

AWASTER — Adopting WASTE as Resource

Best Practice Catalogue

Interreg



Co-funded by
the European Union

Italy – Croatia

 **AWASTER**

Interreg



Co-funded by
the European Union

Italy – Croatia

 **AWASTER**

↘ INTERREG ITALY-CROATIA PROGRAMME 2021 – 2027

Project: AWASTER – Adopting WASTE as Resource

Programme priority: Green and resilient shared environment.

Specific objective: 2.2: Enhancing protection and preservation of nature, biodiversity and green infrastructure, including in urban areas, and reducing all forms of pollution.

↘ Disclaimer:

This deliverable reflects the project AWASTER views; the Interreg IT-HR Programme authorities are not liable for any use that may be made of the information contained therein. The selection of the examples described has been carried out exclusively considering their adherence with the AWASTER project's objectives and should be considered unrelated to any advertising purpose.



Best Practice Catalogue

↘ Introduction

The present document provides an overview of the best practices regarding circular economy principles and approaches from inside and outside of the Interreg IT-HR programme area.

↘ Objective

The main goal of this catalogue is to **showcase a range of examples of good practices regarding the circular economy** which have been successfully carried out by different kinds of entities (public, private, NGOs...) in the Italian, Croatian and European context.

Various stakeholders, both outside and inside of the project consortium, have contributed to the research and collection of good practices.

The intention was to represent a heterogeneous range of experiences, implemented both inside and outside of the programme area by different kinds of entities coming with different sectoral backgrounds and sectors of activity.

In this view, the catalogue aims to provide AWASTER stakeholders key insights on the elements of success and dimension on which circular economy principles can be applied, while conveying a source of **inspiration for replicability**, highlighting the transversality of the circular economy approach for different sectors and geographical contexts.

Geographical context of reference



● NGO ○ Company ● Public ● Start-Up ● University

Index of contents

➤ Introduction		03
➤ Objective		03
➤ Analysis of best practices in circular economy		06
➤ Overview		06
➤ Presentation of best practices in Italy		08
1. La Scarpa		08
2. 9-Tech		10
3. Golden Goose		12
4. Mainetti Hangerloop		14
5. Photovoltaic Cells: Clean Energy from Wine Waste		16
6. FaterSMART		18
7. Green school in Venice		20
8. Favini		22
9. CeRiReuse Center		24
10. Community Composting Plant		26
11. Archeoplastica - the museum of ancient, beached waste		28
12. Radiobag		30
13. Biomethane plant		32
14. Eggplant – Not wasting life		34
15. Albo Circular		36
➤ Presentation of best practices in Croatia		38
1. Sustainable Student Enterprise in Croatian High Schools		38
2. Zero-Waste restaurant		40
3. Sustainable accommodation		42
4. Specialty coffee roasters and shop		44
5. Sustainable fashion brand		46
6. Biodynamic Zero-Waste wine production		48
7. Upcycling restaurant		50
8. “Creative to the clean Adriatic!”		52
9. BlueBag Initiative		54
10. Green Habits for a Sustainable Labin Area		56
11. Educational marine litter programs in Eco-schools from Istrian County		58
12. Sensitizing the touristic sector in Istrian County		60
13. Under water cleaning activities and monitoring in Istrian County		62
14. Free-to-use ashtrays on Istrian beaches		64
➤ Presentation of best practices beyond the Interreg IT-HR cross-border area		66
1. A sustainable University		66
2. 3D printing in construction: optimizing building design		68
3. Plate up for Glasgow		70
4. Digital Deposits for a Reuse Revolution		72
5. Zero-waste restaurant FREA		74
➤ References		76
➤ Project Partners		77

Analysis of best practices in circular economy

Overview

Best practices have been clustered following the five components of the waste management hierarchy¹ (prevention, reduction and re-use, recycling, recovering, disposal) and the geographical context of reference (Italy, Croatia, other European countries).

	Italy	Croatia	Europe
Prevention	La Scarpa	Sustainable student enterprise in Croatian high school	3D printing in construction: optimizing building design
	Green school in Venice	Zero-Waste restaurant	Plate up for Glasgow
		Sustainable accomodation	
		Specialty coffee roasters and shop	
		Green Habits for a Sustainable Labin Area	
		Educational marine litter programs in Eco-schools from Istrian County	
		Sensitizing the touristic sector in Istrian County	
		Under water cleaning activities and monitoring in Istrian County	
Reduction & re-use	Golden Goose	Biodynamic Zero-Waste wine production	Digital Deposits for a Reuse Revolution
	Albo circular		

NGO
Company
Public
Start-Up
University

The analysis of each of the chosen best practices provides relevant information on:

- Name of the initiative
 Promoter
 Type and sector of the promoter
 Other stakeholders involved
 Location
 Website
 Related SDGs targets
- Objective
 Context and challenges addressed
 Circular Economy principles addressed
 Modes of implementation
 Key results
 Success factors

	Italy	Croatia	Europe
Recycling	FaterSMART	Sustainable fashion brand	
	Favini	Creative to the clean Adriatic!	
	CeRiReuse Center		
	Eggplant - Not wasting life		
Recovering	9 Tech	Upcycling restaurant	Zero-waste restaurant FREA
	Mainetti Hangerloop		
	Photovoltaic Cells: Clean Energy from Wine Waste		
	Archeoplastica - the museum of ancient, beached waste		
Disposal	Community Composting Plant	BlueBag initiative	A sustainable University
	Radiobag	Free-to-use ashtrays on Istrian beaches	
	Biomethane plant		

¹ EU Waste framework directive 2008/98/EC

01. La Scarpa

By participating in an innovative EU funded project, La Scarpa, a company producing sports footwear, is seeking to implement a new sustainable business model, which should become a consolidated practice also at supply chain level



📌 Promoter

LA SCARPA is a company based in Asolo (IT), that produces sports footwear, such as boots for alpine skiing, trekking, hiking, trail, running and climbing.

📌 Type and sector affiliation

Businesses (Large companies)/Textile industry (footwear).

📌 Other stakeholders involved

LA SCARPA is Lead Partner of the **LIFE Re-Shoes²** project, aiming to recover secondary raw materials to produce 15.000 new pairs of high-quality shoes. The project sees the collaboration of the **University of Bologna** (testing of materials and footwear, Life Cycle Assessment and design-for-recycling analysis) and **Sciarada Industria Conciaria** (hydrolysis of leather and reuse of the liquid obtained for the tanning of new leather through the EVOLO® process); **Rubber Conversion** (devulcanisation and regeneration of industrial rubber waste to make new treads), **Rubbermac.it** (production of new midsoles and treads made from recycled material), **Innovando** (logistics of the collection campaign for used shoes), **EPSI-European Platform for Sports and Innovation** (networking and promotion).

📌 Related SDGs targets

SDG 12. Responsible consumption and production, 9. Industry, innovation and infrastructure.

📌 Objective

Create **high-quality sports products** which last in time and **minimize the damage to the environment** which stems from their production.

📌 Context and challenges addressed

The shoe is a complex type of product to recycle because it consists of a mix of different materials that are difficult to separate.

Approximately, a carbon footprint of a pair of running shoes made of synthetic materials is equal to around 14 kg CO2e, about the same as driving a car for 56 kilometers or to charging 1.700 smartphones (Lynette, Seiko, & Dai, 2012).

Every year more than 24 billion new shoes are produced worldwide, most of which end up in landfills at the end of their life cycle, representing a big problem for the environment. **Shoes are complex to recycle because** they are composed of a mix of different materials that are very difficult to separate.

📌 Circular Economy principles addressed

Prevention / Reduction and re-use / Recycling / Recovering / Disposal.

📌 Modes of implementation

1. **Material use strategy:** the Maestrale boot (a sci-boot) uses Pebax Rnew polymer for the shell and cuff; also, old shoes are recycled in order to produce new ones. As the primary material for their products, la Scarpa uses the **Pebax® polymers**, block copolymers composed of rigid polyamide blocks and flexible polyether blocks. By adjusting the composition and ratio of these blocks, a broad range of materials can be created, varying from very rigid to extremely flexible, without the need for plasticizers. These distinctive polymers offer the ideal combination of toughness typically associated with polyamides, along with the flexibility and elasticity usually found in polyethers and polyesters. Pebax Rnew Polymer is produced from a **vegetal source**, castor oil extracted from the seeds of the castor plant, a non-GMO and non-edible crop, which **does not compete with the food industry**.

2. **Water strategy:** water is not used in the production processes; it is used only to cool some machinery. This system has also been maximally optimised by implementing a closed-loop system, which allows for the constant reuse of water without any drainage.

3. **Sustainable packaging:** glue-free, is FSC (Forest Stewardship Council) optimized packaging logistics.

