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Italy – Croatia

AWASTER

INTERREG ITALY-CROATIA
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AWASTER – Adopting WASTE as Resource

D.1.3.1 Joint Strategy on sustainable use of resources by the adoption of circular-economy principles

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INTERREG ITALY-CROATIA PROGRAMME 2021 – 2027
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Table of contents

Executive summary

This Joint Strategy sets out a shared vision between Italian and Croatian partners to promote the sustainable use of resources through the implementation of circular economy (CE) principles. Developed within the framework of the Interreg Italy-Croatia AWASTER project, the strategy targets two interconnected pillars: instilling CE values from an early age through education, and promoting sustainable practices in the private sector, particularly among businesses with the potential to reduce or repurpose waste. This Strategy is further strengthened by a commitment to long-term financial sustainability, robust policy integration, adaptive data-driven management, and proactive risk mitigation, ensuring its enduring impact.

The Strategy outlines a coordinated approach to raising awareness, fostering behavioural change, and building local capacity to transition toward circular models. It emphasizes collaborative action and regional integration in support of environmental sustainability, aiming to move beyond traditional linear consumption patterns towards a more regenerative and resilient economic system.

The key objectives of the Strategy are the following:

- Integrate circular economy principles into school programs and informal education. This involves developing comprehensive curricula and engaging pedagogical methods to foster a new generation of environmentally conscious citizens.
- Mobilize business stakeholders to adopt circular practices. This includes providing practical tools, training, and incentives for SMEs to innovate their processes, reduce waste, and create new circular business models.
- Establish frameworks for cross-border cooperation, knowledge exchange, and community involvement. This objective focuses on building robust networks and platforms that facilitate shared learning and collective action across the Adriatic Sea.

By developing this Strategy, AWASTER consortium aims to contribute to increased public awareness and education on circular economy principles, leading to a more informed and engaged citizenry capable of making sustainable choices. Furthermore, through the Strategy, AWASTER project partnership wants to strengthen business engagement in sustainable practices, resulting in reduced environmental footprints, increased resource efficiency, and new economic opportunities for local enterprises. Through the implementation of the AWASTER project, a scalable and transferable model

for other regions is expected to be developed, providing blueprints and best practices that can be adopted and adapted by other coastal areas facing similar environmental and economic pressures.

This Strategy is the foundation for the AWASTER Action Plan, which translates the strategic objectives into concrete actions across the Italy–Croatia programme area. Measures such as Green School networks, ReUse Centres, EcoLabs, waste-free events, and clean-up campaigns operationalise the vision outlined here, ensuring that the Strategy is not only a policy framework but also a driver of tangible, measurable change.

1. Introduction

Coastal regions in Italy and Croatia, renowned for their natural beauty and vibrant tourism sectors, face mounting environmental pressures due to overconsumption, seasonal tourism peaks, and inherent inefficiencies in resource management. These challenges are compounded by fragmented policies, limited infrastructure for material recovery, and low public awareness of sustainable alternatives, especially concerning waste generation and resource reuse. Past experiences with waste management have often focused on end-of-pipe solutions like landfilling or incineration, which, while necessary, do not address the root causes of resource depletion and pollution. This strategy acknowledges these historical approaches and seeks to implement a paradigm shift towards prevention and value retention. The increasing waste production, particularly plastic, poses severe threats to the environment and human livelihoods, affecting habitats, species, and ecosystems in general. This is a pervasive and complex societal problem with no simple solution, especially given that coastal tourism, a key economic activity, is highly impacted by significant waste generation, a portion of which ends up uncontrolled in the Adriatic Sea.

The transition toward a circular economy is critical for long-term sustainability, particularly in regions where economic activity depends heavily on tourism and local production. A linear "take-make-dispose" model is no longer viable given finite resources and increasing environmental degradation. This strategy was developed to provide a unified, cross-border framework for fostering circular thinking, reducing environmental impact, and supporting local development through education and business transformation. Its implementation is envisioned through a multi-stakeholder approach, involving close collaboration between public authorities, educational institutions, private enterprises, and civil society, ensuring that the shift towards circularity is inclusive and deeply embedded in regional practices. The project directly tackles the identified common challenges of fostering CE principles and improving the knowledge base on both the demand side (consumers, focusing on youth) and supply side (economy/manufacturing/tourism sector) regarding waste collection management, recycling, and promotion of waste reuse.

The AWASTER project is a flagship initiative within the Interreg Italy–Croatia Cross-Border Cooperation Programme. It brings together Italian and Croatian partners to implement joint actions that address shared environmental challenges, particularly in promoting circular economy principles

and reducing waste. The project officially started on March 1, 2024, and is set to conclude on August 31, 2026, with a total budget of €1,505,384.

The core aim of AWASTER is to shift from a traditional linear economic model (take-make-dispose) to a circular economy model by minimizing waste generation through education and experience exchange in the Italy-Croatia coastal areas. The project will enhance knowledge of waste management and recycling, thereby protect biodiversity and contribute to the fight against pollution.

The project includes a range of activities designed to build a culture of sustainability rooted in knowledge, participation, and cross-border solidarity. These activities encompass:

- **School-based educational initiatives** - Developing and delivering engaging curricula and hands-on activities for students of all ages. This includes establishing EcoLabs in five cross-border regions where students actively participate in creating new, innovative, viable products from collected waste, thus fostering creativity and practical skills in material reuse. These EcoLabs will also have a competitive character, with the most innovative products being rewarded and presented at the Final International Conference.
- **Pilot workshops with businesses** - Providing practical training and support for SMEs to implement circular practices, focusing on increasing resource productivity and decoupling economic growth from resource use and its environmental impact.
- **Public awareness campaigns** - Utilizing various media channels to inform and inspire citizens about the benefits of the circular economy. This also involves organizing waste-free events to showcase innovative solutions and demonstrate the feasibility of circular practices in real-world scenarios, combining them with the promotion of innovative solutions from EcoLab workshops.
- **Development of digital tools -** Such as a "Waste Footprint App" to help involved educational institutions identify waste issues they should target and measure the achieved reduction of generated waste by individual participants of educational activities.
- **Development of an Action Plan and training scheme** - To promote sustainable resource use and ensure the long-term impact and replicability of project outcomes. This includes a cross-border joint training program to increase the competences of key actors responsible for CE implementation, creating a circular economy hub of knowledge.

1.1. Scope and target audience

This Strategy is designed to be a guiding document for a diverse range of stakeholders, providing guidance, insights, and strategic directions for all involved in building a more circular, resource-efficient Adriatic region. The primary target audiences include:

- **Local and regional authorities in Italy and Croatia** - responsible for local environmental policies and regional environment strategies. They will be engaged in workshops, contribute to guidelines and the Joint Strategy and Action Plan, and implement educational activities. They will also benefit from better dialogue with the local level and increased capacity to network with key regional actors.
- **Educators and school administrators** - specifically elementary and high schools from both countries. Teachers will co-design guidelines for early adoption of CE principles, exchange experiences, and implement educational workshops, clean-up actions, and child-to-parent knowledge transfer. Their involvement in EcoLabs will improve competencies in innovative solutions.
- **SMEs and industry representatives:** - including companies from manufacturing, agriculture and tourism sectors, small hotels, restaurants. They will be targeted by educational approaches on low-resource economy schemes, participating in workshops to increase their competencies and knowledge on improving resource use and business efficiency. Waste management organizations, often locally owned, will also benefit from increased competencies.
- **NGOs and community organizations** - local and regional NGOs and associations focused on environmental protection and sustainable development. They will participate in project activities to bridge gaps between public and private sectors, mobilize communities in awareness campaigns, and replicate programs.
- **Policymakers and development agencies** - including Italian and Croatian Ministries in charge of national-level policy regarding education and waste prevention. They will benefit from AWASTER results to apply to national-level policies, ensuring they respond to local needs and implementation capacities, and addressing marine litter issues.
- **General public -** specifically the youth population in partner regions, and indirectly their households. They will participate in educational activities in schools, clean-up actions, and

local school events, raising awareness and changing habits related to waste production. The general public will also be targeted by social media, website news, and local media articles.

1.2. Joint development and stakeholders' involvement

The development of this Strategy and Action Plan was built by joint collaboration of AWASTER project partners and on extensive stakeholder engagement through 10 world-café workshops held across five Italy–Croatia regions (Apulia, Veneto, Neretva–Dubrovnik, Split–Dalmatia, and Istria) during September 2024 – February 2025. Participants included educators, students, SMEs, business associations, municipal utilities, NGOs, and policymakers. Discussions generated inputs for the educational (D.1.2.1) and business (D.1.2.2) guidelines and defined priority actions.

Across both countries and both sectors, common insights emerged: strong motivation but fragmented implementation, reliance on individual champions, infrastructure and service gaps, and the need to shift from basic recycling to full circularity concepts. Schools highlighted curriculum integration, teacher training, repair/upcycling labs, continuity of projects, and recognition schemes; businesses called for practical knowledge sharing, economic incentives, fit-for-purpose waste services, industrial symbiosis platforms, and clearer regulatory frameworks.

