

Transnational Action Plan for integrating circularity in the entire plastics value chain in the Danube Region

Output 3.2

Responsible Partner: SPK

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Introduction

The Transnational Action Plan is co-created by the project partners to present a set of recommended measures for integrating circularity into the entire plastics value chain of the Danube region.

Based on jointly developed and transnationally oriented strategies for the addressed sub-sectors (plastics processors and the machine industry) of the plastics value chain, the learnings from pilot activities are integrated into one Transnational Action Plan for circularity in the plastics value chain. The Transnational Action Plan considers the differing development statuses and circularity levels of the plastics value chain across all consortium partner regions.

The measures of this Transnational Action Plan aim to support stakeholders in the plastics value chain during the green transition to a more circular economy.

1. Methodology for the preparation of a Transnational Action Plan

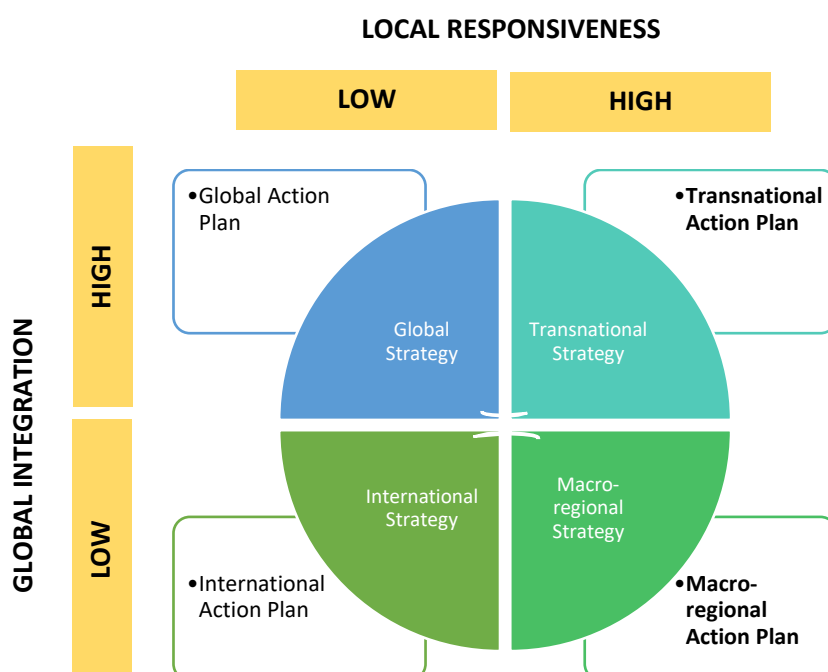
A **transnational action plan** is a strategic document prepared by several countries or regions together to solve a common problem or achieve a common goal that goes beyond the borders of a single state.

Workshops were conducted at a macro-regional level grouping Germany with Austria, the Czech Republic with Slovakia, Hungary with Serbia and Bosnia and Herzegovina, and Romania with Moldova. They served as a **basic tool** for the development of the Transnational Action Plan, which is designed to anchor a strategic roadmap for the transition towards a circular plastic value chain. The country groups were established based on common and interconnected linguistic, historical, geographical, economic, and cultural ties, which are the pillars for cooperation in implementing these transnational actions.

Partners in these macro-regional groups worked on the creation of the Transnational Action Plan using a unified methodology - the **roadmap methodology**. The roadmap methodology is a strategic planning technique that maps objectives and key deliverables (tasks and milestones) onto a timeline, presenting everything together in a single visual. It consistently links strategy (the WHY), the actions required to achieve objectives (the WHAT), and the implementation timeline (the WHEN).

An overview of the EUSDR (EU Strategy for the Danube Region) and other relevant EU strategies in addition to a comprehensive assessment and comparison of the results from specific objective 1 (SO1) "Plastics Industry" and specific objective 2 (SO2) "Machine Industry" and the common solutions developed during the value chain-wide workshops provides another document "Transfer of the strategies from SO1/SO2 into an integrated framework for the entire value chain" (D.3.3.1).

Based on the unique characteristics of the partner regions and their shared challenges, this Transnational Action Plan outlines a series of strategic recommendations, goals, and measures. These initiatives were collaboratively developed by the Plan-C consortium to accelerate the transition to circular practices among stakeholders in both the plastics processing sector and the associated machinery industry.