📌 Key results

Since 2022, the new strategies have led to the reduction of an annual CO2 equivalent emissions by approximately 1400 kg compared to the previous supply and transportation systems.

Life Cycle Analysis (LCA) results of Pebax® Rnew allows for a **32% reduction in CO2 emissions** compared to conventional materials.

📌 Success factors

LA SCARPA **measures its environmental and social sustainability performance on an annual basis** through the Benefit Impact. Assessment, which allows for necessary modifications to the composition of the products in order to reach improved margins and more efficient production.

² The LIFE project Re-Shoes started in September 2022 and will last until end of February 2026.

02. 9-Tech

Is a start-up that produces photovoltaic (PV) panel recycling plants, which allows for an extremely energy efficient process and capable of recovering pure materials to be reused as secondary raw materials



Promoter

9-TECH is an innovative enterprise consisting of a team of engineers and researchers who study and create prototypes, specifically developing **new solutions** to **recover strategic materials from e-waste**.

Type and sector affiliation

Start-up/Waste management.

Other stakeholders involved

Depuracque, Veritas group, Enel GreenPower, Verallia.

Related SDGs targets

SDG 12. Responsible consumption and production.
SDG 9. Industry, innovation and infrastructure.
SDG 11. Sustainable cities and communities.

Objective

Ensure **e-waste upcycling**, i.e. the valorisation of critical raw materials contained in it.

Context and challenges addressed

E-waste is one of the fastest growing waste streams in the EU and less than 40% is recycled (European Parliament, 2020).

Considering the rapid increase of the PV waste generation, proper management of end-of-life PV panels with recovery of precious materials that requires both cost-effective and environmentally sustainable solutions.

Circular Economy principles addressed

Prevention / Reduction and re-use / Recycling / **Recovering** / Disposal.

Modes of implementation

Optimization of the traditional shredding process and mechanical separation, thanks to a thermo-mechanical treatment.

Key results

Upcycling of the waste, e.g. valorisation of critical materials that contain, for instance, aluminium from frames, glass granules, and copper granules and even silver.

9Tech technology can extract raw materials with **over 95% of their economic value**, completely avoiding the creation of waste, including hazardous wastewater and plastic fractions, that currently represent a cost for recycling plants.

Success factors

- Investments in research.
- Collaboration with other actors on the market for industrialization purposes.

03. Golden Goose

Embarking on the journey towards increasingly sustainable and zero-impact production, the Italian fashion brand Golden Goose has taken up important actions not only in the supply chain, but also in the services offered to customer to recover their shoes



Promoter
GOLDEN GOOSE, an Italian fashion brand specialized in footwear.

Type and sector affiliation
Businesses (Large companies) / Textile industry (footwear).

Other stakeholders involved
Coronet.

Related SDGs targets
SDG 12. Responsible consumption and production

Objective
Produce **high-quality luxury footwear without damaging** the environment.

Context and challenges addressed
23 billion pairs of shoes are made every year and 22 billion are thrown into landfill, contaminating the soil e groundwater with the chemicals (Jacobs, 2020).

Circular Economy principles addressed
Prevention / Reduction and re-use / Recycling / **Recovering** / Disposal.

Modes of implementation
The three principles of the Golden Goose:
1) **Repair**: in 2022 they open the first Forward Store, which provides clients with the opportunity to wash and sanitize one's sneakers with ozone, to repair seams, replace zippers and insoles;
2) **Remake**: with a specific design, the shoes make it possible to reinvent and customize old sneakers by changing the star or replacing the laces;
3) **Resell**: a dedicated area in stores where shoes owners can showcase and sell their pair of sneakers

Developed through extensive research to find a responsibly-sourced alternative to leather, the Yatay sneakers are crafted using bio-based and recycled materials.
The sole is made of **biodegradable rubber**, whereas other parts of the shoe are made from recycled materials, including cotton, polyester for the laces, and polyurethane for the tongue and insole.
The packaging has also been designed in keeping with circular consumption and production: the shipping box is the same box the shoes originally come in. Moreover, the **packaging is made of up to 50% FSC-certified recycled paper** from controlled salvage sources, supporting responsible forest management.

Key results
1) 24.000 items repaired, extending their life cycle.

2) Carbon neutral production in Italy for direct and indirect emissions.

Success factors
The opportunity given to the client to **personalize one's pair of sneakers** increases the **sense of ownership** and consumers' commitment to a more responsible and **long-lasting use of footwear**.

04. Mainetti Hangerloop

Mainetti, an Italian manufacturer and supplier for the retail sector, developed a first-of-its-kind reuse and recycling solution for plastics: this involves using reverse logistics to collect and inspect used hangers, reusing them if they pass inspection, or recycling the materials to mold them into new hangers. In this way, the Hangerloop™ process reimagines the lifecycle of a hanger and serves as a benchmark for the industry



📌 Promoter
MAINETTI GROUP, retail agency.

📌 Type and sector affiliation
Businesses (Large companies) / Manufacture.

📌 Other stakeholders involved
—

📌 Related SDGs targets
SDG 12. Responsible consumption and production.

📌 Objective
Keeping previously manufactured materials in the supply chain for as long as possible.

📌 Context and challenges addressed
Just over 30% of plastic waste in Italy is sent for recycling; the rest of it (70 %) gets disposed (ECCO: The Italian Climate Chance Think Tank, 2022).

📌 Circular Economy principles addressed
Prevention / Reduction and re-use / Recycling / Recovering / Disposal.

📌 Modes of implementation
The **used hangers** go straight to the Mainetti Group Facilities, where they are selected and reclassified to be **sent back to clothing manufacturers**. A product is analysed according to its level of downgrading, and then an appropriate action is chosen (retrofitting, revamping and relamping) to **“revitalize” it in the best way**. This selection happens thanks to a specific **automated tracking and recognition** systems; if done manually, this process would not be sustainable, especially from an economic point of view.

📌 Key results
• Mainetti significantly lessens the need for new raw materials, reduces waste, and combats the challenges posed by single-use plastics.

• Launched in 2018, the reuse program has led to the collection of **millions of hangers** at the checkout of clothing stores worldwide each year. Thanks to this program, **up to 80% of hangers can be reutilized**, which consequently reduces the environmental impact.

📌 Success factors
All the actions are executed with the use of the collaborative robotics guided by **artificial intelligence**. These action otherwise would have not been sustainable, especially from an economic point of view.

Photovoltaic Cells: Clean Energy from Wine Waste

The collaboration between Serena Wines,
in the role of supplier of the wine-making waste
material, and the Ca’ Foscari, University of Venice,
represents an emblematic example of
circular economy



✎ Promoter

Serena Wines 1881, among the top 5 Prosecco producers and leader in the production and marketing of wine in steel casks in the Horeca channel.

✎ Type and sector affiliation

Businesses / Agriculture.

✎ Other stakeholders involved

Vinicola Serena Srl.

✎ Related SDGs targets

SDG 12. Responsible consumption and production.

✎ Objective

To valorise waste from the winemaking industry.

✎ Context and challenges addressed

There is growing interest in technologies based on organic materials, with the most promising being **Dye Sensitized Solar Cells (DSSCs)**, which use natural dyes.

However, normally interi foods are used to extract the dyes, thus creating competition for food industry.

✎ Circular Economy principles addressed

Prevention / Reduction and re-use / Recycling / **Recovering** / Disposal.

✎ Modes of implementation

An innovative method introduced by the initiative allows to use an **agro-food waste** product to create **photovoltaic cells** that generate renewable and sustainable electricity: natural dyes are extracted from the by-products of winemaking to capture solar energy.

✎ Key results

The method recovers a production waste and transforms it into a valuable **green resource** to produce renewable and sustainable **electricity**.

✎ Success factors

This technology is highly **replicable** and scalable to different contexts, since there is a large number of winemaking lees and by-products from the winemaking process in wineries.

06. FaterSMART

FaterSMART, part of the Italian Fater group, has developed the world's first industrial-scale technology capable of transforming used personal care products into secondary raw materials with high added value



● Company

🔗 Website link ↔

Promoter
FaterSMART

Type and sector affiliation
Businesses (Large companies).

Other stakeholders involved
—

Related SDGs targets
SDG 9. Industry, innovation and infrastructure.

Objective
To contribute to the economy growth without compromising the environment .

Context and challenges addressed
Every year, 30 million tons of used absorbent personal products are disposed in landfills or incinerators worldwide (9 million tons in Europe and 900.000 tons in Italy) (Fater).

Circular Economy principles addressed
Prevention / Reduction and re-use / **Recycling** / Recovering / Disposal.