Joint measures proposed include education–business bridges, digital tools for monitoring, green public procurement, and tourism-focused solutions such as multilingual guidance and marina waste reception. These participatory findings shaped the Action Plan's concrete priorities, policy package, and investment list, and established a cross-border coordination group to maintain stakeholder ownership, ensure adaptive implementation, and embed lessons into ongoing governance.

2. Circular economy

As the core of the AWASTER project is promotion and adoption of circular economy principles, it is necessary to bring closer and explain what is all about. Circular Economy is an economic model that aims to eliminate waste and promote the continual use of resources. Unlike the traditional linear model (take-make-dispose), the circular economy is based on principles of designing out waste, keeping products and materials in use, and regenerating natural systems. It represents a fundamental shift in how we produce, consume, and manage resources, moving from a destructive linear flow to a restorative and regenerative cycle.

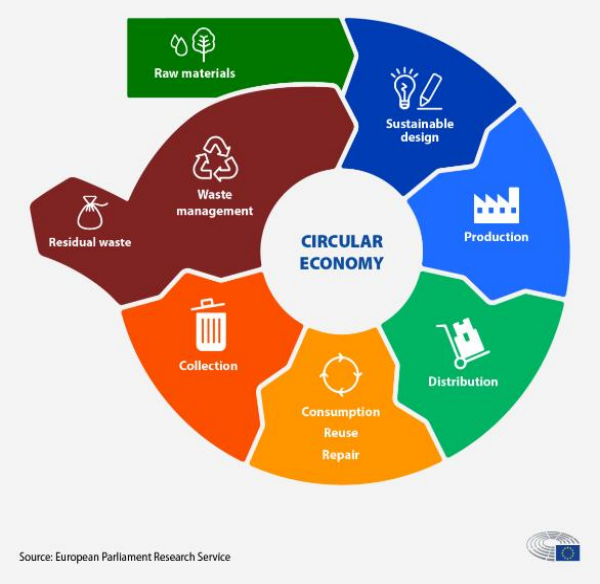

Figure 1 Infographic explaining the circular economy model. Source: European Parliament

For a long time, the global economy has predominantly followed a linear economic model, often summarized as "take, make, dispose" or "take-make-waste".[1] This approach begins with the extraction of raw materials, often at the expense of ecosystems.[2] These materials are then transformed into products through manufacturing processes.[3] Consumers purchase and use these

[1] https://www.europarl.europa.eu/topics/en/article/20151201STO05603/circular-economy-definition-importance-and-benefits
[2] https://romebusinessschool.com/blog/linear-economy/
[3] https://www.ellenmacarthurfoundation.org/what-is-the-linear-economy

products, driving economic growth. However, at the end of their lifecycle, these goods are typically discarded as waste, usually ending up in landfills or incinerators.
This unidirectional flow of resources poses significant challenges such as[4]:

- **Resource depletion** - the linear model relies heavily on finite natural resources, leading to their rapid depletion and increasing strain on ecosystems and biodiversity.
- **Environmental impact** - the disposal phase contributes significantly to pollution and environmental degradation, with landfills overflowing with non-biodegradable waste and incineration releasing harmful emissions, exacerbating climate change and air quality issues
- **Economic inefficiency** - valuable materials are lost in the disposal process, representing an economic inefficiency.
- **Planned obsolescence** - this model often incorporates planned obsolescence, where products are designed to have a limited lifespan to encourage repeat purchases.

The clear negative consequences of this approach—namely environmental damage and the loss of valuable materials—stem from poor resource and land management across multiple industries.

Figure 2: Linear economy flow diagram. Source: https://www.ellenmacarthurfoundation.org/circular-economy-diagram

Unlike the linear model, the circular economy is a system of production and consumption designed to be inherently restorative and regenerative. It emphasizes practices such as sharing, leasing, reusing, repairing, refurbishing, and recycling materials and products to prolong their useful life. The fundamental goal is to minimize waste generation. When products reach the end of their life cycle, their materials are retained within the economy through recycling, enabling continuous reuse and the creation of additional value.

[4] https://romebusinessschool.com/blog/linear-economy/

The key principles of a circular economy include the following:

1. **Design for longevity and reuse** – products are created to last longer, to be easily repaired, upgraded, and ultimately reused multiple times, minimizing the need for new raw materials. This includes modular design and the use of durable materials.
2. **Waste as a resource** – materials considered waste in one process become valuable input for another, creating closed-loop systems. This principle emphasizes the recovery and valorization of all materials, preventing them from being discarded.
3. **Systems thinking** – recognizes the interconnection between production, consumption, and environmental impact. It encourages a holistic view, considering the entire lifecycle of products and materials, and understanding how different elements of the economy interact.
4. **Regenerative processes** – activities that restore or enhance environmental health, such as composting, anaerobic digestion, and biodiversity-friendly land use. This concept goes beyond simply minimizing harm to actively improving natural systems.
5. **Business model innovation** – emphasizes new ways of delivering value, such as product-as-a-service models (where products are leased rather than sold), sharing platforms, and the development of circular supply chains that prioritize material recovery and reuse.

As a practical way to illustrate the circular economy approach, it can be described through the use of "R-strategies" — guidelines that help companies, consumers, and product designers operate in a more circular way. Although "Reduce, Reuse, and Recycle" are the most widely recognized, the R-framework includes many more concepts, with researchers identifying over 35 different "R" terms.

The R-paradigm forms a core principle of the circular economy, outlining practical "how-to" strategies that guide the transition toward circular systems. These strategies provide actionable pathways for achieving circularity in design, production, and consumption. A 2017 study titled "Conceptualising the Circular Economy: An Analysis of 114 Definitions[5] identified at least nine distinct R-strategies, along with numerous possible combinations.

[5] Kirchherr, J., Reike, D., Hekkert, M., 2017

These nine strategies are grouped into three categories based on the specific objectives they support within the circular economy framework:

Aim	**Strategy**	**Definition**
Produce and use products in a smarter way	R0 Refuse	Making the product superfluous by abandoning its function or offering the same function with a radically different product
To promote a fundamental shift in mindset by rethinking how products are designed, produced, and used – with the aim of reducing resource consumption and preventing waste generation at the source.	R1 Rethink	Making intensive use of a product (e.g. sharing)
Extend the life of the product and its components	R2 Reduce	Increase efficiency in the production or use of products by reducing the use of natural resources or materials.
To extend the lifespan of products and materials by encouraging their reuse for the same or similar purpose.	R3 Reuse	Reuse of a discarded product still in good condition and fulfilling its original function by a new consumer
To extend the lifespan of products by repairing and restoring them,	R4 Repair	Repair and maintenance of a malfunctioning product so that it can be used in its original function

thereby reducing the need for new production and minimizing waste generation.		
To improve and modernize existing products or materials by making significant repairs or upgrades, thereby extending their lifespan and enhancing performance while reducing resource consumption and waste.	R5 Renovate	Restore an old product and update it
	R6 Refurbish	Using discarded products or parts thereof in a new product with the same function
To extract valuable materials or energy from waste that cannot be reused, repaired, or recycled, minimizing environmental impact and maximizing resource efficiency.	R7 Requalify	Using discarded products or parts thereof in a new product with a different function
Useful application of materials	R8 Recycle	Process materials to obtain the same or lower quality
	R9 Recover	Energy recovery through material incineration

Table 1 The 9 R-strategies for the circular economy

In the context of Italy and Croatia's coastal regions, circular economy principles are essential for mitigating the ecological footprint of tourism and local industry. They support:

- **Reduced resource extraction and pollution -** by keeping materials in use, the demand for virgin resources decreases, leading to less mining, deforestation, and associated environmental damage.
- **Economic resilience through local innovation** - circular models contribute to local economies by creating new jobs in repair, remanufacturing, and recycling, reducing reliance on volatile global supply chains.
- **Improved waste management and reduced landfill reliance -** by diverting waste from landfills and incinerators, circular practices reduce pollution, conserve land, and create valuable secondary raw materials.
- **Enhanced community engagement and environmental awareness -** the participatory nature of circular initiatives encourages citizens to become active agents of change, fostering a deeper connection to the environment and the feeling of responsibility.

By embedding circular economy principles into education and business sectors, the Strategy fosters long-term cultural and operational shifts toward sustainability, creating a more resilient and environmentally sound future for the Adriatic region.

3. Resource dynamics, awareness, and the path to circularity in the Italy-Croatia coastal areas

The successful transition to circular economy in the Italy–Croatia coastal region depends on understanding how resources are currently used, managed, and perceived by different societal sectors. This chapter provides a contextual foundation for the Strategy by examining patterns of material flow, waste generation, and resource efficiency in both countries, alongside the existing level of knowledge and public awareness about circular economy principles.