Pic.1 The indicated figure demonstrates that the Transnational Action Plan accounts for high local responsiveness whilst, at the same time, being formulated in alignment with a high degree of global integration. Through the Transnational Action Plan, groups of countries within the Danube region are becoming more closely interconnected.

Technical description of data collection via macro-regional workshops

The following table summarises the data collection of holistic workshops proceeding and involved partners.

Involved country region	Partners	Participants
Germany (Baden-Württemberg) and Austria	TZ Horb/Innonet Kunststoff; Biz-Up; AWS	Cloeren GmbH, Ultra Polymers, SWS Packaging, Michael Kunststofftechnik, Ultra Polymers, KC Plastic Cluster, FCIO, SKZ, ICT Fraunhofer, BMIMI, Plastics Europe
Hungary, the Republic of Serbia and Bosnia and Herzegovina	Foundation for Innovation, Technology, and Transfer of Knowledge Innovation Centre, Faculty of Mechanical Engineering Omnipack First Hungarian Packaging Technology Cluster Innoskart Business Development Nonprofit Kft.	FITT, Employers' Association Gračanica, The Chamber of Economy of Tuzla Canton, Hungarian Plastics Association, Hungary, Business Incubator Novi Sad doo, FEFA Faculty, Chamber of Commerce and Industry of Serbia, Hungarian Economic Development Agency, ICMF, Faculty of Mechanical Engineering, University of Tuzla, Plastoflex, Secretariat for Environmental Protection City of Belgrade, Innoskart, City of Gracanica
Slovakia and the Czech Republic	Slovak Plastic Cluster, Technical University of Košice, and Plastic Cluster Zlin, Tomas Bata University in Zlin	Academia, experts in the plastics and machinery industry, key users and intermediaries, regional innovation policy individuals and associations.

Romania and Republic of Moldova	CLUSTERO, ICMPP & SORINTEX	ICMPP and CLUSTERO, Romania, SORINTEX, Republic of Moldova.
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Input information by macro-regions for the creation of an action plan

Machine Producers and Plastics Processors have previously identified hurdles in the circularity of their products. Ways to “lift” each other over said hurdles have been proposed. Input from the realized workshops was used to derive a roadmap towards circularity for each macro-regional group. Possible starting points for cooperation were established.

Brief description of the roadmap resulting from the macro-regional workshops held by Germany (Baden-Württemberg) and Austria:

The transnational workshops in this macro-region revealed that the circular transition in both the plastics and machine industries is primarily hindered by structural design deficits, economic pressure, regulatory complexity, and technological uncertainty.

Key high-impact barriers identified in the workshop include:

- Poor design of products and machines for recycling, repair or reuse (Impact: very high)
- Lack of modularity and mixed materials complicate recycling in machinery
- Recycling showing fluctuating material properties and contamination risks
- High investment costs for circular technologies
- Complex certifications and regulatory requirements
- Expensive transport, storage, and take-back logistics

The roadmap therefore focuses on three strategic transformation pillars per sector:

1. Circular Design & Modularity
2. Economic Feasibility & Competitiveness
3. End-of-Life Systems & Traceability

Brief description of the roadmap resulting from the macro-regional workshops held by Slovakia and the Czech Republic:

Key high-impact barriers identified in the workshop include:

- Plastics Design (Material and Technology) - uniformity of plastic product groups, simple end-of-life separation for multi-material products, and the utilisation of alternative materials
- Manufacturing Process overall equipment effectiveness, the share of recycled material in production, innovation, and development,
- End of life (EOL) - the recycling rate of plastic products, the design of EOL, and environmental impact
- Design in the Machine industry (optimal design concept)
- Machine construction- competitiveness of machine manufacturing companies
- Recycling - ecologically and economically friendly separation of materials and liquids
- the proportion of recyclable materials in new machines, End-of-Life (EOL) management

A brief description of the roadmap resulting from the macro-regional workshops held by Hungary, the Republic of Serbia and Bosnia and Herzegovina:

The macro-regional roadmap for this group was developed through a structured roadmap methodology applied during the sectoral (SO1 – Plastics Industry, SO2 – Machine Industry) and holistic value chain workshops.