Modes of implementation
FaterSMART designed a SMART BIN to minimise the costs of collection services while offering users a flexible, user-friendly and incentive-based service. The collected diapers and other absorbent products are sent directly to an autoclave, where recycling begins through pressurized steam without combustion, sterilizing and opening the materials. **The recyclable components** — plastic, cellulose, and super absorbent polymer — are separated and **used to produce high-quality secondary raw materials** for new products, including plastics, absorbent products for pets, textiles, and fertilizers.

Key results
The recycling technology and plant developed by FaterSMART **can recover 150 kg of cellulose, 75 kg of plastic, and 75 kg of super absorbent polymer** from 1 ton of waste collected separately. These materials are then **used to create new products** such as hangers, containers, plastic tables, high-quality paper, textiles, fertilizers, and absorbents for pets or the horticultural industry.

Success factors
1. Sensibility towards recycling issues and research.

2. Operating in the sector of vital necessity products, which quickly embraces innovative solutions.

Green school in Venice

Green School was founded in 2009 with the aim of fostering good habits to concretely reduce the carbon footprint of schools, measurable in kilograms of CO2 avoided in the atmosphere. The basis of these actions revolves around six pillars: energy saving, waste reduction, sustainable mobility, water saving, food waste reduction and biodiversity promotion, with result measured through the "Green School" certification, in a ranking from Class A to Class D



➤ Promoter
CENTER FOR VOLUNTARY SERVICES OF VENICE (CSV Venezia).

➤ Type and sector affiliation
Nonprofit organization and educational institutions/ Education.

➤ Other stakeholders involved
The territorial committee consisted of:
1. IUAV University of Venice.
2. Ca' Foscari Sostenibile, Ca' Foscari University of Venice.
3. Provincial Acli of Venice.
4. Arpav – Regional Agency for Prevention and Environmental Protection of Veneto.

Four participating institutions: Industrial Technical Institute C. Zuccante (Mestre), Municipal Kindergarten Dario and Federica Stefani (Marghera), Industrial Technical Institute Levi Ponti (Mirano).

➤ Related SDGs targets
SDG 11. Sustainable cities and communities.
SDG 13. Climate action.

➤ Objective
To **reduce** substantially the **carbon footprint** of **educational institutions**, measurable in kilograms of CO2 prevented from being released into the atmosphere.

➤ Context and challenges addressed
1. Sustainability and responsible consumption (of water, of energy and of food) is best taught at school, since it provides the foundation for the personal growth.

2. More than 30 % of the Italian schools have very low energy efficiency due to aging or poor quality of buildings and urgent actions are needed in order to commit to the sustainability of the latter (Rigoberto Arambula, Pernigotto, Cappelletti, Romagnoli, & Gasparella).

➤ Circular Economy principles addressed
Prevention / Reduction and re-use / Recycling / Recovering / Disposal.

➤ Modes of implementation
The four participating institutions undertook five actions aimed at enhancing the sustainability of schools, two of which focus on **circular economy principles**:

1. Introduction of two **plastic-free days** per week, along with the organization of containers and the creation of a story to encourage waste collection.
2. **Food planning** became a participative procedure, along with the introduction of a designated "anti-waste guardian" of the school.

➤ Key results
The four participating institutions were assigned a score based on their progress towards lower consumption levels and the **resulting reduction in CO2 emissions**. HEI C. Zuccante and a Municipal Kindergarten Dario and Federica Stefani received a Green School certification of Class B, the second category, in the very first year of the project; IIS Levi-Ponti has started the process to obtain the certification, which it is expected to receive in the next school year.

➤ Success factors
1. The actions were underpinned by the **educational campaign** conducted by the volunteers of the CSV Venice.

2. The initiative takes place **every year** with the aim of attracting more educational institutions.

08. Favini

Since 1990s, Favini is recognized as one of the world's leading companies in the production of sustainable papers made with waste materials from other production chains according to a model of industrial symbiosis



📌 Promoter
FAVINI

📌 Type and sector affiliation
Businesses (Large companies) / Light industry.

📌 Other stakeholders involved
—

📌 Related SDGs targets
SDG 12. Responsible consumption and production.
SDG 9. Industry, Innovation and Infrastructure.

📌 Objective
Foster the development of papers that respect the principles of the circular economy, combining the concepts of sustainability and innovation, reducing the environmental impact of paper production.

📌 Context and challenges addressed
Papermaking is an industrial process with several implications for the environment due to its high consumption of natural resources, energy and use of pollutants.
In the 1990s, the Venice Lagoon was facing abnormal algae infestation, plaguing the delicate lagoon ecosystem, leading to its eutrophication.
Thus, Favini invented the Alga Carta, the paper that creatively reuses seaweed.
Alga Carta has become the progenitor of a range of sustainable papers that characterize Favini's production, made with waste materials from other production chains according to a model of industrial symbiosis.

📌 Circular Economy principles addressed
Prevention / Reduction and re-use / **Recycling** / Recovering / Disposal.

📌 Modes of implementation
All products are made from eco-innovative raw materials:
• 40% to 100% recycled fibre.
• Materials from creative reuse such as textiles or agro-industrial waste.
• Alternative tree fibers such as fast-growing bamboo.

In 2012, Favini identified an alternative use for **by-products of agro-industrial processing** (residues of almonds and hazelnuts, citrus fruits, coffee, corn, kiwi, lavender, cherries, grapes and olives), revalorizing them as a noble raw material for paper production for the production of Crusch, a set of sustainable paper replacing up to 15% of tree pulp.
From the by-products of another industrial chain, that of **leather** goods, comes another innovative and eco-sustainable product: Remake paper, made from 25% leather goods waste and 40% post-consumer cellulose.
The latest product designed and developed by Favini according to the logic of creative reuse is the ecological paper Refit.
Born from the industrial symbiosis between the paper and **textile industries**, Refit is made from 15% wool and cotton textile waste and 40% post-consumer cellulose.

📌 Key results
Pre- and post-consumer recycling allows Favini to limit the use of virgin pulp for its product lines: recycled fibre from pre-consumer waste, fed back into the production process to reduce the use of virgin raw material, amounts to 16%.
The commitment for circular economy has been further valued through the creation of the umbrella brand “Paper from our Ecosystem”, allowing for market's and consumers' recognition.

📌 Success factors
The key concept for Favini is that of **industrial symbiosis**, the process in which traditionally separate industries integrate their processes to promote competitive advantages through an exchange of matter, energy, water and, in the case of Favini and its ecological papers, by-products.
The interactions generated by the industrial symbiosis established by Favini between the paper industry and the agro-industrial, tanning and textile sectors have enabled the creation of new products.

09. CeRiReuse Center

Reuse Centers are facilities that complement municipal ecocenters, where users can access and take the material displayed for their own needs without profit motives. A successful experience is represented by the one created by the Municipality of Campi Salentina, with the aim of valorizing waste as useful objects, by paying attention to waste reduction and promoting critical and responsible consumption



Public

Website link ↔

Promoter
MUNICIPALITY OF CAMPI SALENTINA

Type and sector affiliation
Public.

Other stakeholders involved
Citizens, schools, associations.

Related SDGs targets
SDG 12. Responsible Consumption and Production.
SDG 11. Sustainable Cities and Communities.
SDG 13. Climate Action.

Objective
The objective of Reuse Center is to reduce waste production by extending the products' life cycle. This also helps to eliminate or strongly limit the phenomenon of indiscriminate abandonment.

Context and challenges addressed
The Campi Salentina Reuse Center was born in an area characterized by a strong need to improve the management of urban waste and to raise awareness among the community on the importance of reuse. Puglia, like many other Italian regions, has had to face challenges related to the saturation of landfills, the increase in waste disposal costs and a widespread lack of environmental culture. The main challenges included:
• Reducing the amount of waste sent to landfill: a chronic problem due to poorly optimized disposal systems.
• Citizen involvement: the local community's low awareness of the importance of reuse and circular practices.

Circular Economy principles addressed
Prevention / Reduction and re-use / Recycling / Recovering / Disposal.

Modes of implementation
The reuse center is a place where materials recovered from the sorting of waste deliveries, artisanal production leftovers, and store discards are collected, displayed, and offered to reinvent their use and meaning. At the Reuse Center, consumer goods that are still in good condition (including hygiene) and functional are accepted, which can be effectively reused for their original uses, purposes, and goals. The used goods delivered to the Reuse Center are taken over by the staff, following a check for compliance, and deposited in the spaces designated for the initial accumulation. They are then classified based on their type, with an assigned expiration date for their stay at the Reuse Center (for a maximum period of 3 months, depending on the type of item). In the absence of the necessary requirements for acceptance, the delivered item is directed to the Municipal Collection Center for recovery/disposal, with immediate communication to the contributor who retains the option to refrain from disposal and retain ownership. Citizens and associations are able to collect products free of charge up to a maximum of 5 pieces with a frequency not exceeding 2 collections per month.