The analysis highlights key similarities and differences between Italy and Croatia, identifying the structural, economic, and cultural factors that influence resource management performance. It also explores sector-specific challenges in education and business, revealing gaps in awareness and opportunities for improvement. The findings are consolidated in a detailed SWOT analysis, providing a clear picture of the region's readiness to embrace circular economy practices and the barriers that must be addressed to accelerate progress.

3.1. Analysis of sustainable resource use and waste management in Italy and Croatia

This section provides a comparative analysis of how Italy and Croatia approach the sustainable use of resources, emphasizing their material flow and consumption patterns in direct relation to waste generation, prevention, and management strategies. It highlights key differences and similarities in their efforts towards a more circular economy, drawing on recent data and policy initiatives.

3.1.1. Material flow, sustainable consumption, and waste generation patterns

Italy, as a highly industrialized and densely populated nation, navigates the complexities of substantial material flows through a growing emphasis on sustainable consumption and advanced waste management. Its Domestic Material Consumption (DMC) reflects the significant demands of its diverse economy, heavily influenced by sectors such as manufacturing (automotive, machinery, fashion), construction, and food and beverage production. While these sectors are inherently resource-intensive, Italy has demonstrated a strong commitment to decoupling economic growth

from primary resource extraction. This commitment is reflected in its consistently high circularity rate, which is significantly higher than Croatia's and often exceeds the EU average. This achievement is underpinned by a mature and sophisticated waste management infrastructure, particularly evident in the more economically developed northern regions, which excels in source separation, collection, and high-quality recycling of paper, glass, metals, and plastics.
However, the pursuit of sustainable resource use also faces challenges. Despite national progress, regional disparities in waste management performance persist, with some southern regions lagging in collection infrastructure and achieving lower recycling rates. The overall municipal waste generation per capita was 503 kg in 2019, highlighting the ongoing need for stronger waste prevention strategies and a shift towards less consumptive lifestyles. Policies promoting extended producer responsibility (EPR) schemes for various waste streams are instrumental in encouraging product redesign for durability and recyclability, thereby supporting more sustainable material loops. The strategic import of raw materials to fuel its manufacturing capabilities often contrasts with efforts to increase the uptake of secondary raw materials, a key aspect of sustainable resource use.

Croatia's approach to sustainable resource use is characterized by its ongoing transition from a linear to a more circular model, driven significantly by its EU accession and alignment with EU environmental directives. Its Domestic Material Consumption (DMC) is influenced by its natural resource endowments and evolving economic structure, with notable reliance on non-metallic minerals for construction (e.g., gravel, sand, construction rocks) and biomass for agriculture and energy. While blessed with significant renewable energy sources (hydro, wind, solar) that contribute to sustainable energy use, Croatia still grapples with a substantial reliance on imported fossil fuels, underpinning the need for continued energy transition efforts.

In terms of waste management, Croatia is actively working to modernize its systems and improve its circularity rate, which, while progressing (its value is rapidly increasing), still trails the EU average and Italy. Historical reliance on landfilling is being phased out through significant investments in sorting facilities, composting plants, and recycling infrastructure, often backed by substantial EU Cohesion Funds. However, waste generation per capita has been increasing, from 336 kg per capita in 2005. to 445 kg per capita in 2019., particularly in urban and tourist-heavy areas, highlighting the urgent need for robust waste prevention and reduction programs. The implementation of effective municipal waste separation schemes is crucial but varies in efficiency across different municipalities. Efforts are being intensified to manage specific waste streams more sustainably, such as packaging waste, bio-

waste (with growing interest in composting initiatives), and construction and demolition waste, aiming to recover valuable resources rather than simply disposing of them. The focus is increasingly on establishing an "eco-system of recycling" and promoting resource recovery through material valorisation.

3.1.2 Resource efficiency, circularity, and waste prevention strategies

This comparative analysis extends to understanding how both countries embed resource efficiency, circularity, and robust waste prevention into their economic and environmental strategies, critically linking resource use with waste outcomes.

Italy's higher resource productivity signifies its greater efficiency in converting material inputs into economic output, a testament to its long-standing industrial expertise and early adoption of certain circular principles. Its leadership in the EU's circular economy agenda is demonstrated through proactive policies aimed at increasing the uptake of secondary raw materials and fostering industrial symbiosis among businesses. Key waste prevention strategies include promoting the production and consumption of durable goods, actively encouraging repair and reuse initiatives (often culturally ingrained elements of Italian craftsmanship), and supporting eco-design principles in manufacturing to reduce waste at the source. The country's strong recycling industry is inherently linked to its sustainable resource use, as it provides high-quality secondary raw materials that significantly reduce the demand for virgin resources across various industries. Legislative frameworks, such as the National Strategy for Circular Economy, explicitly aim to reduce overall waste generation and enhance material circularity across various sectors, including packaging, textiles, and electronics, moving towards higher levels of the waste hierarchy.

Croatia is on a significant journey to enhance its resource efficiency and adopt more circular practices. Its relatively lower resource productivity compared to Italy indicates ample room for improvement through the optimization of industrial processes, enhanced waste segregation, and increased material recovery. Waste prevention strategies are gaining traction, with increasing emphasis on public awareness campaigns promoting reduced consumption, food waste prevention, and the encouragement of reuse and repair networks. The country's accession to the EU has been a powerful driver for aligning its waste management legislation with ambitious European targets, pushing for higher recycling rates and a substantial reduction in landfilling. Projects funded by the

EU are actively supporting the development of modern selective waste collection systems and infrastructure for bio-waste treatment and other specific streams, such as construction and demolition waste processing facilities. The ultimate goal is to transition from a traditional waste management paradigm to a comprehensive resource management approach, where waste is increasingly seen as a valuable resource for new products and economic activities. This fundamental shift is crucial for realizing the full potential of sustainable resource use within Croatia's growing economy.

3.2. Analysis of level of knowledge and the need for raising awareness about circular economy principles

This section assesses the current understanding of circular economy (CE) principles and highlights the critical need for increased awareness within the educational and business sectors of Italy and Croatia.

3.2.1 Educational sector

In both Italy and Croatia, there's a growing but still uneven integration of CE principles into formal education. At the primary and secondary levels, basic principles of "reduce, reuse, recycle" are often taught, though broader CE concepts like design for longevity or new business models are less common. However, specific projects and initiatives are emerging. For example, AWASTER project, explicitly aims to integrate circular economy principles into school programs and informal education, developing comprehensive curricula and engaging pedagogical methods to foster a new generation of environmentally conscious citizens. This involves developing and delivering engaging curricula and hands-on activities for students of all ages. Similarly, the FishNoWaste project (another Interreg Italy-Croatia cross-border collaboration) aim to raise awareness among stakeholders (fishermen, fishing organizations, fish markets, ports, local and national authorities, and the public) about issues related to waste reduction, its reusing, and recycling in fishing ports, with educational components targeting students and consumers in regions like Istria.

At the **higher education level**, universities in both countries are increasingly offering specialized courses, modules, or even entire master's programs in areas like sustainable development, environmental engineering, eco-design, and circular economy. Italian universities, given their

stronger research base, often have more established programs. In Croatia, efforts are underway, with some faculties (e.g., at the University of Zagreb) integrating CE topics into technical and economic studies. However, the depth of knowledge and the practical application skills taught can vary significantly. Extracurricular activities, workshops, and student-led initiatives also play a vital role in fostering CE awareness outside formal curricula.

The imperative for raising awareness in the educational sector is paramount for fostering a future workforce and citizenry capable of driving the circular transition. There's a strong need to:

- **Build foundational knowledge early:** Introduce CE principles from an early age, helping students understand not just waste management, but the entire lifecycle of products and the systemic nature of circularity.
- **Develop critical thinking:** Equip students with the ability to analyze environmental challenges from a holistic, CE perspective and to propose innovative, systemic solutions.
- **Promote interdisciplinary approaches:** Encourage curricula that blend economics, environmental science, engineering, design, and social sciences, as CE requires a multi-faceted understanding.
- **Emphasize practical application:** Move beyond theoretical knowledge to practical skills development through real-life case studies, projects, and hands-on experiences, such as the EcoLabs where students create new products from waste.
- **Bridge the skills gap:** Prepare students for emerging green jobs in the circular economy by providing relevant training and vocational education.

3.2.2 Business sector

Awareness and adoption of CE principles within the business sector vary significantly between and within both countries. In Italy, larger corporations and innovative SMEs, particularly those in sectors like fashion, automotive, and food & beverage, are increasingly exploring and implementing CE practices, often driven by consumer demand, regulatory pressure, and the pursuit of efficiency gains. Many Italian companies are pioneers in industrial symbiosis, where waste from one process becomes input for another. National strategies, such as Italy's National Strategy for Circular Economy, provide a guiding framework.