In the first phase, plastics producers and machine manufacturers independently identified the most critical lifecycle stages influencing circularity. For the plastics sector, production, recyclability, material uniformity, and collection systems were identified as structural bottlenecks. For the machine industry, the design phase and the use & maintenance stage were recognised as the highest-impact leverage points for circular transformation.

Participants then analysed **key hurdles** such as:

- Low economic competitiveness of recycled materials,
- Insufficient standardisation,
- Technological limitations of existing equipment,
- Weak reverse logistics systems,
- Limited cross-sector coordination

During the holistic workshop, these sectoral findings were integrated into a cross-value-chain perspective. The discussion moved from isolated technical barriers toward systemic transformation pathways. Special emphasis was placed on aligning ambitious circular economy goals with realistic technological and economic conditions in the macro-region.

As a result, the roadmap was structured along **three strategic dimensions for each sector**:

For the Plastics Industry:

1. Circular product design and material standardisation,
2. Manufacturing efficiency and regranulation quality improvement,
3. Collection, recycling, and end-of-life system integration.

For the Machine Industry:

1. Circular machine design and modularity,
2. Retrofitting, digitalisation, and lifecycle extension,
3. End-of-life systems, remanufacturing, and reverse logistics.

The process clearly demonstrated that circularity in the plastics value chain cannot be achieved through isolated sectoral actions. Instead, it requires coordinated macro-regional intervention combining regulatory alignment, industrial innovation, financial instruments, and knowledge transfer

Brief description of the roadmap resulting from the macro-regional workshops held by Romania and the Republic of Moldova:

The **third transnational workshop** built on prior sessions to define a strategic pathway for circularity across the plastics value chain.

Key priority areas were identified:

- Waste collection
- Waste sorting
- Reintegration of recycled materials
- Design for circularity
- Reuse & repurposing

Participants translated these priorities into **actionable measures:**

- Immediate/short-term interventions: awareness campaigns, local collection points, pilot sorting initiatives
- Medium- and long-term actions: legislative reforms, large-scale recycling infrastructure, sector-wide circular design standards, integration of circular economy principles into education and industrial practice

Impact:

- Structured, results-driven framework for circular transformation
- Improved resource efficiency and material recovery
- Strengthened cross-border collaboration between Romania and Moldova
- Foundation for a sustainable and competitive plastics sector

2. Main Areas of the Transnational Action Plan

To integrate circularity into the entire plastics value chain, circular solutions must be considered for both plastics and the machinery used to process them. In the Transnational Action Plan, partners focus on three strategic transformation pillars for the plastics and machinery sectors:

- **Circular Design & Modularity:** Optimal design concepts and strategic design decisions.
- **Economic Feasibility & Competitiveness:** Process efficiency, construction, and technological adaptability.
- **End-of-Life (EOL) Strategies:** Systemic solutions at the end of a product's life (environmentally and economically viable, including reuse and repurposing).

The Transnational Action Plan includes measures for up to the next five years. It was developed based on the assessment of the collected roadmaps and actions derived from workshops held by the following macro-regional groups:

- Germany (Baden-Württemberg) and Austria
- Hungary, Serbia, and Bosnia and Herzegovina
- Slovakia and the Czech Republic
- Romania and the Republic of Moldova

Area 1: Circular Product and Machine Design (Material Standardisation & Modularity)

This area addresses the root causes of circularity limitations. Current challenges include:

- **Virgin material** is often significantly cheaper than recycled alternatives.
- **Recyclate quality** remains inconsistent.
- **Existing equipment** is frequently unsuitable for processing recycled materials.
- **Multilayered products** (non-monomaterials) are difficult to recycle.

Design decisions are the structural root cause affecting recycling efficiency, feedstock purity, and cost competitiveness. **Design and Material Selection** have been identified as the most critical stages in machine circularity, as early decisions determine repairability, disassembly, material recovery, and retrofit feasibility.

Area 2: Manufacturing Process & Competitiveness

In addition to process optimisation, the efficiency of industrial solutions must be considered. This includes:

- Reducing high energy and water demands during production.
- Improving regranulation quality (addressing inhomogeneous feedstock).
- Retrofitting older machinery and implementing digitalisation.
- Utilising AI-based monitoring and predictive maintenance to extend machine lifecycles.