Key results
• Promote the reuse and repurpose of used goods that are still reusable and not included in the urban and similar waste collection circuit, extending their life cycle beyond the needs of the first user to reduce the quantity of waste to be sent for treatment/disposal.
• Provide a support structure to sensitive groups of users by acquiring, free of charge, used consumer goods that are still functional and in conditions to be effectively used for the original uses, purposes and aims of the goods themselves.

Success factors
The success factors of the Reuse Center are grounded in its **comprehensive and well-coordinated approach to waste management and community involvement**. **Institutional support** from local authorities ensures the center has the necessary funding, legal framework, and long-term sustainability, enabling it to align with regional and national waste management strategies. **Community engagement** is pivotal, as the initiative directly involves citizens, schools, and local associations in both the delivery and use of reusable goods. This fosters a shared sense of responsibility and environmental awareness within the community. Lastly, the **inclusive approach** ensures that the center is accessible to all, particularly vulnerable groups, by providing essential goods for free. This not only addresses social equity but also promotes a circular economy mindset, encouraging behavioral shifts towards reuse and waste reduction.

Community Composting Plant

Since 2017, an innovative experience for the management of organic waste has been implemented by the Municipality of Melpignano: the community composter, a positive practice of local management of organic waste which reduces environmental impact, lowers disposal costs, and provides residents with high-quality natural fertilizer



Archeoplastica – the museum of ancient, beached waste

The Archeoplastica project, promoted by the NGO
Millenari di Puglia in collaboration with schools and
local associations, entails beach clean-up activities
and awareness-raising initiatives by combining citizen
science approaches and digital tools to combat the
issue of waste dispersion in the Apulian coastlines



12. Radiobag

RadioBag is a disposal bag that opens innovative scenarios in terms of waste collection and monitoring, allowing for the creation of a “traceability chain” for waste



Promoter
SFREGOLA MATERIE PLASTICHE

Type and sector affiliation
Business (SME) / Manufacturing.

Other stakeholders involved
Citizens, municipalities, enterprises, institutes research .

Related SDGs targets
SDG 9: Industry, innovation and infrastructure.
SDG 12: Responsible Consumption and Production.
SDG 11: Sustainable Cities and Communities.
SDG 13: Climate Action.

Objective
The objective of the RadioBag® project is to promote efficient and sustainable waste management by introducing an innovative system for tracking and monitoring waste collection. This system encourages responsible behavior among citizens, reduces waste destined for landfills, and increases the recovery of raw materials, thereby fostering a circular economy.

Context and challenges addressed
In Apulia, in 2023 waste sorting reached the percentage of 60.22%, with an increase of 0.78 percentage points compared to 2022, whose RD was 59.44%. Based on the data published on the portal of the Regional Waste Observatory of Puglia (ORRP), in 2023 there was a reduction in the total MSW quantities produced of 5.72%, as in 2022 these quantities were equal to 1,716.409.57 tons. Furthermore, waste collected through RD decreased by 45,656.06 tons, with a decrease of 4.48%; the production of undifferentiated MSW also decreased by 7.53%, corresponding to a quantity equal to 52,455.46 tons.
The challenges include fostering citizen awareness and participation to overcome resistance to proper waste sorting, addressing logistical inefficiencies and inadequate infrastructure that led to waste ending up in landfills, and tackling contamination and complex recycling processes to improve raw material recovery through innovative technologies and enhanced collection practices.

Circular Economy principles addressed
Prevention / Reduction and re-use / Recycling / Recovering / Disposal.

Modes of implementation
RadioBag® is an Italian patent that allows the bag to communicate in real time with a technological platform capable to identify and track the bags intended for both the differentiated and the undifferentiated collection. Its technology allows to monitor the quantity and the quality of waste, “following it” throughout its course. RadioBag® can create an incentive/deterrent mechanism to reward the virtuous citizens with discounts also on the bill.
RadioBag® also allows to monitor the “bad users”, those who cause damage and transgress the rules of the fair behavior, so helping the local governments that can proceed against them with all the appropriate actions. The ecological operator through a reading system (without checking the contents of the bag) will be able to verify the user coordinates who have committed an infraction. All this will happen in total respect of the citizens’ privacy.

Key results
The analysis carried out in more than 150 Italian municipalities that adopted the RadioBag® highlighted the following positive effects:
• Reduction in quantities of unsorted waste collection, mainly due to the effectiveness of the user control mechanism (as the meritocratic/sanction system educates and empowers citizens).
• Increase in raw material destined no longer for landfills but for the relevant circuits and recovery consortia.
• Monitoring of bags’ consume of the individual citizen.
• Optimized waste bag distribution.
• Reduced Landfill Disposal Costs.
• Lower expenditure on landfill waste disposal.
Specifically, the adoption of RadioBag® led to an average increase of 20% of recycling in municipalities that have adopted this system (on average leave from 65% to reach 85%).

Success factors
The success of the RadioBag® project lies in its innovative tracking technology, which ensures accurate waste segregation and transparency, alongside its ability to engage citizens through a merit-based system that fosters responsible behavior. By increasing raw material recovery, reducing landfill dependency, and optimizing costs, the project supports circular economy principles and reduces environmental impact. Its scalability and alignment with SDGs enhance its broader adoption potential, while collaboration among stakeholders ensures inclusivity and long-term impact.

13. Biomethane plant

For years, the agricultural company Arca has been investing in the most advanced technologies for the production of biogas and biomethane, promoting a circular approach to the management of agricultural resources: with this objective in mind the company has built an anaerobic digestion plant that transforms agricultural by-products into renewable energy



● Company

🔗 Website link ↔

📌 Promoter
ARCA AGRICULTURAL COMPANY

📌 Type and sector affiliation
Businesses (SME) / Agriculture.

📌 Other stakeholders involved
Agro-industrial enterprises, environmental associations.

📌 Related SDGs targets
SDG 7. Affordable and clean energy.
SDG 9. Industry, innovation and infrastructure.
SDG 12. Responsible Consumption and Production.
SDG 11. Sustainable Cities and Communities.
SDG 13. Climate Action.

📌 Objective
Reutilize by-products from local agriculture as a driver for an ecological transition that benefits both the environment and the local community.

📌 Context and challenges addressed
Although Italy, with over 1,700 biogas plants, stands as the second-largest producer in Europe, the country still has significant room for growth in this field. Puglia plays a pivotal role in the development of biomethane for Italy's decarbonization and energy independence strategy. With its vast agricultural potential, the region represents a key area for the development of biogas and biomethane production in Italy. Leveraging this potential is essential to support the country's transition towards a more sustainable and energy-independent future. Moreover, Puglia's agricultural sector is deeply connected to the circular economy, particularly in the olive oil industry. Olive mills generate substantial volumes of liquid and solid organic by-products. However, reusing these by-products remains costly, and without anaerobic digestion, their disposal has a negative environmental impact.

📌 Circular Economy principles addressed
Prevention / Reduction and re-use / Recycling / Recovering / **Disposal**.

📌 Modes of implementation
Through anaerobic digestion, olive pomace is converted into both biomethane and digestate, a premium organic fertilizer. This process not only contributes to renewable energy production but also regenerates soil by increasing organic carbon levels and improving soil health, offering long-term benefits for future generations.

ARCA has embraced the "Biogasfattobene" ("Well-Done Biogas") model, a national initiative promoted by CIB (Italian Consortium Biogas). This integrated approach combines the production of biogas and biomethane, high-quality food cultivation, and innovative agricultural practices. Moreover, the process ensures soil resilience by reintegrating valuable organic matter, supporting the natural regeneration of crops. By striking a balance between economic productivity and environmental stewardship, this model safeguards agricultural resources and promotes sustainability for future generations.

📌 Key results
This innovative facility produces 500 Smc/hour of biomethane, along with electricity, thermal energy, and digestate. The digestate is applied to 600 hectares of agricultural land managed by the company, reducing fertilization costs while enriching the soil and ensuring its long-term fertility. Over one year, the plant processed approximately 60,000 tons of olive pomace and produced 4.8 million m³ of biomethane—enough to meet the annual energy needs of approximately 20,000 households. The use of olive pomace, a by-product of olive oil production, demonstrates how renewable energy and high-quality organic fertilizer can be produced while reusing agricultural waste and protecting the environment.

📌 Success factors
The success of the Biomethane Plant lies in its ability to integrate **advanced technology** with agricultural processes, turning waste into resources. The synergy between agriculture and technology drives ecological innovation, transforming agricultural by-products into renewable energy and organic fertilizers while preserving soil health. Its emphasis on environmental sustainability not only reduces greenhouse gas emissions and landfill dependency but also enhances biodiversity and soil regeneration, directly benefiting future agricultural cycles. The economic and operational efficiency of the plant ensures its long-term viability, generating financial returns through energy production and reducing costs for waste disposal.

