circular economy principles through various measures such as encouraging efficient material and energy use,

promoting waste reuse and recycling, and obligating manufacturers to manage product waste responsibly. Challenges include limited enforcement, awareness, and economic incentives favoring short-term gains.

Funding Schemes and Further Business Support Measures:

- **Relevant Funding Schemes:** Initiatives like EU4Energy and the Environmental Protection Fund of the Federation of Bosnia and Herzegovina provide financial support for green and circular business opportunities, municipal waste management efficiency, and environmental education projects.
- **Business Support Measures:** Programs like training on circular economy principles by Zenica Development Agency (ZEDA), mentorship programs for plastic reduction and recycling by GIZ, and support from the Environmental Protection Fund aim to foster sustainable practices among businesses.

Technology Providers in Bosnia and Herzegovina:

- **Key Providers:** Organizations like Center for Energy, Climate, Environment, Economy and Consulting d.o.o. Sarajevo, Center for the Environment Banja Luka, and Material Processing Companies like Grič Plast d.o.o. and Welt plast d.o.o. contribute to sustainable development through consulting, advocacy, and recycling technologies.

Business Models and Practices:

- **Role Model Companies:** Companies such as Variplast d.o.o. and Kesa d.o.o. exemplify sustainable practices by specializing in plastics processing, recycling, and innovative product design using recycled materials. These companies contribute significantly to waste management and environmental conservation efforts in Bosnia and Herzegovina.

Shortcomings and Barriers:

- **Sectoral Challenges and Opportunities:** Challenges include inadequate waste management infrastructure, high costs of recycled materials, and low consumer demand for sustainable products. Opportunities lie in expanding recycling infrastructure, optimizing waste sorting processes, and promoting circular design principles to enhance recyclability and market demand for recycled materials.

In conclusion, Bosnia and Herzegovina is actively working towards integrating circular economy principles into its waste management strategies and business practices. Addressing current challenges through policy reform, financial support, technological innovation, and public awareness campaigns will be crucial for advancing towards a more sustainable and circular economy in the country.

Serbia

Policies and Business Support:

- **Policy Framework:** Serbia has developed a robust regulatory framework integrating circular economy principles, including laws like the Environmental Protection Law and Climate Change Law. Strategic documents such as the Roadmap for Circular Economy and the Green Agenda for the Western Balkans outline Serbia's path towards sustainability.
- **EU Directives Influence:** Serbia aligns its policies with EU directives like "Towards a Circular Economy" and the "Circular Economy Action Plan," enhancing guidance and standards for sustainable development.
- **Funding and Business Support:** Initiatives like the Innovation Vouchers Program, "EU for the Green Agenda in Serbia," and the Sustainable Europe Investment Plan provide financial support for green projects and innovation. The Center for Circular Economy of the Serbian Chamber of Commerce facilitates partnerships and promotes circular business models.

Technologies and Knowledge Providers:

- **Key Providers:** Institutions like the Center for Green Economy at the University of Kragujevac and the Faculty of Organizational Sciences at the University of Belgrade offer educational modules and consulting services. They focus on implementing circular economy practices, sustainable development reporting, and fostering collaboration between academia and industry.

Business Models and Practices:

- **Role Model Companies:** Companies such as CirEkon, Banca Intesa Beograd, and SGS Serbia demonstrate leadership in circular economy practices. They integrate sustainability into business strategies, promote circular product lifecycle management, and support environmental stewardship through partnerships and financing initiatives.

Industrial Groupings and Networks:

- **Relevant Networks:** Organizations like Smart Kolektiv and the Association of Recyclers of Serbia collaborate with businesses and civil society to advance circular business models. They offer support through training, development, financing access, and advocacy for sustainable practices.

Shortcomings and Barriers:

- **Challenges:** Serbia faces regulatory, institutional, financial, material sourcing, waste management, reintegration of recycled plastics, and product design challenges in transitioning to a circular economy.
- **Opportunities:** Potential exists in regulatory alignment, material sourcing innovations, waste management improvements, recycled plastics integration, and circular product design advancements to accelerate Serbia's circular economy transformation.

Conclusion: Serbia's efforts in adopting circular economy principles are pivotal for addressing environmental challenges, fostering sustainable economic growth, and meeting international standards. Overcoming existing barriers through strategic implementation and collaboration will be crucial for realizing the full potential of circularity in Serbia's economic and environmental development.

Romania

In Romania, various policies and strategic documents aim to foster a circular economy in the plastics industry through comprehensive legislative frameworks and strategic planning:

Circular Economy Initiatives in Romania:

1. Legislative Frameworks and Policies:

- Adherence to EU directives and Romanian laws mandating waste hierarchy, recycling targets, and bans on specific plastic products.
- Introduction of a Circular Economy Levy (Law No. 175/2023) to promote sustainable practices.
- Implementation of the National Strategy for the Circular Economy (NSCE) to promote circular practices across various sectors.