Area 3: End-of-Life Systems & Logistics

"End-of-Life" (EOL) refers to the point at which a product is no longer supported, maintained, or used. While plastic products should be collected, sorted, and recycled, machinery can be repaired, reused, or remanufactured.

Key issues to address in this area include:

- Dependence on imported waste and waste trading mechanisms.
- Coordination between waste management and industry.
- Reverse logistics and non-standardised components.
- Greenwashing (where organisations falsely promote products as sustainable without meaningful action) and the resulting low trust in recycled content.

Horizontal Area: Cross-Cutting Market & Regulatory Framework

The pillars listed above also account for cross-cutting issues between sectors (e.g., energy and transport) and the necessary coordination between various regulatory frameworks.

3. Common main Objectives within Areas of Interest

The objectives below represent what should be achieved in the defined areas.

Area 1: Circular Product and Machine Design (Material Standardisation & Modularity)

Objectives

1. Harmonise plastic product design across priority product groups to increase recyclability and material uniformity.
2. Promote the gradual substitution of virgin materials with technically viable recycled, bio-based, or durable alternative materials.
3. Increase the technical compatibility of plastic products with existing recycling and regranulation technologies.
4. Integrate design-for-circularity principles into new machinery development (*modular and repairable design principles*) across the macro-regions and subsequently in the Danube Region.
5. Standardise key machine components and interfaces to enable repairability, upgradeability, and interoperability.

Area 2: Manufacturing Process & Competitiveness

Objectives

1. Upgrade plastics processing technologies to improve the handling, stability, and quality of recycled material.
2. Reduce energy and water intensity in plastics production and regranulation processes.
3. Strengthen industrial quality control systems to ensure consistent recycle performance and product reliability.
4. Improve recycling quality and compatibility.
5. Upgrade existing machinery through retrofitting and digitalisation to extend operational lifetime and improve energy efficiency.
6. Implement predictive maintenance and AI-based monitoring systems to optimise machine performance and reduce downtime.

Area 3: End-of-Life Systems & Logistics

Objectives

1. Strengthen economic viability and traceability of circular plastic streams.
2. Establish structured remanufacturing and take-back systems.
3. Increase the availability and homogeneity of collected plastic waste streams within the Danube Region.
4. Establish coordinated macro-regional mechanisms linking waste management actors and plastics industry demand.
5. Align regulatory and economic frameworks to improve the financial viability of recycling and recycled material use.
6. Establish structured remanufacturing and refurbishment systems for industrial machinery in the Danube Region.

4. Transnational Action Plan: Areas, Objectives and Actions

The objectives below represent what should be achieved with the proposed actions within the estimated time frame. The time frames given for individual activities should be taken as a framework. The achievement of the specified objectives depends on external factors and on the possibility of implementation by individual or groups of regions and countries. This refers also to the availability to the financial resources, especially to the Interreg funding programmes, since the recent Interreg 2021-2027 programmes are coming to an end and Interreg 2028-2034 programmes are in development.

Area 1: Circular Product and Machine Design (Material Standardisation & Modularity)

Objective 1 & Actions	
Harmonise plastic product design across priority product groups to increase recyclability and material uniformity.	
1.1 Develop macro-regional design guidelines for recyclable and mono-material plastic products, and based on them, create common guidelines within the Danube Region (created a working group and accordingly developed guidelines within 3 years) 1.2 Establish cross-sector working groups (producers + recyclers + machine suppliers) to define standardised material families (within 1 year) 1.3 Propose legislative recommendations supporting material uniformity and design simplification at the level of the Danube Region countries (within 5 years)	
Indicators:	Financial resources:
- At least 3 priority product groups identified, and standardisation guidelines developed. - At least 20 companies adopted design-for-recyclability guidelines within 5 years. - One prepared legislative recommendation supporting material uniformity and design simplification.	- Horizon Europe, LIFE Programme EIT Manufacturing / EIT Raw Materials - National Innovation Funds - Ministry of Economy / Ministry of Environment support schemes - R&D tax incentives - Public procurement innovation funds - University-Business (R2B / U2B) co-financing - Industry cluster contributions - Corporate co-financing from participating companies - Shared funds or programme funds
Responsibility:	
- Strategic / Legislative Level (Ministries, Regulatory Authorities, Standardisation Bodies). - Coordination & Industry Level (chamber of commerce, clusters, associations).	