Eggplant Not wasting life

In an agricultural socio-economic context, EggPlant emerges as an innovative and sustainable model, providing advanced solutions to transform wastewater into high-performance bioplastics. By doing so, it not only mitigates environmental impact but also generates economic and social value through technologies inspired by blue economy and biomimicry principles



15. Albo Circular

Albo Circular is the digital platform of Confindustria Emilia Area Centro available to all Italian companies to facilitate the transition towards more sustainable and circular business models



📌 Promoter
CONFINDUSTRIA EMILIA CENTRO

📌 Type and sector affiliation
Trade association / Industry.

📌 Other stakeholders involved
Small and Medium Enterprises (SMEs).

📌 Related SDGs targets
SDG 12: Responsible Consumption and Production.
SDG 11: Sustainable Cities and Communities.
SDG 13: Climate Action.

📌 Objective
To **prevent waste** of resources and, at the same time, **sustain the national economy**.

📌 Context and challenges addressed
Despite the leading position of Italy in terms of circularity (the use of recycled materials in production processes is at 18.7%, well above the EU average of 11.5%), there is still **little investment in the circular economy** (0.7% of GDP), and in recent years, the **consumption of virgin raw materials has increased** (+5.5%), while in the rest of Europe it has decreased (-6.3%).

📌 Circular Economy principles addressed
Prevention / Reduction and re-use / **Recycling** / Recovering / Disposal.

📌 Modes of implementation
“Albo Circular” is a virtual marketplace designed for the exchange of production waste, secondary raw materials, and recycling services.

Thanks to the portal, companies are able to:

- search for new collaboration opportunities.
- identify suppliers of production waste recycling services.
- identify suppliers of recovered material.
- identify services related to the circular economy.
- publish and consult ads to sell or buy materials and production waste.

Any company from Italy can access it for free and exchange materials: waste from one company can become secondary raw materials for another, thus, **turning waste into resources**.

📌 Key results
145 businesses from all over Italy has subscribed to the platform, thus spreading the business’ awareness about sustainability not conceived as a cost, but an opportunity for growth and innovation.

📌 Success factors

- The digital platform is free for its users.
- The interface is aimed at encouraging an intuitive search for opportunities: through an interactive map and customized filters, businesses can find partners for recycling services in the area, buy or sell production waste, and search for secondary raw materials.
- Innovation: Confindustria Emilia is already working to expand the platform’s functionalities to include a permanent observatory on company data and best practices.

01.

Sustainable student enterprise in Croatian high schools

The education initiative promoted in Split focuses on integrating sustainability into student entrepreneurship and promoting a sustainable entrepreneurial mindset in high schools



02. Zero-Waste restaurant

The Restaurant Makarun, based in Split, adopted a business model that addresses key challenges regarding the hospitality and food service industries, including excessive single-use plastic packaging and tackles the food waste problem, by adopting a zero-waste approach to cuisine



Sustainable accomodation

Heritage Hotel FERMAI Gallery has implemented a zero single-use plastic policy and a zero-waste strategy, significantly reducing plastic packaging and food waste in their business activity



Promoter
HERITAGE HOTEL FERMAI GALLERY

Type and sector affiliation
Businesses / HORECA sector.

Other stakeholders involved

Related SDGs targets
SDG 6: Clean Water and Sanitation.
SDG 7: Affordable and Clean Energy.
SDG 8: Decent Work and Economic Growth.
SDG 11: Sustainable Cities and Communities.
SDG 12: Responsible Consumption and Production.
SDG 13: Climate Action.
SDG 17: Partnerships for the Goals.

Objective
Sustainable tourism and a circular economy.

Context and challenges addressed
Hotels generate different waste streams, and many types of waste could in fact be avoided. Some objects or materials are managed as waste when they could be reused within the hotel itself or by other users. The laundry bags in hotel rooms are often not used for this purpose and have a very short lifespan. According to research , a 4-star hotel recorded a consumption of 6,321 plastic bags in one year and received only 101 laundry service requests. This consumption is equivalent to 2,958 m2 of plastic material, enough material to cover 11.5 tennis courts.

Also, the cost and waste associated with the daily use of plastic film in the kitchen are extremely high. In the group of hotels in the project, it costs more than €1,000 per year (even reaching €2,500 in some cases), with an annual consumption of 251,910 m2, equivalent to 966 tennis courts.

Circular Economy principles addressed
Prevention / Reduction and re-use / Recycling / Recovering / Disposal.

Modes of implementation
The creation of plastic packaging is eliminated by implementing a Zero single-use plastic policy, which fosters the adoption of reusable packaging and of natural materials instead of plastic. Leftover food is weighed, and a log is maintained to monitor and reduce food waste by adjusting the menu and portion sizes.

Water flow regulators have been installed in showerheads, sink faucets, and cisterns in guest rooms and other hotel areas (public restrooms, kitchen, cloakroom, etc.). Monthly records of water and electricity consumption are maintained.

During the off-season, room assignments are made on the same floor to reduce electricity usage, and energy consumption in other parts of the hotel is minimized when not in use. Also, awareness campaigns are put in place to educate guests, for example on the principle that bed linen is not changed every day and that towels are reused.

Key results
• Energy savings.
• Financial savings.
• Plastic waste set to zero.
• Enhanced recognition from client as a sustainable destination.

The efforts of the hotel support a more sustainable economy, foster environmental responsibility, and promote efficient business management.

Success factors
Proper and efficient management of business
Strong commitment of the business owners shared with co-workers.

Specialty coffee roasters and shop

By reducing plastic usage, encouraging the reuse of packaging, and implementing sustainable solutions, the establishment help foster a more sustainable and environmentally responsible approach to business



Sustainable fashion brand

Portico is a slow-fashion brand that recycles waste materials and surpluses from the textile industry into a new production chain, thus contributing in the sustainable change of the fashion industry



Biodynamic Zero-Waste wine production

As the first certified ecological grape growers in the county, Winery Križ aspires to grow grapes and produce wine naturally, while bearing sustainability at the heart of its business model



Modes of implementation
In a production process no waste is generated - both in the vineyards or in the wine production processes: when maintaining the vine, the branches that are trimmed are chopped up and used as fertilizer. Wine by-product, which is organic mass, would otherwise represent waste, but Križ Winery uses it as a secondary raw material. A part of the organic mass is used to produce rakija and gin, and in cooperation with Mlinarica Brewery, beer is produced as well. The remaining part is used as a natural fertilizer. Additionally, from fermented wine, vinegar is produced. The soil and wine are treated by hand, without the use of pesticides, as they would negatively impact natural yeasts. The approach to wine production is ecological therefore natural yeasts are preserved in the soil and grapes so there is no need for fertilizers. Biodynamic techniques are used alongside traditional cultivation. Wild indigenous yeasts are exclusively used for fermentation, and the aging process occurs in neutral barrels crafted from Slavonian oak for a duration of 12 months. This process emphasizes long lees contact, ensuring purity and freshness of the final product. Generated biowaste is further processed, some of it is used for production of other alcoholic beverages, such as rakija and gin, while the rest is processed into humus that is reused in viticulture.

Key results
Since 2008, Križ Winery has been engaged in organic viticulture, making them the first certified organic grape growers in Dubrovnik-Neretva County. The cultivation of the vineyards and crops is 100% natural, traditional and ecological. The soil and wine are treated by hand, without the use of harmful chemicals in the production processes. In the production process, no waste is generated. Since 2012, Winery has been a member of the Slow Food Movement and an active member of numerous festivals, international and domestic wine fairs, such as GrapeSton - festival of natural winegrowers and spontaneous wines.

Success factors
Križ Winery successfully cultivates 28.000 vines on 2.75 ha. In the wine production process, zero waste is generated. It has successfully developed a sales chain with approximately 40 regular customers in Croatia. The winery's products are exported to 9 countries across 3 continents. In addition to this, a key element of its success is networking: Križ Winery collaborates with other natural winegrowers and winemakers on national and international level and is a regular participant of various wine fairs and festivals.

07. Upcycling restaurant

The interior of the restaurant located in the heart of Dubrovnik Old Town fully reflects the philosophy of upcycling - creative repurpose: the restaurant space combines high environmental awareness with the long-standing family tradition of gastronomy of the Šare family, known for its quality and authenticity



08. “Creative to the clean Adriatic!”