2. Strategic Documents:

- Inclusion of circular economy principles in Romania's National Strategy for Sustainable Development 2030.
- Adoption of the Circular Economy Action Plan for Romania (PAEC) focusing on plastics in packaging, construction, and electronics.
- Integration of circularity initiatives in the National Recovery and Resilience Plan (NRRP) supported by EU funding.

3. Operational Policies:

- Implementation of waste collection and recycling policies such as the guarantee-return system for non-reusable packaging and methodologies for recycling plastic materials.

4. European and International Alignment:

- Alignment with EU directives and strategic frameworks to ensure consistency and effectiveness in promoting circular economy practices.

Conclusion: In summary, Romania's approach integrates legislative measures, strategic planning, and operational policies to advance circularity in the plastics industry, aiming for sustainable resource use, waste reduction, and enhanced recycling capabilities. These efforts are part of broader EU and global commitments to environmental sustainability and circular economy principles.

Business Business Models and Practices:

- **Material Sourcing:** Companies like MF PLAST SERV, PetStar Recycling, RomCarbon, and Cardinal SRL focus on recycling various plastic materials.
- **Material Processing:** Harplast and REMATINVEST offer comprehensive plastic processing services and industrial waste collection and processing.

- **Waste Collection/Sorting:** TeraPlast and Plastic Recycling Export specialize in waste collection, sorting, and recycling of various plastic materials.
- **Recycling Process:** PetStar Recycling and Plastic Recycling Export emphasize high-quality recycling processes for PET and HDPE.
- **Reintegration of Recycled Plastics:** GreenTech Romania and TeraPlast Recycling contribute significantly to reducing plastic pollution by producing recycled materials.
- **Product Design:** Cardinal SRL and Coca-Cola HBO Romania prioritize eco-design principles in their product development processes.

Relevant Industrial Groupings and Networks:

- ROCESP, CERC, RoRec, and 3R Green Cluster promote circular economy practices and innovations in plastic recycling.

Shortcomings and Barriers – Potentials for Transformation:

- Challenges include a complex regulatory landscape, inadequate collection infrastructure, and limited consumer awareness.
- Opportunities lie in legislative simplification, enhanced enforcement, investment in advanced technologies, and promoting public awareness.

This summary provides an overview of how businesses in Romania's circular plastics industry are adopting sustainable practices and addressing challenges to promote circularity effectively.

Overview of EU Laws, Regulations, and Directives Related to the Circular Economy Action Plan (Plan C)

The European Union has developed a comprehensive set of laws, regulations, and directives under the Circular Economy Action Plan (CEAP) to promote sustainability and the circular use of resources. Here are some key elements:

1. **Circular Economy Action Plan (CEAP):**
 - Launched in March 2020, this plan aims to make the EU economy circular and climate-neutral by 2050. It focuses on the entire lifecycle of products to ensure resources are kept in use for as long as possible.
 - **Key Areas:** Sustainable product design, empowering consumers, circularity in production processes, and waste management.
2. **Sustainable Products Initiative (SPI):**

- Proposes the Ecodesign for Sustainable Products Regulation (ESPR) to ensure products are designed sustainably from the start.
 - Focuses on increasing product durability, reusability, upgradability, and recyclability.
3. **Packaging and Packaging Waste Directive (PPWD):**
 - Revised to enhance the recycling and reuse of packaging materials.
 - Aims to reduce packaging waste and improve the sustainability of packaging materials used in the EU market.
 4. **Waste Framework Directive (WFD):**
 - Establishes measures to protect the environment and human health by preventing or reducing the adverse impacts of waste generation and management.
 - Sets recycling targets and waste reduction goals for member states.
 5. **European Green Deal:**
 - A broader initiative that encompasses the Circular Economy Action Plan.
 - Targets achieving climate neutrality by 2050 through policies including those on circular economy, biodiversity, and pollution reduction.
 6. **Right to Repair Directive:**
 - A proposed directive to make it easier for consumers to repair goods instead of discarding them.
 - Includes obligations for manufacturers to design products that are easier to repair and maintain.
 7. **Green Claims Directive:**
 - Aims to prevent greenwashing by ensuring companies make verifiable and transparent environmental claims about their products.
 - Promotes accurate information about the environmental impact of products and services.
 8. **Microplastics Regulation:**
 - Targets the reduction of microplastic pollution through measures such as preventing pellet losses and addressing intentionally added microplastics.
 9. **Sustainable Batteries Regulation:**
 - Focuses on ensuring that batteries placed on the EU market are sustainable, high-performing, and safe throughout their lifecycle.
 - Includes measures for battery collection, recycling, and repurposing.

These initiatives are part of the EU's effort to transition to a circular economy, which aims to minimize waste and make the most of resources. By implementing these laws and directives, the EU seeks to promote sustainability, reduce environmental impact, and foster economic growth through innovative practices and resource efficiency.



Conclusion

Hungary, the Czech Republic, and Romania as non EU-Countries, share very similar objectives in emphasizing recycling, implementing Extended Producer Responsibility (EPR) systems, and aligning their policies with EU directives. Their key challenges include modernizing recycling infrastructure, improving waste handling technologies, and addressing regulatory complexities. Collaborative efforts with technology and knowledge providers, as well as innovative business models, are crucial for enhancing their recycling processes and achieving circular economy goals.