Objective 2 & Actions Promote the gradual substitution of virgin materials with technically viable recycled, bio-based, or durable alternative materials.	
2.1 Create a database of technically viable recycled and alternative materials (within 2 years) 2.2 Launch projects using recycled or bio-based materials in selected industries (within 3 years) 2.3 Develop economic incentive proposals (subsidies, tax relief, procurement criteria) to reduce the virgin–recycled price gap (within 5 years)	
Indicators: 1. Created a macro-regional material database operational within 2 years. 2. At least 5 companies implemented recycled or alternative materials in commercial production within 5 years. (<i>Demonstration projects</i>) 3. Proposed and supported at least one incentive to reduce the virgin–recycled price gap.	Financial resources: ▪ Horizon Europe, LIFE Programme EIT Manufacturing / EIT Raw Materials ▪ National Innovation Funds ▪ Ministry of Economy / Ministry of Environment support schemes ▪ R&D tax incentives ▪ Public procurement innovation funds ▪ University–Business (R2B / U2B) co-financing ▪ Industry cluster contributions ▪ Corporate co-financing from participating companies ▪ Shared funds or programme funds
Responsibility:	
▪ Strategic / Legislative Level (Ministries, Regulatory Authorities, Standardisation Bodies). ▪ Coordination & Industry Level (chamber of commerce, clusters, associations). ▪ Business Support Organisations	

Objective 3 & Actions

Increase the technical compatibility of plastic products with existing recycling and regranulation technologies

- 3.1 Conduct technical audits of selected product groups to assess recyclability gaps (within 3 years)
- 3.2 Prepare a pilot redesign projects improving recyclability in cooperation with recyclers and machine manufacturers (within 5 years)
- 3.3 Develop recycling compatibility testing protocols and quality benchmarks (within 3 years)

Indicator:

- 1. Three technical audits of selected product groups conducted to assess recyclability gaps.
- 2. At least 5 pilot product redesign projects completed within 5 years.
- 3. At least 3 harmonised recyclability testing protocols adopted regionally.

Financial resources:

- Horizon Europe, LIFE Programme EIT Manufacturing / EIT Raw Materials
- National Innovation Funds
- Ministry of Economy / Ministry of Environment support schemes
- R&D tax incentives
- Public procurement innovation funds
- University-Business (R2B / U2B) co-financing
- Industry cluster contributions
- Corporate co-financing from participating companies
- Shared funds or programme funds

Responsibility:

- Strategic / Legislative Level (Ministries, Regulatory Authorities, Standardisation Bodies).
- Coordination & Industry Level (chamber of commerce, clusters, associations).
- Knowledge & Technical Support (Universities and applied research institutes, Testing laboratories and certification bodies).
- R&D Level (Universities, Innovation Centres).

Objective 4 & Actions

Integrate design-for-circularity principles into new machinery development (*modular and repairable design principles*) across the macro-regions and subsequently in the Danube Region.

- 4.1 Develop circular machine design guidelines for the Danube region (within 2 years)
- 4.2 Organize joint design workshops between machine manufacturers, plastics processors, and recyclers with the aim of launching pilot projects applying circular design principles in new machinery models (within 3 years)
- 4.3 Launch pilot projects applying circular design principles in new machinery models (within 3 years)

Indicators:

- 1. One macro-regional circular machine design guideline developed within 2 years.
- 2. At least 10 machine manufacturers adopted circular design principles within 3 years.
- 3. Increased share of modular machine designs in participating companies by +20% within 3 years.

Financial resources:

- Horizon Europe EIT Manufacturing
- EIT Raw Materials
- LIFE Programme (Circular Economy)
- Interreg Danube / Interreg Central Europe
- National Innovation Funds
- Corporate R&D investment
- Private innovation capital / venture funds (advanced machinery solutions)

Responsibility:

- Coordination & Industry Level (chamber of commerce, clusters, associations).
- R&D Level (Universities, Innovation Centres).
- Business Support Organisations.

Objective 5 & Actions

Standardise key machine components and interfaces to enable repairability, upgradeability, and interoperability.

- 5.1 Identify priority components suitable for standardisation across manufacturers and develop a voluntary standardisation framework for machine parts and interfaces (within 3 years).