Since its foundation in 2021, Maritimo Recycling has regularly organized and participated in voluntary actions to clean up the shores, beaches and underwater areas, focusing on the participation of the local community, especially its youngest members



09. BlueBag Initiative

The BlueBag initiative started in Croatia in 2014 on the island of Krk: through the distribution of blue bags to residents, tourists, fishermen and boat owners, the initiative aims to boost their involvement to an ecological venture through the cleaning of the coastline



Promoter
ASSOCIATION "OBALA NAŠIH UNUKA"

Type and sector affiliation
Nonprofit / Waste collection.

Other stakeholders involved
Utility company "Ponikve Eko Otok Krk".

Related SDGs targets
SDG 13: Climate Action.
SDG 14: Life Below Water.

Objective
The initiative is based on the volunteer cleaning of the coastline with the goal to collect at least one bag of debris that the sea has thrown ashore during the summer season.

Context and challenges addressed
The BlueBag initiative started in Croatia in 2014 on the island of Krk by the association "Obala naših unuka" and Krk's utility company "Ponikve Eko Otok Krk" and it was triggered by the burning problem of debris that enters the Adriatic Sea through river watercourses, currents from other seas and winds that bring waste from the shore or various vessels.

Circular Economy principles addressed
Prevention / Reduction and re-use / Recycling / Recovering / **Disposal**.

Modes of implementation
The objective of the initiative is to distribute blue bags to residents, tourists, fishermen and boat owners, and invite them to contribute to an ecological venture through the cleaning of the coastline while they are visiting the beaches and bays.
The bags are distributed by local tourist boards, marinas, gas stations or they can be found on frequently visited spots on the coast.
The BlueBag is designed as a motivational promotional material that encourages conscientious boat owners, and all other citizens, to behave responsibly and to do something environmentally friendly, as they can fill at least one bag with plastic debris in only five minutes and thus contribute to a cleaner environment.

Key results
From 2014 till 2020. more than 40.000,00 BlueBags were distributed to the residents, tourists, fishermen and boat owners.
The bags were filled with the debris found on the coastline and then disposed at the appropriate collection point.

Success factors
The initiative was recognized and implemented by numerous coastal authorities, utility and public and private companies in the Republic of Croatia by following the original idea started on the island of Krk. The BlueBag initiative has a significant potential to be implemented in every coastal community who is affected with the problem of debris waste and is seeking to implement a practice which can be more innovative and motivating than the regular cleaning campaigns.
For the potential transfer of the practice to other EU regions, few simple facts can be highlighted. First, removing the debris that the sea brings to the coastlines is not dangerous. Secondly, the cleaning process can even be fun because many items collected on the shore in imaginative hands can become interesting and original artistic creations.
And thirdly, the effects of implementing the "Blue Bag" action are immediate, the cleaned beaches immediately shine with a new glow. Each participant in the "Blue Bag" campaign can publish their good work on social networks and thus encourage other people to get involved in the action.
Spending five minutes to beautify the environment should not be a problem for anyone.

Green Habits for a Sustainable Labin Area

The municipality of Labin aims to tackle the insufficient level of information among citizens about waste management by implementing awareness activities about the importance of responsible municipal waste handling, waste prevention, proper household waste separation, household composting, and reusing objects in order to reduce the amount of waste disposed at landfills



Educational marine litter programs in Eco-schools from Istrian County

As part of the MARLESS - MARINE Litter cross-border action of awareness and innovation, INTERREG VA Italy-Croatia 2014-2020, a two-steps educational program was established in the Istrian County to address schools and Eco schools encouraging students to take care of the marine environment



Promoter
IRENA – Istrian Regional Energy Agency, IRB CIM – Center marine research Rovinj

Type and sector affiliation
Public sector / Environment and energy.

Other stakeholders involved
Eco schools from Istrian County, Utility companies 1. Maj d.o.o. Labin and MED EKO SERVIS d.o.o Medulin, teachers and elementary students.

Related SDGs targets
SDG 11: Sustainable Cities and Communities.
SDG 12: Responsible Consumption and Production.
SDG 13: Climate Action.
SDG 17: Partnerships for the Goals.

Objective
Focus on implementing good environmental practices at earlier age, to encourage young people to actively engage for the protection of their environment.

Context and challenges addressed
The goal was to raise awareness among students and through them their families and communities about the reduction of the purchase and use of plastic. A special emphasis was given to the role that each person can play in the reduction of marine litter through responsible behaviour. Students were shown how by properly selecting waste, reducing the use of disposable plastics, participating in cleaning actions and disseminating knowledge, they can contribute to solving this serious problem.

Circular Economy principles addressed
Prevention / Reduction and re-use / Recycling / Recovering / Disposal.

Modes of implementation
Educational marine litter programs in Eco-schools were set up in two steps:

- Step 1.
- Organization of interactive workshops in school classes.
 - Organization involved preparation of materials and presentations
 - Interactive discussion with students
 - Animated educational video of the MARLESS project was also shown to student. Video was developed by IRENA specifically for this kind of activities.
- Step 2.
- Organization of clean-up actions.
 - Preparation of clean up equipment.
 - Training with students related to collecting and recycling.
 - Collecting waste.
 - Analysis of collected waste (quantity, weight, types and materials).
 - Discussion about the origin of the collected waste.

Key results
The education was attended by students from 6 elementary schools (Dr. Mate Demarina Medulin, Banjole, Matija Vlačić Labin, Vladimir Nazor Vrsar, Monte Zaro Pula, Kaštanjer Pula). In total, almost 300 students of different ages participated in the education. Through education, students learned what marine litter is, what microplastic pollution is, what are the causes of marine litter and how this pollution affects the environment, marine animals and humans. It has been shown that one of the global problems of today is the large amount of waste in the seas and oceans, primarily plastic waste. After educational cycle, during April-May 2022, IRENA in cooperation with the Center for Marine Research of the Ruđer Bošković Institute launched three beach cleaning campaigns with students that participated. The clean-up action, in addition to the benefits of cleaning the coastal area, aimed to show the students involved and the general public how much waste can really be found on our coast and further raise awareness of this global problem.

Success factors
Students and teachers were very happy that they participate in this kind of initiative and expressed they desire to continue with these activities, in schools and in private life. After finalization of originally planned initiative, further schools expressed desire to participate, and IRENA held additional educations in two more schools.

Sensitizing the touristic sector in Istrian County

As part of the MARLESS - MARINE Litter cross-border action of awareness and innovation, INTERREG VA Italy-Croatia 2014-2020, the project saw the involvement would then help them understand amount, types and source of waste that is accumulating on their beaches and develop plan how to prevent/reduce this problem



● Public

🔗 Website link ↔

📌 Promoter

IRENA – Istrian Regional Energy Agency, IRB CIM – Center marine research Rovinj

📌 Type and sector affiliation

Concessionaires of beaches (hotel companies); Plava Laguna, Maistra, Valamar.

📌 Other stakeholders involved

Eco schools from Istrian County, Utility companies 1. Maj d.o.o. Labin and MED EKO SERVIS d.o.o Medulin, teachers and elementary students.

📌 Related SDGs targets

SDG 13: Climate Action.

📌 Objective

Sensitise the touristic sector by actively involving concessionaires of beaches (e.g. hotel companies) in the marine litter assessment.

📌 Context and challenges addressed

Region of Istria and its coastal systems is threatened by intense anthropogenic pressures including rapid accumulation of marine litter by diverse human activities. The region, which is very popular to touristic destination, must face a seasonal increase of waste generation due to the seasonal influx of visitors. The beaches, extremely crowded during the summer, are particularly vulnerable since they are proven to be concentrated accumulation zones and one of the main gateways of litter to enter the marine system. It is well known that the touristic sector generates a great amount of land-based marine litter. One main aim of the activity was indeed to involve and raise awareness on the touristic sector regarding the phenomenon of marine litter. The beach concessionaires involved were required to assess the marine litter collected during the daily cleaning-up actions according to prescribed methodologies proposed to them by IRENA and CIM, to identify the quantity and composition of beached marine litter, both contributing to the monitoring action and participating in project MARLESS touristic sector' engagement.

📌 Circular Economy principles addressed

Prevention / Reduction and re-use / Recycling / Recovering / Disposal.

📌 Modes of implementation

The project has covered different activities, namely:

- Organization of meetings and trainings with beach concessionaires.
- Implementation of data collection during summer months; concessionaires listed (types of waste) and

weighted waste during the regular/daily cleaning of beaches.

- After the end of season; analysis of collected data by experts.
- Participation of involved concessionaires (Croatian and Italian) in Interregional meeting.
- Proposal of measures how to prevent/reduce creation of waste at beaches.