In Croatia, while awareness is growing, the practical adoption of CE principles by businesses, especially SMEs, is still nascent. Companies involved in waste management and recycling are naturally at the forefront. However, traditional industries often lack comprehensive understanding beyond basic recycling. Croatian companies are increasingly recognizing drivers like cost reduction (especially for raw materials), improved brand image for sustainability-conscious consumers (crucial in the tourism sector in Istria), and new market opportunities. Examples include initiatives to reduce food waste in hotels and restaurants, or companies exploring repurposing plastic waste into new products. Croatia's Smart Specialization Strategy also highlights CE as a priority area, guiding regional development plans.

The business sector faces significant challenges in fully embracing CE, primarily due to a knowledge gap and the complexity of shifting established models. Key areas for raising awareness include:

- **Targeted training and workshops:** Providing practical training and support for SMEs to implement circular practices, focusing on increasing resource productivity and decoupling economic growth from resource use and its environmental impact. The AWASTER project will organize two regional educational workshops for the economy sector (manufacturing, tourism) to raise awareness and propose business schemes for increasing resource productivity.
- **Promoting industrial symbiosis:** Facilitating networks and platforms for businesses to collaborate on resource sharing, waste exchange, and co-product development.
- **Clear information on regulations and funding:** Disseminating easily accessible information on regulatory frameworks, funding opportunities (especially EU funds like the Recovery and Resilience Facility, available until 2026), and market demand for circular products and services.
- **Highlighting business cases:** Showcasing successful CE examples and quantifying the economic benefits (cost savings, new revenue streams) to encourage wider adoption.
- **Leveraging digital tools:** Promoting the use of digital tools like the "Waste Footprint App" to help involved educational institutions identify waste issues they should target and measure the achieved reduction of generated waste by individual participants of educational activities. These tools are crucial for connecting businesses in the circular economy.

3.3. SWOT analysis for circular economy adoption in Italy-Croatia coastal areas

This section presents a comprehensive SWOT analysis for the adoption of circular economy principles in both countries, considering their specific contexts and current challenges/opportunities. This Strategy is intrinsically linked to and supports existing national and European regulatory frameworks aimed at promoting sustainability and circularity, including the EU Circular Economy Action Plan (2020), the EU Waste Framework Directive (2008/98/EC, revised 2018), and the EU Single-Use Plastics Directive (2019/904/EU), as well as National Waste Management Plans of both countries. The CE approach is identified as one of the cross-cutting challenges for the programme area and is strongly promoted in the UN Agenda 2030 and the European Green Deal.

The SWOT analysis is divided per each country, in order to present more detailed overview of both countries.

3.3.1 Strengths

Italy:

- **Strong industrial base and expertise:** Italy boasts a robust manufacturing sector with extensive experience in precision engineering, design, and complex production processes, offering immense potential for remanufacturing, repair, and high-value material recovery in sectors like automotive, textiles, and machinery.
- **Advanced recycling infrastructure:** The country has a relatively mature and effective recycling industry, particularly for paper, glass, and metals, contributing to a circularity rate often above the EU average, indicating existing capabilities and expertise.
- **Established policy framework**: Italy has developed a comprehensive National Strategy for Circular Economy, providing a clear strategic direction and supporting policy instruments to facilitate the transition.
- **Innovative SMEs:** A dynamic ecosystem of innovative small and medium-sized enterprises (SMEs) is actively exploring and implementing sustainable practices and circular business models, driving bottom-up innovation.
- **"Made in Italy" quality**: The cultural emphasis on high-quality, durable products and craftsmanship aligns well with CE principles of longevity and repair, distinguishing Italian products in global markets.

Croatia

- **Rich renewable energy potential**: Abundant hydro, wind, and solar resources provide a strong foundation for transitioning to a decarbonized and circular energy system, reducing reliance on fossil fuels.
- **EU membership and commitment**: Croatia's membership in the European Union necessitates alignment with ambitious environmental directives and the Circular Economy Action Plan, driving policy and investment towards CE goals.
- **Potential for eco-innovation:** There's an increasing focus on developing eco-innovative solutions, particularly in areas like green construction, waste valorization, and sustainable agriculture.
- **Access to EU funding**: Croatia benefits from substantial EU funds that can be leveraged to finance CE infrastructure, R&D, and SME initiatives.

3.3.2 Weaknesses

Italy

- **Regional disparities:** Significant variations exist in waste management and recycling infrastructure, particularly between the more advanced North and the Southern regions, hindering uniform CE progress and creating efficiency gaps.
- **Bureaucracy and regulatory complexity**: A sometimes cumbersome and complex regulatory environment can slow down the implementation of new circular economy initiatives and discourage innovation, leading to delays in project approvals.
- **Limited secondary raw material demand**: Despite the supply of recycled materials, a robust and consistent market demand for secondary raw materials is not always present in all key industries, leading to lower uptake and economic inefficiencies.
- **Information gaps**: A lack of consistent and precise information about resources, products, and processes across supply chains can impede effective circular design and management.
- **Risk of "Greenwashing":** Without robust verification and accountability mechanisms, there's a potential for companies to claim circularity without genuine environmental impact, eroding consumer trust.

Croatia

- **Lower R&D spending and weak industry-academia linkages**: Relatively low investment in research and development compared to the EU average and insufficient collaboration between scientific institutions and industry limit the creation and transfer of CE-specific knowledge and technologies.
- **Regional disparities:** As it is relevant for Italy, in Croatia also are present significant variations in waste management, recycling infrastructure and recycling rates between the regions.
- **Lower circularity rate**: Croatia's circularity rate, while improving, remains below the EU average and Italy's, indicating a greater need for systemic changes in resource management and waste prevention strategies.
- **Reliance on linear models:** Many traditional industries and businesses still operate predominantly within linear economic models, with a slow transition to circular approaches due to entrenched practices and lack of awareness.
- **Infrastructure gaps**: Inadequate broadband infrastructure in some rural areas can hinder the adoption of digital solutions crucial for circular economy management and data sharing, particularly relevant for smart waste management systems.
- **Brain drain and aging population**: Emigration of skilled young professionals and an aging population can impact the availability of a workforce capable of driving CE innovation and implementation, creating labor shortages in specialized fields.
- **Regulatory inertia:** Perceived over-regulation and a slower adoption of new business paradigms compared to more agile economies can impede CE growth and innovation.

3.3.3 Opportunities

Italy:

- **Developing secondary raw material markets**: Opportunities to create stronger markets for secondary raw materials through economic instruments like virgin materials taxes, reduced VAT on recycled content, and green public procurement mandates.
- **Green public procurement (GPP):** Leveraging GPP to create significant market demand for circular products, services, and construction materials across all levels of government, driving innovation in supply chains.

- **Investment in R&D and innovation:** Further investment in research into circular design, advanced recycling technologies, new circular business models, and digitalization for resource tracking, fostering technological leadership.
- **International collaboration:** Strengthening collaborations with other EU member states and international partners to exchange best practices, technologies, and market access in the circular economy space.
- **Digital transformation:** Utilizing digital tools and platforms for circular supply chain management, material traceability (e.g., Digital Product Passports), and waste valorization, enhancing transparency and efficiency.

Croatia:

- **EU funding utilization**: Maximizing the use of available EU funds (ESIF, RRF) for R&D, innovation, green infrastructure development (e.g., waste sorting plants), and SME support in circular economy initiatives.
- **Growth of sustainable tourism:** The increasing global demand for sustainable tourism presents a unique opportunity for Croatian destinations, to implement circular practices in accommodation, food services, and attractions, enhancing their competitive edge.
- **Construction sector modernization:** Opportunities to modernize the construction sector through green building standards, modular construction, and the increased use of recycled content in building materials, reducing construction waste.
- **Waste-to-Resource initiatives:** Significant potential for developing waste-to-resource initiatives, particularly for plastic waste, bio-waste (e.g., through anaerobic digestion for biogas), and construction and demolition waste, where current recycling rates offer room for substantial improvement.
- **National Action Plan on GPP:** Implementing the National Action Plan on Green Public Procurement to create demand for circular products and services across public tenders, stimulating a market for sustainable goods.
- **Niche market development**: Opportunities to develop niche markets for eco-innovative products and services that leverage Croatia's natural assets and cultural heritage, appealing to sustainability-conscious consumers.

3.3.4 Threats

Italy:

- **Resistance from established industries**: Strong vested interests in existing linear models within traditional industries could resist systemic shifts towards circularity, delaying necessary transitions.
- **Economic slowdowns:** Economic crises or slowdowns could divert focus and investment away from long-term CE transitions to short-term economic survival, hindering progress.
- **Global competition**: Intense competition from countries with lower labor and production costs could undermine the economic viability of some circular business models if not adequately supported by policy frameworks or market differentiation.
- **Insufficient policy implementation**: A risk that national CE strategies and regulations might not be effectively implemented or enforced across all regions, leading to limited practical impact and compliance gaps.
- **Limited consumer engagement**: Low consumer awareness or willingness to pay a premium for circular products/services if the perceived value is not clear, hindering market growth and scalability.