Indicator:

- 1. At least 5 priority machine components identified and standardised.

Financial resources

- Shared funds or programme funds
- National Innovation Fund
- EU funds

Responsibility:

- Strategic / Legislative Level (Ministries, Regulatory Authorities, Standardisation Bodies)
- Coordination & Industry Level (chamber of commerce, clusters, associations)
- Knowledge & Technical Support (Universities and applied research institutes, Testing laboratories and certification bodies)

Area 2: Manufacturing Process & Competitiveness

Objective 1 & Actions Upgrade plastics processing technologies to improve the handling, stability, and quality of recycled material	
1.1. Support retrofitting of plastics processing equipment for recyclate adaptability (sensors, control systems, material handling upgrades) (within 3 years) 1.2. Introduce AI-supported process optimisation systems to stabilise recyclate processing (within 3 years) 1.3. Develop joint technical training programmes for operators on processing secondary materials (within 3 years).	
Indicators: 1. At least 15 production lines retrofitted or upgraded within 3 years. 2. Reduced scrap rate in participating companies by 10% within 3 years and increased processing stability (measured by defect rate reduction) by 15% within 3 years. 3. At least 100 technical staff trained in recyclate processing within 3 years.	Financial resources: ▪ Cohesion Policy Funds ▪ Modernisation Fund (energy efficiency & decarbonisation) ▪ Just Transition Fund ▪ National Green Transition / Energy Efficiency Subsidies ▪ Development Bank loans (EBRD, EIB) ▪ Green investment loans ▪ Private sector CAPEX investment ▪ Green bonds / sustainability-linked loans ▪ Technology upgrade grants
Responsibility: ▪ Business Support Organisations ▪ Coordination & Industry Level (chamber of commerce, clusters, associations) ▪ Enterprise Level	

Objective 2 & Actions

Reduce energy and water intensity in plastics production and regranulation processes

- 2.1 Promote energy audits and resource efficiency assessments in plastics production facilities (within 2 years).
- 2.2 Support integration of renewable energy solutions (solar, waste heat recovery, water-loop systems) (within 5 years).

Indicator:

1. At least 10 companies implemented energy audit recommendations within 2 years.
2. Increased renewable energy share in participating facilities by +15% within 5 years.

Financial resources:

- ERDF (Operational Programmes for Competitiveness & Innovation)
- Cohesion Policy Funds
- Modernisation Fund (energy efficiency & decarbonisation)
- Just Transition Fund
- National Green Transition / Energy Efficiency Subsidies
- Development Bank loans (EBRD, EIB)
- Green investment loans
- Green bonds / sustainability-linked loans
- National energy agencies support scheme

Responsibility:

- Business Support Organisations
- Coordination & Industry Level (chamber of commerce, clusters, associations)
- R&D Level (Universities, Innovation Centres)
- Enterprise Level

Objective 3 & Actions

Strengthen industrial quality control systems to ensure consistent recycle performance and product reliability.

- 3.1 Introduce harmonised QC protocols for recycled feedstock (within 3 years).
- 3.2 Establish macro-regional material testing cooperation between universities and industry (within 5 years).

Indicator:

1. Reduced scrap rate in participating companies by 10% within 3 years.
2. Three collaborations established in material testing within 5 years.

Financial resources:

- Interreg/Horizon
- National and regional funds
- Automation and Industry 4.0 support programmes
- Development bank financing (EBRD, EIB)

Responsibility:

- Coordination & Industry Level (chamber of commerce, clusters, associations).
- Knowledge & Technical Support (Universities and applied research institutes, Testing laboratories and certification bodies)
- Enterprise Level.

Objective 4 & Actions

Improve the quality of the recycle and compatibility

4.1 Prepare a map of regional recycle suppliers (within 5 years).

Indicator:

1. Overview created

Financial resources:

- National and regional funds
- Private funds

Responsibility:

- Coordination & Industry Level (chamber of commerce, clusters, associations).
- Business Support Organisations

Objective 5 & Actions

Upgrade existing machinery through retrofitting and digitalisation to extend operational lifetime and improve energy efficiency

5.1 Implement retrofitting programmes for sensor integration and automation upgrades (within 3 years).

5.2 Introduce energy-efficiency upgrade schemes (motor replacement, electric transition, optimisation) (within 3 years).

5.3 Provide technical advisory services for retrofit feasibility assessment (within 5 years).

Indicators:

1. At least 20 machine units within 3 years retrofitted or upgraded.
2. Reduced energy consumption per machine by 10–15% within 3 years.
3. Extended operational lifetime of retrofitted machines by a minimum of 5 years (average projection).