Country	Key Policies & Objectives	Implementation & Legislation	Challenges & EPR System	Technology & Knowledge Providers	Business Models & Practices	Recycling Process
Hungary	Emphasis on recycling and EPR, Climate and Nature Protection Action Plan (KTA).	National Waste Management Plan (OHT), updates to align with EU directives.	Insufficient recycling rates for industrial and household waste, EPR mandatory from July 2023.	Environmental service associations, universities, companies like Poliloop and Cellugy	Innovative waste collection and recycling approaches like UgrinPack-Erdősi Kft.'s bio-composting pilot.	Limitations in recycling infrastructure, focus on producing food-grade recyclates.
Czech Republic	Waste Act, Act on Limiting the Impact of Selected Plastic Products	National Waste Management Plan (2015-2024), focusing on waste handling and prevention.	Modernizing waste sorting and recycling technologies to meet EU standards.	Czech Plastic Cluster, CYRKL, companies like REMAQ and REPLAST.	Support for innovation and sustainability through programs like OP TaK and OPZP.	Focus on advanced material processing and plastic recycling technologies.
Romania	Circular Economy Levy, National Strategy for the Circular Economy (NSCE).	Circular Economy Action Plan for Romania (PAEC), National Recovery and Resilience Plan (NRRP).	Complex regulatory landscape, inadequate collection infrastructure, limited consumer awareness.	Companies like MF PLAST SERV, PetStar Recycling, RomCarbon, and Cardinal SRL in material processing.	High-quality recycling processes for PET and HDPE by companies like PetStar Recycling and Plastic Recycling Export.	Focus on enhancing recycling capabilities and promoting eco-design principles.

There are also other countries with similar objectives and requirements focused on recycling, circular economy, and alignment with EU directives. Below we have listed an overview with the additional countries:

Country	Key Policies & Objectives	Implementation & Legislation	Challenges & EPR System	Technology & Knowledge Providers	Business Models & Practices	Recycling Process
Austria	Waste prevention, reducing single-use plastics, reusable packaging quota	Abfallwirtschaftsgesetz (AWG) and Verpackungsverordnung (VVO), Waste Prevention Program 2023.	Enhancing recycling-friendly design, improving input material quality.	Circular Economy Forum Austria, Montan Universität Leoben, TU Wien.	Companies like OMV, Borealis, MGG Polymers in chemical and mechanical recycling technologies.	Focus on reducing packaging, sustainable product design, and secondary raw material usage.
Germany	Circular Economy Act, KrWG (Closed Substance Cycle Waste Management Act).	Regional Waste Management Plans, Circular Economy Strategy, Resource Efficiency Program.	Inconsistent policies, limited sustainable material availability, inefficient waste collection systems.	Siemens AG, SAP SE, Bosch Group, Fraunhofer Institute, Max Planck Society, Technical University of Munich (TUM).	Companies like Recycling Network Germany (RNG), Trigema, Werner & Mertz (Frosch), ALBA Group, Remondis.	Advanced recycling technologies and solutions, integrating resource efficiency and renewable materials.
Slovakia	National Circular Economy Strategy, focusing on plastics.	Investment in recycling infrastructure, alignment with EU directives.	Supply chain issues, low citizen education on waste management.	Institute of Natural and Synthetic Polymers, Polymer Institute of the Slovak Academy of Sciences, VUCHV.	Companies like Chemosvit Fibrochem, ENVIROCARE, General Plastic, SK-TEX in sustainable material sourcing.	Advanced recycling processes and integration of recycled plastics into production.
Serbia	Environmental Protection Law, Climate Change Law, Roadmap for Circular Economy.	Aligning with EU directives, funding support through Innovation Vouchers Program, EU for the Green Agenda.	Regulatory alignment, material sourcing innovations, waste management improvements.	Center for Green Economy at the University of Kragujevac, Faculty of Organizational Sciences at the University of Belgrade.	Center for Green Economy at the University of Kragujevac, Faculty of Organizational Sciences at the University of Belgrade.	Companies like CirEkon, Banca Intesa Beograd, SGS Serbia in circular economy practices.

The presented countries are converging towards common objectives centered around recycling, the circular economy, and alignment with EU directives. This includes Hungary,

the Czech Republic, Romania, Austria, Germany, Slovakia, Slovenia, and Serbia. These countries are actively implementing comprehensive waste management strategies and policies aimed at reducing waste, preventing single-use plastics, and increasing the use of recyclable materials. They are leveraging partnerships with technology providers, academic institutions, and innovative companies to develop and implement sustainable recycling solutions. By promoting business models that emphasize sustainability, they are fostering a more integrated approach to waste management.

The shared objectives and collaborative efforts of these countries highlight a strong regional commitment to achieving sustainable waste management and advancing the circular economy. Continued investment in technology, infrastructure, and public awareness, along with supportive regulatory frameworks, will be crucial in overcoming the challenges and realizing the full potential of these initiatives.