Croatia:

- **Lack of structural reforms**: A failure to implement broader structural reforms to improve the overall business environment (e.g., bureaucracy, efficiency of public administration) could impede CE growth and innovation.
- **Over-reliance on EU Funding**: A risk that CE initiatives might not be sustainable beyond the initial EU funding period if self-sustaining business models are not developed or if absorption rates for funds remain low.
- Slow digitalization adoption: A slower pace of digitalization across industries compared to EU leaders could put Croatian businesses at a disadvantage in leveraging digital tools for CE, such as advanced analytics for resource flows.
- **Economic seasonality**: The high seasonality of the Croatian economy due to tourism can make long-term investment in CE challenging for some businesses, as financial flows are often concentrated in short periods.
- **Continued emigration**: The ongoing departure of skilled labor can exacerbate the existing skills gap, particularly for specialized CE roles requiring technical or managerial expertise.

- **Global economic volatility**: External economic shocks could impact export-oriented industries and their capacity to invest in circular economy transitions, potentially shifting priorities away from long-term sustainability goals.

The detailed SWOT analysis reveals that while both Italy and Croatia possess distinct advantages for advancing circular economy principles, they also face common and unique challenges in achieving the Joint Strategy's ambitious objectives.

Italy's strengths, such as its robust industrial base and advanced recycling infrastructure, position it as a leader in certain aspects of circularity, offering a valuable model for its Croatian counterparts. However, regional disparities in waste management and bureaucratic complexities pose ongoing hurdles. Croatia, benefiting from significant EU funding and a growing commitment to sustainability, has considerable potential for eco-innovation and green tourism development. Yet, its lower circularity rate and weaker industry-academia linkages highlight areas requiring targeted development and capacity building. Crucially, the opportunities identified for both nations directly align with the Strategy's core pillars:

Education and Awareness: The strong potential for educational initiatives to build lifelong awareness, as highlighted in the SWOT, directly supports the Strategy's objective of instilling CE values from an early age through comprehensive curricula and engaging pedagogical methods.

Business Engagement: The identified opportunities for businesses to embrace sustainable practices, particularly with technical support and clear economic benefits, directly addresses the Strategy's aim to mobilize the private sector for waste reduction and the creation of new circular business models.

However, realizing these opportunities necessitates proactively addressing the identified threats and overcoming persistent barriers. These include the risk of insufficient policy implementation, economic slowdowns, and the pervasive challenge of limited public and business awareness. The Strategy's emphasis on long-term financial sustainability, robust policy integration, adaptive data-driven management, and proactive risk mitigation is thus critical. By leveraging their collective strengths, addressing weaknesses through targeted interventions, and seizing opportunities for

cross-border collaboration, Italy and Croatia can collectively advance towards a more regenerative and resilient economic system in the Adriatic region, moving beyond traditional linear consumption patterns as envisioned by the AWASTER project. The AWASTER project's activities themselves serve as a testament to how integrated interventions—spanning schools, businesses, and governance—can accelerate this shift.

SWOT analysis and regulatory framework

This strategy is intrinsically linked to and supports existing national and European regulatory frameworks aimed at promoting sustainability and circularity. Key directives and strategies include:

- EU Circular Economy Action Plan (2020): This ambitious plan sets out legislative and non-legislative measures to transition the EU to a circular economy, covering areas from sustainable product policy to waste reduction.
- EU Waste Framework Directive (2008/98/EC, revised 2018): Establishes the waste hierarchy (prevention, reuse, recycling, recovery, disposal) and sets targets for waste management.
- EU Single-Use Plastics Directive (2019/904/EU): Aims to reduce the impact of certain plastic products on the environment, particularly marine pollution.
- National Waste Management Plans: Both Italy and Croatia have national plans that outline strategies for waste prevention and management, which this Strategy seeks to reinforce and localize.

The Strategy leverages these existing frameworks while identifying areas for stronger regional alignment and practical implementation. The CE approach is identified as one of the cross-cutting challenges for the programme area and is strongly promoted in the UN Agenda 2030 and the European Green Deal. While programme regions have shown progress, significant disparities exist between the two countries, with Italy having a significantly higher circular material use rate than Croatia in 2019, though Croatia's value is rapidly increasing.

3.4. Existing barriers to circular economy adoption

The transition to a circular economy in Italy and Croatia faces significant challenges. Several critical barriers hinder the broad adoption of circular economy principles, necessitating coordinated efforts to address them.

A significant challenge is the lack of clear, consistent, and easily enforceable regulations that specifically support circular practices. While both countries have national strategies, the implementation often faces bureaucratic complexity and fragmentation. For instance, the process of obtaining "end-of-waste" status for recycled materials can be cumbersome and time-consuming, hindering their re-entry into the market as valuable resources. Furthermore, insufficient incentives, whether financial (e.g., inadequate tax breaks, limited subsidies for circular innovations) or non-financial (e.g., lack of streamlined permitting for reuse facilities), often mean that traditional linear models remain more economically attractive.

The high upfront investment costs associated with new circular technologies, such as advanced sorting plants, remanufacturing facilities, or circular design software, pose a significant barrier, especially for SMEs. Often, virgin raw materials are still cheaper than secondary raw materials due to historical market structures and the failure to internalize environmental costs, making it difficult for circular products to compete on price. Many businesses also struggle with a lack of clear, proven business cases that demonstrate the profitability and scalability of circular initiatives.

Both countries face technological readiness gaps in certain areas. While basic recycling is established, advanced recycling techniques for complex materials, large-scale remanufacturing, or efficient repair processes often require significant R&D and investment. The lack of standardized technologies for material sorting, processing, and quality control of secondary raw materials can reduce their purity and value, impacting market uptake. There's also a continuous need for further research and development in areas like sustainable material science, product design for disassembly, and innovative digital solutions for tracking resources throughout their lifecycles.

A fundamental challenge is the limited effective demand for circular products and services from both consumers and businesses. Moreover, robust and transparent markets for secondary raw materials are often underdeveloped, leading to price volatility and uncertainty for businesses relying on recycled content. Establishing efficient and cost-effective reverse logistics and collection systems for used products and materials remains complex, particularly for bulky or widely dispersed items. Finally, integrating design for circularity (e.g., designing products for durability, repairability, and recyclability from the outset) requires significant shifts in product development processes and often involves overcoming intellectual property concerns. There is also a weak collaboration between local

authorities, private stakeholders, and research institutions, limiting the potential for integrated solutions and shared learning across supply chains.

Despite growing interest, there's still lack of awareness and practical knowledge among citizens and businesses regarding the benefits and methods of circularity, often leading to a preference for familiar linear models. This includes insufficient educational content on circular economy in schools, resulting in a generation less equipped to embrace sustainable lifestyles and careers.
Deep-seated cultural and behavioural patterns also pose challenges. A prevailing consumer preference for new products over reused or repaired ones, often driven by marketing and perceived status, hinders the growth of reuse models. Resistance to change from traditional linear business models, especially within large, established industries, can be strong due to existing investments and entrenched practices. The dominant "ownership" mindset, where individuals prefer to own rather than access or share products, also limits the adoption of promising product-as-a-service models.

3.5. Opportunities for enhancing sustainability through circular economy

The circular economy offers a transformative pathway for Italy and Croatia to enhance their sustainability across environmental, economic, and social dimensions, unlocking significant benefits and fostering a more resilient future.

Adopting CE principles leads directly to profound environmental gains. It enables significant resource conservation by reducing the demand for virgin resources, leading to less mining, deforestation, and associated environmental damage. This also results in improved waste management and reduced landfill reliance, diverting vast amounts of waste from landfills and incinerators, which in turn cuts down on land use for disposal and minimizes pollution. By closing material loops, CE contributes directly to biodiversity protection by lessening the environmental footprint of production and consumption. Critically, it plays a vital role in climate change mitigation by reducing energy consumption in manufacturing processes and lowering greenhouse gas emissions from waste decomposition. For example, in Istria County, shifting towards circular tourism could significantly reduce the environmental impact of seasonal waste generation and resource consumption from hotels and restaurants. The problem of marine litter, particularly plastic, has an obvious cross-border dimension, making joint work essential for environmental protection.

The economic opportunities presented by the circular economy are substantial. It fosters new business models and job creation in emerging sectors such as repair, remanufacturing, recycling services, and the sharing economy, creating skilled green jobs and diversifying economic activity. By enhancing resource security, countries become less reliant on volatile global markets for raw materials, improving national and regional competitiveness and resilience to supply chain disruptions. Businesses can achieve significant cost savings through waste reduction, increased operational efficiency, and the valorization of materials previously considered waste. The CE also acts as a powerful catalyst for innovation and diversification, stimulating the development of new, high-value products and services, opening up new revenue streams and markets. This includes opportunities for new green jobs and competitive advantages. Furthermore, it promotes regional development by fostering local value chains, reducing transportation costs, and strengthening local economies, such as through localized food systems or material recovery hubs in areas like Pula. The plastics industry, important for the European economy, presents opportunities for improved recycling and reuse, with Italy having a remarkable role in the EU in this regard.