Financial resources:

- National and regional funds
- Private funds
- Automation and Industry 4.0 support programmes
- Development bank financing (EBRD, EIB)

Responsibility:

- Business Support Organisations
- Coordination & Industry Level (chamber of commerce, clusters, associations)
- Enterprise Level

Objective 6 & Actions Implement predictive maintenance and AI-based monitoring systems to optimise machine performance and reduce downtime.	
6.1 Deploy AI-supported monitoring systems in selected pilot companies (within 3 years). 6.2 Develop macro-regional digital twin demonstration projects (within 5 years). 6.3 Organise specialised training programmes for AI-driven maintenance optimisation (within 2 years).	
Indicators: 1. Deployed AI-based monitoring systems in a minimum of 15 companies within 3 years. 2. Reduced unplanned downtime by 25% within 5 years and reduced defect-related material waste by 15% within 5 years. 3. 150 technical staff trained in predictive maintenance within 2 years.	Financial resources: ▪ Innovation Fund (industrial decarbonisation) ▪ Development bank financing (EBRD, EIB) ▪ Green loans and sustainability-linked financing ▪ Automation and Industry 4.0 support programmes ▪ Tax incentives for digitalisation investments
Responsibility: ▪ Coordination & Industry Level (chamber of commerce, clusters, associations). ▪ Business Support Organisations. ▪ Enterprise Level.	

Area 3: End-of-Life Systems & Logistics

Objective 1 & Actions Strengthen economic viability and traceability of circular plastic streams	
1.1 Introduce QR-based material traceability pilot or Digital product pass (within 3 years).	
Indicator: 1. At least 1 Material traceability pilot implemented.	Financial resources: ▪ Interreg/Horizon ▪ National and Regional Funds ▪ Private funds
Responsibility: ▪ Coordination & Industry Level (chamber of commerce, clusters, associations) ▪ Enterprise Level	

Objective 2 & Actions	
Establish structured remanufacturing and take-back systems	
2.1 Develop Component Return Incentive Programmes (within 5 years).	
Indicator: 1. Two Component Return Incentive Programmes developed within 5 years.	Financial resources: - Machine manufacturers - Recycling companies - Regional authorities - Clusters - Industry associations - Innovation labs - Logistics services
Responsibility: - Coordination & Industry Level (chamber of commerce, clusters, associations). - Business Support Organisations. - Enterprise Level.	

Objective 3 & Actions	
Increase the availability and homogeneity of collected plastic waste streams within the Danube region	
3.1 Improve coordination between municipalities and recyclers to optimise waste separation systems (within 3 years).	
3.2 Launch public awareness and behavioural change campaigns on proper sorting (within 3 years).	
Indicators: 1. Increased separate collection rate of plastics by +10% within 3 years. 2. Reduced impurity rate in collected plastic waste by 15% within 3 years.	Financial resources: - National and regional funds - Private funds
Responsibility: - Strategic / Legislative Level (Ministries, Regulatory Authorities, Standardisation Bodies). - Coordination & Industry Level (chamber of commerce, clusters, associations). - Business Support Organisations.	

Objective 4 & Actions

Establish coordinated macro-regional mechanisms linking waste management actors and plastics industry demand

- 4.1 Develop cross-border waste trading pilot mechanisms (within 2 years).
- 4.2 Develop or strengthen a digital platform for scrap exchange and secondary material matching across the Danube region (within 5 years).

Indicators:

1. One operational macro-regional scrap exchange platform developed within 2 years.
2. At least 20 cross-company material exchange transactions annually after platform launch developed.

Financial resources:

- National and regional funds
- Private funds

Responsibility:

- Coordination & Industry Level (chamber of commerce, clusters, associations).
- Business Support Organisations.
- Enterprise Level.

Objective 5 & Actions

Align regulatory and economic frameworks to improve the financial viability of recycling and recycled material use.