📌 Key results

At the beginning of 2021, IRENA contacted four biggest hotels in the Istria Region: Maistra, Valamar, ARENA Hospitality Group and Plava Laguna, and invited them to participate in project activities. IRENA and CIM organized two trainings where methodology for the monitoring activity was presented. Three beaches were chosen for monitoring (locations: Rovinj, Poreč and Umag). The monitoring activities have been conducted during two touristic seasons (summer 2021 and summer 2022). Overall, monitoring showed the most frequent type of waste in all beaches is the category of plastics and that general analysis of the data indicates that the sampled objects are mostly of anthropic nature due to bathing activity and not coming from the sea. Luckily, monitored beaches are cleaned regularly so they are not big source of marine litter but we can conclude that a lot of other beaches in the region, which are not under concession and are not cleaned regularly, can be a big source of marine litter. After the collection and categorization of the marine litter, main results were the data analysis of marine litter and the proposal of conservation measures. Licensed beaches provide a significant amount of data on the amount and composition of marine litter due to daily cleanups. Furthermore, the trained beach facilities stakeholders involved in the monitoring activities participated in the international MARLESS Project meeting at Bisceglie in one of the test sites of Apulia Region (Italy), during which the interaction between researchers and local, regional and international stakeholders could focus and discuss on different aspects of the important issue of marine litter in the environment.

📌 Success factors

The main achievements include the successful involvement of some beach concessionaires who increased their awareness about the problem of marine litter and a major visibility of the project along with citizens' engagement. Moreover, the activity strengthened the dialogue between the public institutions and the tourist sector. Overall, the feedback received was positive, with participants stating their interest in the theme and their willingness to participate in potential future action aimed at tackling the problem of marine litter.

Underwater cleaning activities and monitoring in Istrian County

As part of the EU project MARLESS - MARine Litter cross-border awareness and innovation actions, financed through the Italy-Croatia cross-border cooperation program 2014-2020, IRENA organized several submarine cleaning actions that involved different local stakeholders, that also led to gather an insight, for the first time in Istria, into the quantities of waste that are accumulated across the year, especially after the high-touristic season



Free-to-use ashtrays on Istrian beaches

The activity, promoted by IRENA in the municipalities of Raša, Kršan, aimed at raising awareness about the problem of cigarette butts in coastal areas and in the seas through the use of cardboard ashtrays



📌 **Promoter**
IRENA – Istrian Regional Energy Agency Ltd.

📌 **Type and sector affiliation**
Energy agency / Public sector

📌 **Other stakeholders involved**
City of Labin, Municipalities of Raša, Kršan, Tourist boards Rabac-Labin, Raša and Kršan, Utility company 1.MAJ d.o.o.

📌 **Related SDGs targets**
SDG 13: Climate Action.
SDG 14: Life Below Water.

📌 **Objective**
Reduce the amount of cigarette butts, primarily on beaches and bathing areas.

📌 **Context and challenges addressed**
Beach waste management in heavy tourism-oriented areas is a complex activity. The number of users, type of beach activities, natural conditions such as wind and tidal changes, beach composition, difficult access, and various other factors make it a time a resource consuming effort with varying results. Some items that are frequently identified during beach cleaning actions are especially problematic. One of them are cigarette butts. Depending on natural conditions, estimates on the total degradation of cigarette butts vary from 10 months to up to 10 years. Even then, they degrade into microplastics causing permanent environmental hazards, both to the land and ocean environment.

📌 **Circular Economy principles addressed**
Prevention / Reduction and re-use / Recycling / Recovering / **Disposal.**

📌 **Modes of implementation**
To deal with this issue on beaches of Istrian region, IRENA, in cooperation with regional stakeholders, has identified good practices that could be replicated within the region and has proposed the action of developing biodegradable cardboard ashtrays, free-to-use and easy to dispose. In July 2023, first four stands equipped with free-to-use cardboard ashtrays were installed in Rabac, Ravni and Plomin Luka, all situated on the Labin area coastline. The first weeks of implementation have shown different results, in some areas the users have shown significant interest and have properly used the ashtrays, but in some locations, the amount of cigarette butts found on the beach and coastline shows that there is still a need to constantly raise awareness about the issue of improper disposal of cigarette butts and the consequences arising from it.

📌 **Key results**
More than 10.000 cardboard ashtrays were distributed over 2 summer seasons in the Labin area.

📌 **Success factors**
In 2024 IRENA and involved stakeholders have continued with the initiative and several authorities from the Istrian region have expressed their interest for implementing the activity in 2025.

01. A sustainable University

Erasmus University of Rotterdam has introduced a series of actions to reduce its carbon footprint and promote sustainability among its students and staff



📌 Promoter
ERASMUS UNIVERSITY ROTTERDAM

📌 Type and sector affiliation
University / Education

📌 Other stakeholders involved
City of Labin, Municipalities of Raša, Kršan, Tourist boards Rabac-Labin, Raša and Kršan, Utility company 1.MAJ d.o.o.

📌 Related SDGs targets
SDG 11. Sustainable cities and communities.
SDG 13. Climate action.

📌 Objective
To ease **waste sorting** and to **reduce the carbon footprint** of the university by raising awareness of the ways **individuals** can **contribute** to **reducing CO2 emissions**.

📌 Context and challenges addressed
Although there has been a shift to more recycling and less landfilling, Europe still generates 2.2 billion tonnes of waste every year, 27% of which is municipal waste (more than a quarter) (EU Monitor, 2024). At the Erasmus University Rotterdam, the separation of waste is done as much as possible by employees and students themselves. In order to steer this process in the right direction, new waste bins have been placed throughout the campus since the end of August 2020. Here, organic waste, coffee cups, paper, plastic and residual waste are collected separately. Other residual flows such as small chemical waste, glass, swill (cooked leftovers), white goods, construction and demolition waste were already collected separately per type through a waste management procedure.

📌 Circular Economy principles addressed
Prevention / Reduction and re-use / Recycling / Recovering / **Disposal**.

📌 Modes of implementation
1. Placement of bins and tools to boost **separate waste collection**.
2. Placement of a **composting machine** which converts organic fractions, such as swill and coffee grounds, into compost has been placed on campus. Processing this type of waste reduces the need for storage space and improves hygiene because there is no need for swill containers, which usually provide a breeding ground for rats.
2. **Disposable cups are no longer acceptable** at coffee corners: students will have to bring their own reusable cups or buy the ones on campus.

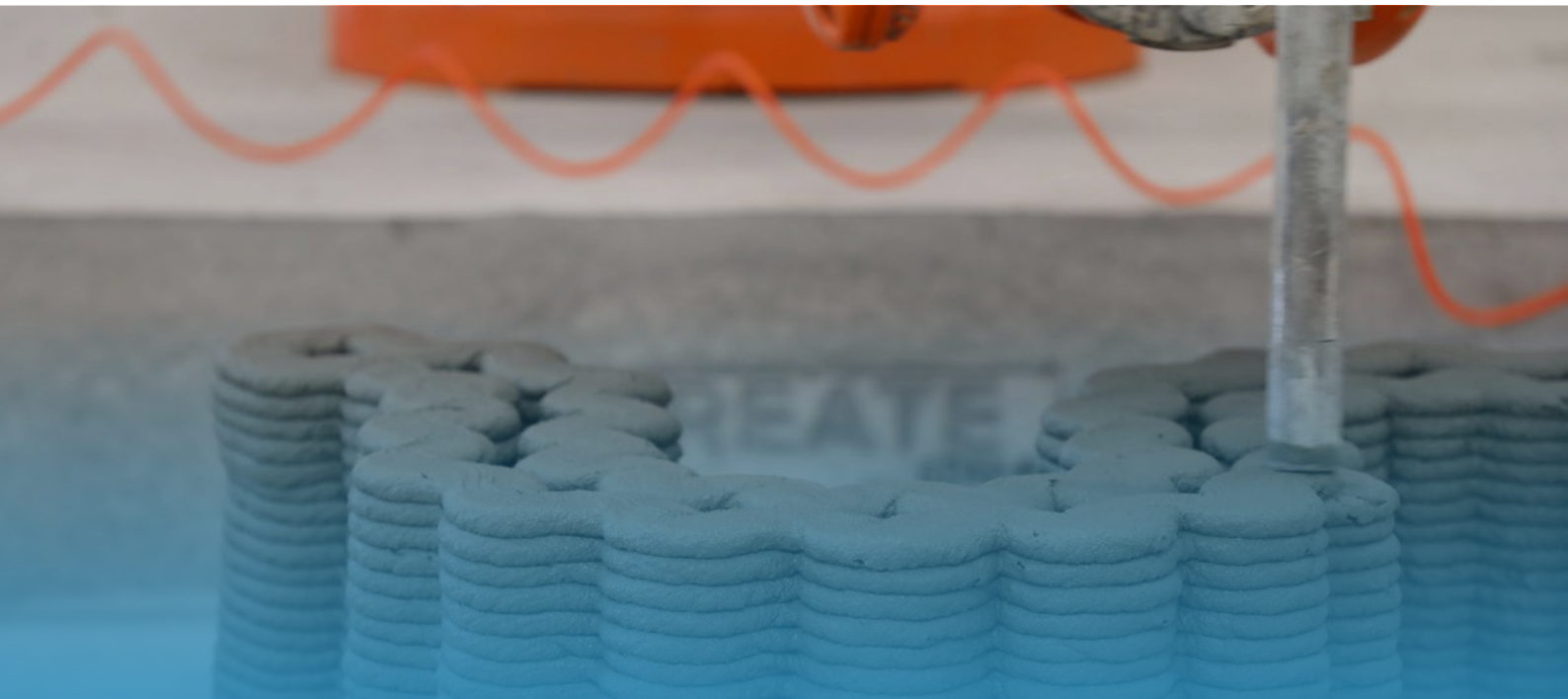
📌 Key results
1. The percentage of **recyclable materials** being separated out has risen considerably in buildings where the new system has been introduced.
2. The improvements in separating waste mean that an increasing volume of **valuable resources** is now being reused or recycled, and carbon emissions are being avoided. Since the arrival of the composting machine, **11,000 kg of organic waste** has been converted into compost resulting in a savings of 220 kg CO2 compared to traditional processing of organic waste in the Netherlands.
3. There are also **financial benefits**, because it costs less to dispose of paper and packaging than residual waste. Taken together with the lower volume of total waste, this means a saving on disposal costs.
4. The university is actively involved in the Higher Education Waste Benchmark. A waste benchmark was conducted in 2023, with the aim to gain more insight into the waste of educational institutions and to compare results and share best practices. Over the whole of 2021 and the first half of 2022, the university scores above average compared to 6 other universities with a place in the top 3.