Beyond environmental and economic gains, the circular economy yields considerable social benefits. It contributes to improved public health and well-being by reducing pollution from waste and industrial processes, leading to cleaner air, water, and healthier living environments. Consumers gain enhanced product value and access to more durable, repairable, and affordable products, along with new service models that offer functionality without the need for outright ownership, potentially reducing financial burdens. The CE also encourages enhanced community engagement and environmental awareness through local initiatives like repair cafes, community composting programs, and participatory design, fostering social innovation and a sense of collective responsibility. It builds increased resilience and self-sufficiency in resource management at local and national levels, making communities less vulnerable to external shocks and promoting a more sustainable lifestyle. Finally, the shift towards circularity creates demand for new skills, driving skills development and retraining opportunities, leading to a more adaptable and future-proof workforce.

The AWASTER project's activities demonstrate how integrated interventions—spanning schools, businesses, and governance—can accelerate the shift toward a circular model in the Adriatic region, turning challenges into tangible opportunities for sustainable development.

4. Strategic objectives

The strategic objectives of this document provide a shared direction for implementing circular economy principles across Italy and Croatia's coastal areas. These objectives build on the AWASTER project's results and align with both EU strategies and local sustainability goals, ensuring a comprehensive and impactful transition.

4.1. SO1 Improving resource efficiency

This objective focuses on optimizing the use of all resources throughout their lifecycle, minimizing waste and maximizing value retention.

The goals of the SO1 are the following:

- **Promote the optimal use of materials and energy,** by encouraging practices such as industrial symbiosis, energy efficiency measures, and the use of renewable energy sources in production processes. This includes assessing the quantity and composition of collected waste, recycling rates, and the potential for reusing collected waste through secondary markets.
- **Reduce resource dependency through reuse, repair, and recycling**, by supporting the development of local repair networks, second-hand markets, and advanced recycling facilities that can process complex waste streams.
- **Foster innovation in waste management technologies and service delivery**, by investing in research and development for new sorting technologies, waste-to-product solutions, and digital platforms that facilitate material exchange.

4.2. SO2 - Promoting circular economy practices in key sectors

This objective target specific economic sectors crucial to the coastal regions, fostering the adoption of circular models that address their unique challenges and opportunities.

The goals of the SO2 are the following:

- **Support circular practices in tourism, agriculture, retail, and manufacturing,** by developing sector-specific guidelines, providing tailored training, and showcasing successful case studies (e.g., closed-loop systems for hotel waste, sustainable farming practices, packaging-free retail). This includes promoting innovative and sustainable business models that minimize direct and indirect environmental costs through viable product and process designs.
- **Encourage development of new business models such as product-as-a-service and sharing platforms,** by providing incentives and technical assistance for businesses to shift from selling products to offering services or facilitating collaborative consumption.
- **Identify scalable pilot initiatives and support their replication** across the region, including developing pathways for market integration and commercialization of innovative products from initiatives like EcoLabs. By creating a framework for evaluating pilot projects and disseminating lessons learned to encourage wider adoption of proven circular solutions, such as the EcoLabs and waste-free events.

4.3. SO3 - Building awareness and capacity for circular economy adoption

This objective aims to empower individuals and organizations with the knowledge and skills necessary to embrace and implement circular principles.

The goals of the SO3 are the following:

- **Integrate CE concepts into school curricula and lifelong learning programs**, by developing engaging educational materials, teacher training modules, and public workshops that make circular economy principles accessible and relevant to all age groups, particularly focusing on early adoption.
- **Train educators, public officials, and SMEs on sustainable practices**, by offering specialized courses, workshops, and mentoring programs that equip key stakeholders with practical skills in circular design, waste auditing, and resource management. This includes cross-border joint training programs.
- **Utilize campaigns and digital tools (e.g., Waste Footprint app) to engage citizens**, by launching targeted public awareness campaigns through social media, local events, and interactive digital platforms that encourage behavioral change and track individual impact.

4.4. SO4 - Encouraging collaboration and knowledge sharing

This objective fosters a collaborative environment that facilitates the exchange of ideas, resources, and best practices across borders and sectors.

The goals of the SO4 are the following:

- **Establish platforms for cross-border dialogue and best practice exchange**, by organizing regular forums, conferences, and online communities where Italian and Croatian stakeholders can share experiences and learn from each other.
- **Facilitate partnerships between public institutions, academia, and the private sector**, by creating matchmaking events, joint research projects, and innovation challenges that bring together diverse expertise to solve circular economy challenges.
- **Strengthen regional networks that advocate for circular development**, by supporting existing networks and helping to establish new ones that can collectively lobby for supportive policies and promote circular initiatives, building on the strong stakeholder network of partners.

These strategic directions ensure that CE adoption is holistic, inclusive, and rooted in the shared environmental, social, and economic priorities of the Italy–Croatia coastal corridor, paving the way for a truly sustainable future.

5. Workshops and practical education

Educational workshops serve as a cornerstone of the Strategy, aiming to instill circular economy principles through participatory, experiential learning. These workshops have been piloted under the AWASTER project in both school and business contexts, acting as key instruments for implementation and fostering tangible change. Beyond workshops, the Strategy also leverages pilot actions as practical demonstrations of circular principles in real-world settings.

Target groups for training and education

The Strategy targets a multi-faceted approach to education and training, ensuring that circular economy principles are understood and adopted across various segments of society:

- **Primary and secondary school students -** to build foundational understanding of sustainability and CE principles, fostering lifelong habits of resourcefulness and environmental responsibility from an early age. This includes elementary school students participating in educational workshops, clean-up actions, and local school events, and high-school students involved in EcoLabs.
- **Teachers and educators -** to equip them with the necessary tools, resources, and pedagogical methods to effectively integrate CE into their teaching across various subjects, becoming multipliers of knowledge. Teachers will co-design guidelines for early adoption of CE principles.
- **Business owners and employees -** particularly SMEs in sectors such as tourism, retail, and food services, and manufacturing, where waste reduction potential is high and innovative circular business models can yield significant economic and environmental benefits. Waste management organizations will also participate.

Methodology and content of workshops

The workshops are designed to be highly interactive, practical, and tailored to the specific needs of each target group. The methodology emphasizes hands-on learning and real-world application:

- **Interactive activities** such as waste audits (identifying waste streams and opportunities for reduction), recycling games, and upcycling exercises (transforming waste materials into new products), making learning engaging and memorable. This includes clean-up actions accompanied by monitoring of collected waste to ensure further reuse.
- **Scenario-based learning** on waste streams and material lifecycle, allowing participants to analyse real-world challenges and collaboratively develop circular solutions.
- **Practical demonstrations** of how businesses can minimize, reuse, or repurpose waste, including examples of composting, food waste valorization, and packaging reduction strategies, and promoting innovative and sustainable business models.
- **Use of digital tools** like the Waste Footprint app, enabling involved educational institutions to identify waste issues they should target and measure the achieved reduction of generated waste by trained users, fostering a data-driven approach to sustainability.
- **Integration of circular economy** into existing environmental education programs, ensuring that CE is not an isolated topic but a core component of broader sustainability efforts. This includes child-to-parent transfer of knowledge workshops to ensure involvement of parents in raising CE awareness.

Workshops can be organised as interactive, participatory events that combine expert input with hands-on activities. A world-café format is recommended, with participants rotating between small-group discussions on specific topics, supported by visual tools (flipcharts, sticky notes, digital polling) and ending with a plenary to validate proposals. In the educational sector, schools can host workshops that blend theory and practice: introductory sessions to explain circular economy principles; outdoor clean-up and waste-quantification activities; creative “use and reuse” exercises where students transform everyday waste into new objects; and EcoLabs for older students, where waste is processed with simple equipment into usable products displayed at waste-free events. Schools are also encouraged to integrate digital monitoring tools such as a Waste Footprint App and to involve families through child-to-parent activities, ensuring intergenerational learning. Recognition schemes such as competitions, certificates, or “Eco-Champion” awards can further motivate students and teachers. As a flagship initiative, the Strategy supports the development of a cross-border Green School Network, connecting schools engaged in circular economy practices and promoting exchange of methods, teaching materials, and student projects. Educational actions will also build on innovative methods such as child-to-parent knowledge transfer, ensuring that sustainable practices learned in the classroom are carried into households and communities. Furthermore, schools are

encouraged to host waste-free events where students, families, and municipalities collaborate to demonstrate zero-waste practices in real-life contexts.