- 5.1 Develop macro-regional policy recommendations introducing financial incentives for recycled material use (within 2 years).
- 5.2 Advocate gradual regulatory alignment with technical recycling limits to avoid unrealistic targets (within 5 years).

Indicators:

1. One joint macro-regional policy recommendation document developed within 2 years.
2. At least 2 regulations introduced at the national level aligned with the technical limits of recycling within 5 years.

Financial resources:

- Public-Private Partnerships (PPP)
- Private equity and industrial investors
- National and regional funds
- Private funds

Responsibility:

- Strategic / Legislative Level (Ministries, Regulatory Authorities, Standardisation Bodies)
- Coordination & Industry Level (chamber of commerce, clusters, associations)
- Knowledge & Technical Support (Universities and applied research institutes, Testing laboratories and certification bodies)

Objective 6 & Actions Establish structured remanufacturing and refurbishment systems for industrial machinery in the Danube region.	
6.1 Develop circular procurement criteria for machinery acquisition and propose policy recommendations introducing circular performance requirements in public procurement (within 2 years).	
Indicators: 1. One macro-regional circular procurement guideline developed within 2 years.	Financial resources: - National and regional funds - Private funds
Responsibility: - Strategic / Legislative Level (Ministries, Regulatory Authorities, Standardisation Bodies). - Coordination & Industry Level (chamber of commerce, clusters, associations).	

5. Recommendations for implementing and evaluation of the Transnational Action Plan

This Transnational Action Plan, which aims to anchor the circular economy within the plastics value chain, is addressed to SMEs, large enterprises, Business Support Organisations (BSOs), sectoral agencies, and policymakers/public authorities.

Responsibility

To ensure tasks and activities are implemented, they must be assigned to specific stakeholders/actors/organizations responsible for coordinating or managing the given task.

Therefore, the following are suggested to be responsible for the implementation:

- Business Support Organisations
- Strategic / Legislative Level** (Ministries, Regulatory Authorities, Standardisation Bodies)
- Coordination & Industry Level** (chamber of commerce, clusters, associations)
- R&D Level** (Universities, Innovation Centres)
- Knowledge & Technical Support** (Universities and applied research institutes, Testing laboratories and certification bodies)
- Enterprise Level**

Evaluating an action plan means comparing how effectively the plan works in different contexts (e.g., economic level, region, or development status). A clear structure ensures consistent and meaningful evaluation.

Recommendation for evaluation criteria in the performance evaluation process

Use of the same evaluation criteria across all participating countries' organisations for comparability:

- **Relevance** - Does the action plan address the needs of each county group?
- **Effectiveness** - Are the intended outcomes being achieved?
- **Impact** - What long-term changes are visible?
- **Sustainability** - Will results last after the plan ends?

The most important thing to focus on is the **effectiveness** of the implementation of the action plan at the level of each country. Here, it is necessary to monitor the **implementation of goals and activities, and of course, the achievement of indicators**. The achievement of each goal is monitored in percentage. Given the differences between individual countries (industry, level of functioning of collection, separation, and recycling in individual countries, setting of national legislation, creation and drawing down of various funds that can be potential financial sources, etc.), there will be time **differences in the implementation of the objectives**.

Implementing organisations/bodies shall deliver a **report on the implementation of the relevant action of the transnational action plan** in accordance with the structure of Chapter 4. In the report on the implementation of objectives and activities, obstacles to fulfilment will be indicated, as well as other important information preventing the achievement of results.

The first evaluation of implemented actions is recommended to be carried out after 3 years, and the subsequent one after 5 years. The responsible organisations shall communicate with each other during the implementation of the plan and seek common approaches.

6. Conclusion

The **Transnational Action Plan** is the key dissemination tool with **recommended actions** designed to ensure the uptake of project results by the value chain actors across industry, sustainability, and innovation policies within the partner countries. Serving as a primary reference and guidance tool for regional and national policymakers, it recommends concrete measures to support the adoption of sustainable circular solutions within the business and innovation ecosystems of the Danube countries in the future.

Based on jointly developed and transnationally oriented strategies for the addressed sub-sectors (plastics processors and machine manufacturers) of the plastics value chain, the learnings from pilot activities are integrated into one Transnational Action Plan towards circularity in the plastics value chain.