In the business sector, workshops should target SMEs in manufacturing, agriculture, tourism, and services, with groups of 15–20 enterprises to encourage peer learning. A typical structure can include presentations of circular business models and real case studies, process-mapping exercises to identify waste hotspots, and group dialogues to explore cross-sector synergies such as by-product exchanges. Local pioneers can be invited to share their experiences, followed by sessions on relevant policies and financial incentives, helping companies understand both obligations and opportunities. Each business should conclude by drafting a simple Circular Commitment Plan listing feasible short-term actions. Follow-up surveys, mentoring, or networking platforms are recommended to sustain engagement, while chambers of commerce and local authorities can help scale up lessons learned. The Strategy recognises the importance of establishing ReUse Centres as hubs where products and materials can be collected, repaired, repurposed, and returned to circulation. These centres reduce disposal, extend product lifecycles, and provide opportunities for SMEs, social enterprises, and municipalities to collaborate in practical circular economy solutions.

In addition to regular educational and business workshops, the Strategy promotes EcoLabs as permanent spaces for innovation and reuse, and encourages schools and municipalities to organise waste-free events as living demonstrations of circular economy principles. These activities, piloted through the Action Plan, provide models for replication and scale-up beyond the project lifetime.

EcoLabs – concept and purpose

EcoLabs are interactive, hands-on learning laboratories where participants – primarily students but also community members – can experiment with circular economy practices in a practical way. They are designed as creative spaces equipped with simple tools and materials that allow waste items to be repaired, reused, or transformed into new products.
In schools, EcoLabs can take the form of workshops where students bring everyday waste (plastic bottles, textiles, paper, electronics) and learn how to sort, dismantle, or repurpose it. Activities may include plastic shredding and remoulding, sewing and repairing old clothes, building simple items from reclaimed wood, or creating art from recyclables. For older students, EcoLabs can integrate

basic machines (such as shredders, extruders, or 3D printers) that enable more advanced prototyping.
Beyond technical skills, EcoLabs foster entrepreneurship, teamwork, and environmental responsibility. By turning waste into resources, students experience the economic and creative potential of circularity. EcoLabs can also function as community hubs, hosting repair cafés, exhibitions, or "waste-free events," where students present their creations and share knowledge with parents, local businesses, and citizens.
In short, EcoLabs are practical innovation spaces where theory meets practice, making the principles of the circular economy tangible and inspiring behavioural change.

Collaborations with local stakeholders and experts

Workshops are co-designed and delivered in close partnership with local NGOs, municipal authorities, educational institutions, and industry experts. This collaborative model ensures content is relevant, localized, and sustainable over time. Experts also contribute to the development of take-home toolkits, online resources, and follow-up mentoring, ensuring continuity of learning and practical application beyond the workshop setting. This approach builds local capacity and fosters a sense of ownership among participants. The project will capitalize on extensive knowledge from previous projects like MARLESS (eco-cleaning, educational workshops for school children, marine litter data monitoring, stakeholder networks) and CAPonLITTER (policy recommendations for waste management in coastal tourism), FISHING FOR FUTURE (sea waste practices in fishing areas), Plastic Smart Cities (communication channels for citizen engagement), and "For plastic free Croatian Islands" (reduce, reuse, recycle principles). The cross-border joint training program will culminate in the development of a "circular economy hub of knowledge," serving as a dynamic, accessible online platform for continuous learning, resource sharing, and best practice dissemination, ensuring the durability and replicability of the project's approach beyond its funding cycle.

Evaluation and Feedback

Rigorous evaluation mechanisms are integrated into all workshop and pilot actions. Surveys conducted before and after workshops revealed a marked increase in awareness and intent to act. For example, 82% of students expressed interest in continuing CE activities at home or in

extracurricular clubs, indicating a strong motivational impact. Among businesses, 60% reported implementing at least one change to reduce single-use items within three months, demonstrating clear and measurable changes in behaviour. This experiential, participatory approach to education and business training has proven to be both scalable and adaptable across different regional contexts in the Italy–Croatia programme area, providing a robust framework for future expansion. Surveys will be conducted among involved economic entities to assess workshop impact on resource use and waste generation.

6. Policy recommendations

To scale up circular economy adoption and ensure policy alignment across governance levels, as part of the project there is a dedicated activity within WP3 – A.3.1 – Recommendations for future proceedings where a special focus will be on preparing and delivering a comprehensive set of policy recommendations for changes in policy instruments dealing with the circular economy. However, taking into account strategic importance of this document, it is of high importance to include also a section dedicated to the policy recommendations, as a result of the joint work on elaborating this document.

To scale up circular economy adoption and ensure policy alignment across governance levels, the following recommendations can be proposed:

- **Integration of circular economy targets into municipal and regional development strategies** by setting clear, measurable goals for waste reduction, material recovery, and circular business development in local and regional plans, ensuring CE is a core component of sustainable growth. This includes involving local authorities in adopting the AWASTER Joint Strategy and Action Plan, and influencing policy changes to ensure a proper environment for CE implementation.
- **Support of cross-sectoral coordination through interdepartmental working groups** by establishing formal mechanisms that bring together representatives from environment, economy, education, and urban planning departments to ensure a holistic and integrated approach to CE policy development and implementation. Regional authorities will benefit from better dialogue with the local level.
- **Development of clear regulatory frameworks that facilitate waste prevention, material reuse, and extended producer responsibility**, accompanied by proactive advocacy efforts and engagement with legislative bodies to ensure their adoption and robust enforcement. By simplifying permitting processes for reuse and repair centers, clarifying end-of-waste criteria, and implementing effective Extended Producer Responsibility (EPR) schemes that incentivize manufacturers to design for circularity. This includes leveraging the experience of municipalities with "door-to-door" smart separate collection systems and Eco-centres/Reuse centres.

To embed circularity into governance, several practical policy tools and approaches can be proposed. One key measure is the harmonization of waste classification systems and data reporting, aimed at enabling effective benchmarking, facilitating cross-border material flows, and ensuring accurate data for decision-making and progress tracking. This involves adopting common standards aligned with EU regulations and informed by regional waste reports. Additionally, promoting circular public procurement can play a vital role by encouraging policies that prioritize low-impact, circular products and services. This includes introducing criteria in public tenders that favor items made from recycled materials, designed for durability, or delivered through product-as-a-service models—thereby driving market demand for circular solutions. Financial incentives, such as reduced VAT, grants, or preferential loans, can further support the transition by rewarding businesses that invest in circular infrastructure, adopt eco-design principles, or implement waste prevention measures. Moreover, fostering deeper institutional ownership within public authorities is essential. This can be achieved by providing targeted capacity building, facilitating peer-to-peer learning, and working toward the formal integration of circular economy principles into their operational mandates and strategic plans.

Beyond regulatory frameworks, active support mechanisms are essential to accelerate the adoption of circular economy practices, particularly among SMEs and innovators. It is highly recommended to establish dedicated funding schemes for circular economy pilot projects and SME transformation initiatives. This could include accessible grant programmes or venture capital funds targeted at supporting businesses in their transition to circular models, covering areas such as research and development, infrastructure upgrades, and workforce training. Additionally, launching innovation hubs or incubators can play a critical role by connecting startups with mentors, investors, and municipal needs—creating ecosystems where circular solutions receive technical assistance, business development support, and access to funding aligned with real-world challenges. Offering technical assistance, capacity building, and training to municipalities and enterprises is also vital. This can be achieved through specialized training programs, expert consultancy, and the development of online resources that guide stakeholders in effectively implementing circular practices. A notable example is the AWASTER Joint Training program, designed to support project partners and stakeholders. Collectively, these recommendations aim to foster a supportive and dynamic environment for the circular economy, positioning the Adriatic coastal regions as leaders in sustainable development. They build upon insights from the AWASTER project and align with broader EU strategies, such as the Circular Economy Action Plan (2020) and the European Green Deal (2019), both of which emphasize the need for integrated, inclusive, and innovation-driven circular policies.

7. Monitoring and evaluation

To ensure the effective implementation and continuous improvement of this Strategy, a robust monitoring framework is essential. This framework will allow stakeholders to track progress, identify challenges, and make data-driven adjustments, ensuring the Strategy remains relevant and impactful.

The monitoring framework will rely on a set of key performance indicators (KPIs) that reflect the strategic objectives and expected outcomes. Data collection should be coordinated at the municipal or regional level and aligned with national and EU reporting frameworks to ensure consistency and comparability. Suggested indicators include:

- **Number of educational workshops implemented and student participation rates -** these measures the reach and engagement of educational initiatives, indicating the foundational impact on future generations. (Proposed target: 10 educational workshops in elementary and high-schools and 5 child-to-parent transfer of knowledge events during one school year).
- **Percentage of schools integrating circular economy content into curricula -** this tracks the institutionalization of CE education, moving beyond one-off events to systemic change (Proposed target: 1 new school each year in included region).
- **Number of businesses participating in CE training or adopting circular practices -** this quantifies business engagement and the uptake of sustainable operational changes, such as implementing waste reduction plans or developing circular products. (Proposed target: 2 regional educational workshops for the economy sector per year in each involved region).
- **Quantifiable reductions in waste production or increases in recycling rates -** These are direct environmental impact indicators, showing tangible progress towards a more resource-efficient economy. This could include metrics like tons of waste diverted from landfill or percentage increase in material recovery, measured through waste monitoring during clean-up actions or through the use of the Waste Footprint App.
- **Public engagement metrics through apps or awareness campaigns -** such as downloads of the Waste Footprint app, participation in community clean-up events (Proposed targets: At least 2 clean-up actions yearly in involved region), or reach of awareness campaigns, indicating broader societal behavioural change.

The project AWASTER should contribute to the following Interreg Italy-Croatia Programme Result Indicators:

- **RCR79_2.2: Joint strategies and action plans taken up by organisations.** (Target value: 1 joint strategy/action plan). This refers to the AWASTER Joint Strategy and Action Plan on sustainable use of resources.
- **RCR104_2.2: Solutions taken up or up-scaled by organisations**. (Target value: 1). This refers to the jointly developed solution resulting from AWASTER pilot actions, which includes the establishment of EcoLabs and the framework for organizing waste-free events. Number of educational workshops implemented and student participation rates.

Progress reviews should be conducted annually, involving key project partners, stakeholders, and policymakers to assess performance against established KPIs and make data-driven adjustments.

These reviews should include:

- **Data aggregation and analysis -** compiling data from various sources (schools, businesses, municipalities) and analyzing trends to identify areas of success and areas needing improvement.
- **Stakeholder workshops -** regular meetings to discuss findings, share insights, and collaboratively refine implementation strategies.
- **Reporting -** producing concise and transparent reports for all stakeholders, including the public, to ensure accountability and communicate achievements.

Data collection should be systematically analyzed and interpreted to inform strategic adjustments and adaptive management decisions throughout the project's lifecycle. Regular internal review cycles should be established to refine approaches, optimize resource allocation, workshop surveys, and clean-up monitoring reports.

Beyond quantitative targets, the project will broaden its impact measurement to include qualitative and systemic change indicators. This involves assessing shifts in community attitudes, business practices, and the overall effectiveness of circular economy policies, and exploring methodologies to estimate the aggregate waste reduction across the entire programme area, demonstrating the project's ultimate contribution to environmental protection and waste minimization.

An adaptive approach is crucial for the Strategy's long-term success. Robust feedback mechanisms will ensure continuous learning and refinement:

- **Establish feedback loops with workshop participants, educators, and business users**: Through post-workshop surveys, interviews, and dedicated online channels to gather qualitative insights on the effectiveness of programs and identify areas for improvement. This includes monitoring of resource use and waste generation reports from businesses.
- **Conduct post-implementation surveys and follow-up interviews**: To assess long-term changes in behavior, practices, and attitudes among target groups, providing a deeper understanding of the Strategy's sustained impact.
- **Integrate findings into the refinement of educational materials, business support services, and future project planning:** Ensuring that lessons learned from monitoring and evaluation directly inform and improve subsequent phases of the Strategy, making it more responsive to evolving needs and challenges. This will be facilitated by the AWASTER Joint Training program and the development of guidelines for implementation of circular economy principles.

This adaptive approach ensures that the Strategy remains relevant and responsive to evolving needs, while continuing to advance circular economy goals across the Italy–Croatia coastal region.

Financial sustainability and scalability

To ensure the long-term viability of initiatives like EcoLabs and waste-free events, the Strategy commits to developing a comprehensive financial sustainability plan. This plan will explore diversified funding streams, including dedicated budget allocations from local and regional governments (e.g., from the 20 local and 5 regional public authorities targeted 1), corporate sponsorships (particularly from manufacturing and tourism companies engaged in workshops 1), and potential revenue generation models (e.g., sale of EcoLab products, specialized workshops). Formalizing long-term operational support commitments from involved Project Partners (PPs) and associated organizations (e.g., 1.MAJ d.o.o. 1) within their post-project agreements will provide crucial institutional backing, ensuring these successful pilot initiatives continue to operate and expand beyond the project's grant period.

The Strategy will be financed not only through Interreg and project resources, but also by leveraging the funding sources identified in the Action Plan, including EU programmes (Horizon Europe, LIFE, Interreg NEXT MED), national and regional funds, local government budgets, and private foundations. Private sector co-financing, especially from businesses engaged in circular value chains, will be actively pursued to ensure continuity and scalability of the Strategy's measures.

8. Risk management and contingency planning

The effective implementation of this Strategy depends on anticipating and addressing risks that could undermine its objectives. Risk management in a cross-border context is especially important, given the diversity of stakeholders, institutional frameworks, and socio-economic conditions between Italy and Croatia. For this reason, the AWASTER Strategy adopts a proactive and adaptive approach to risk management, emphasising prevention, early detection, and rapid response.

Risks can emerge in several domains. At the strategic level, there is a possibility that political priorities change, that national or regional authorities show limited uptake, or that new EU regulatory frameworks shift the focus away from the areas foreseen by AWASTER. Operational risks relate to delays in project implementation, limited human resources, or technical difficulties with tools such as the EcoLabs or the Waste Footprint App. Financial risks are also significant: project funding is limited in time, and without clear follow-up mechanisms and diversified resources, activities may not be sustained. On the social side, behavioural resistance can slow adoption – some SMEs may be reluctant to change established processes, while citizens and schools might show limited engagement if incentives are not strong enough. Finally, external risks such as natural disasters, pandemics, or energy crises could divert attention and resources away from circular economy initiatives.

To mitigate these risks, the Strategy recommends a combination of monitoring and contingency measures. By establishing a Cross-Border Circular Economy Coordination Group, involved actors can regularly review progress, update the risk register, and take corrective action when needed. Monitoring indicators will not only measure outcomes but also act as early-warning signals. For example, declining attendance at workshops or weak follow-up surveys may indicate low engagement, requiring additional communication campaigns. If participation from SMEs is limited, chambers of commerce and business associations can intervene with targeted incentives and outreach. Similarly, if policy uptake

appears weak, advocacy efforts will be intensified and aligned with EU Green Deal and Circular Economy Action Plan priorities.

Flexibility in implementation is another central pillar. Activities proposed in Action Plan will be designed in a modular way so that, if disruptions occur, they can be delivered through alternative channels. For instance, educational and business workshops can be moved online, and awareness campaigns can be strengthened through digital media. Financial resilience can be supported by developing a Sustainability and Funding Roadmap that identifies EU programmes (Horizon Europe, LIFE, Interreg NEXT MED…), national sources, and private sector co-financing opportunities to bridge gaps after the project ends.

Finally, risk management in AWASTER is conceived as an adaptive and dynamic process. The Strategy will be reviewed periodically to ensure alignment with evolving EU legislation, such as the Ecodesign for Sustainable Products Regulation, the Right-to-Repair Directive, and the Packaging and Packaging Waste Regulation. In this way, risk management does not only protect against potential obstacles but also ensures that the Strategy remains relevant and resilient in a rapidly changing policy and economic landscape.

9. Conclusion

This Joint Strategy has outlined a comprehensive approach to advancing the circular economy across the coastal regions of Italy and Croatia. Grounded in the tangible outcomes and lessons learned from the AWASTER project, it places education, business engagement, and policy coherence at the core of sustainable development efforts. We have explored how instilling CE values from an early age, mobilizing the private sector, and fostering cross-border collaboration are essential pillars for transitioning away from a linear economic model. The Strategy emphasizes practical implementation through workshops, pilot actions like EcoLabs and waste-free events, and robust monitoring, all supported by a responsive policy framework and a strong partnership of diverse organizations from both countries.

The transition to a circular economy is not a singular action but a collective journey involving profound cultural change, continuous innovation, and long-term commitment. Coastal regions, with their delicate ecosystems and reliance on natural resources, have a unique opportunity to lead by example. By embracing circular principles, these regions can balance environmental preservation with economic resilience, creating new opportunities for local businesses, fostering community well-being, and enhancing their appeal as sustainable destinations. The synergy between Italian and Croatian efforts, as demonstrated by the AWASTER project, provides a powerful model for regional cooperation in addressing global environmental challenges. Its long-term success will be underpinned by sustained communication and advocacy, ensuring its valuable results and lessons learned continue to inspire and inform beyond its immediate funding cycle.

We call on all stakeholders – policymakers, educators, businesses, civil society organizations, and citizens – to actively contribute to this transformation. By embracing circular practices in daily life and business operations, sharing knowledge and best practices, and fostering cross-border cooperation, the Italy–Croatia region can become a beacon for sustainable coastal development in Europe and beyond. This strategy is a starting point, a framework for collective action. Its success hinges on the commitment and collaborative spirit of everyone involved, working together to build a more resource-efficient, resilient, and prosperous Adriatic future, supported by a dynamic and continuously updated circular economy knowledge hub.

The Strategy does not stand alone, it is concretely implemented through the AWASTER Action Plan, which translates strategic priorities into operational measures, pilot actions, and monitoring

indicators. Together, the Strategy and Action Plan form a coherent package, ensuring that the cross-border vision for a circular economy is both forward-looking and practically achievable.

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List of tables and figures