📌 Success factors
1. Some of the **actions** introduced by the University are **binding**, like the one connected to the use of personal cups for drinking coffee from the vending machines.
2. The actions introduced by the University are also accompanied by a series of **awareness** raising campaigns.
3. Trash separation systems have a uniform look to prevent confusion and a wrong waste separation.

02.

3D printing in construction: optimizing building design

The Finnish company Hyperion Robotics implemented an automated 3D printed systems which allows reduce material use by 75%, and the construction's carbon emissions by 90%, offering significant cost and time savings



Promoter
HYPERION ROBOTICS, a Finnish construction technology company

Type and sector affiliation
Start-up / Manufacturing (robotics and deep tech).

Other stakeholders involved
Peikko, KUKA, Aalto university, Katapult Climate.

Related SDGs targets
SDG 11: Sustainable cities and communities.

Objective
Design and deliver **low-carbon concrete products** for infrastructure and industrial projects.

Context and challenges addressed
The **production of building materials** is responsible for an estimated 15-20% of **emissions** from buildings and **50-60% from infrastructure**. Among these materials, cement plays a significant role, contributing roughly 30% of building material emissions and 7% of global carbon emissions. **To reduce the carbon footprint of both buildings and infrastructure**, it is essential **to focus on the production and use of concrete** (World Economic Forum, 2023).

Circular Economy principles addressed
Prevention / Reduction and re-use / Recycling / Recovering / Disposal.

Modes of implementation
A combination of **industrial robots**, proprietary software, and upcycled materials.

Key results
The company's automated 3D printed systems can **reduce material use by 75%, and the construction's carbon emissions by 90%**, offering significant cost and time savings. Plus, **the material used is made from 50 % of waste** and has a lower carbon footprint than traditional concrete.

Among the sustainable solutions put in place by Hyperion there are:
1. Water Tanks.
2. Foundations - save up to 70% of material compared to traditional pad foundations, making them easy and fast to install on site.
3. Drawpits - up to 30% material saving compared to traditional trenches, they are ideal for efficient transport and installation on site.

Success factors
A multi-cultural **team** where **each member brings an added value** thanks to their crucial and unique competencies.

Plate up for Glasgow

Organized in the city of Glasgow by the NGO Zero Waste Scotland and the hospitality industry network “Experience Glasgow Food and Drink”, the five-week campaign aimed to raise awareness about food waste and promote sustainable food practices in the hospitality sector



Promoter

ZERO WASTE SCOTLAND and the hospitality industry network “Experience Glasgow Food and Drink”

Type and sector affiliation

NGO / Environment.

Other stakeholders involved

41 participating hospitality businesses.

Related SDGs targets

SDG 2: Zero hunger.
SDG 12: Responsible consumption and production.

Objective

Raise awareness about food waste and promote sustainable food practices.

Context and challenges addressed

The linear food system is a major contributor to environmental challenges, accounting for roughly a third of global emissions and over half of human-driven pressures on biodiversity. In Scotland alone, **1.35 million tonnes of food waste are generated annually**, with one in every six meals served going to waste. This waste also incurs significant costs, with businesses losing an average of £10,000 per hospitality establishment each year, while Scottish councils spend £85 million annually on waste disposal (Ellen Macarthur Foundation, 2023).

Circular Economy principles addressed

Prevention / Reduction and re-use / Recycling / Recovering / Disposal.

Modes of implementation

1. Key menu items featured **ingredients that are typically discarded**, such as vegetable stalks, leaves, and meat offcuts.
2. **Food preservation techniques** like drying, pickling, smoking, and fermenting were introduced, along with explanations of their benefits, such as preventing products from being discarded prematurely.
3. **Creating a dish from surplus or donated food** became a common practice, with food suppliers occasionally providing venues with "surprise" ingredients when they had an excess supply.

Key results

1) The campaign had a lasting impact on the participating venues. Most (88%) **committed to keeping their campaign dish or drink on the menu**, and 92% expressed interest in joining similar collaborations in the future. Additionally, 60% reported that **they now view food waste as a more significant issue** after participating in the campaign.

Success factors

A **shared spirit** of all the participants of the fair, including the actors with major weight in the industry, such as hospitality businesses.

04.

Digital Deposits for a Reuse Revolution

VISA is promoting waste reduction through an innovative project that enables customers to return reusable packaging into reverse vending machines (RVM) enables and instantly receive the deposit through a digital payout to their VISA card or contactless device, thus reducing the paper waste amount



Zero-waste restaurant FREA

FREA is a free-waste German restaurant: all their food scraps are processed into a soil substitute in the restaurant’s own composting machine within 24 hours and returned to the suppliers, creating a virtuous circular supply chain



References:

↘ **ECCO: The Italian Climate Chance Think Tank.** (2022). Plastics in Italy: A Vice or A Virtue?

↘ **Ellen Macarthur Foundation.** (2023). Activating food business networks: Circular Glasgow. Retrieved from - [Link](#) ↔

↘ **Ellen Macarthur Foundation.** (2024). Digital Deposits for a Reuse Revolution: Visa/Tomra. Retrieved from - [Link](#) ↔

↘ **EU Monitor.** (2024, December). Waste management in the EU: infographic with facts and figures. Retrieved from EU Monitor - [Link](#) ↔

↘ **European Commission.** (2020). In focus: Energy efficiency in buildings. Brussels: European Commission. Retrieved from - [Link](#) ↔

↘ **European Parliament.** (2020). E-waste in the EU: facts and figures (infographic). Retrieved from - [Link](#) ↔

↘ **Fater. (n.d.).** Fater SpA started testing its machine to recycle used personal hygiene absorbent products in collaboration with Contarina SpA, at its head office in Lovadina di Spresiano (TV), which manages waste for the Consorzi Priula and TV3. Retrieved from Fater - [Link](#) ↔

↘ **Gaude, A. (n.d.).** For the climate: Avoiding excessive food waste. Helmholtz Climate Initiative. Retrieved from - [Link](#) ↔

↘ **Jacobs, B.** (2020). The nasty truth about trainers. BBC. Retrieved from - [Link](#) ↔

↘ **Lynette, C., Seiko, M., & Dai, F.** (2012). Manufacturing-focused emissions reductions in footwear production. Journal of cleaner production.

↘ **NAVIT. (n.d.).** Bus, train, car or e-scooter: carbon emissions of transport modes ranked. Retrieved from - [Link](#) ↔

↘ **Rigoberto Arambula, L. Pernigotto, G. Cappelletti, F. Romagnoli, P. & Gasparella, A.** (2015). Energy audit of schools by means of cluster analysis. Energy and Buildings, 95, 160 -171.

↘ **World Economic Forum.** (2023). Scaling Low-Carbon Design and Construction with Concrete: Enabling the Patch to Net-Zero for Buildings and Infrastructure.

Project partners:

Lead partner

IRENA
Istrian Regional Energy Agency Ltd.



Partners

SINLOC SpA



LAG 5
Local Action Group

SUNCE
Association for Nature, Environment and Sustainable Development



VEGAL
LAG Eastern Venice

MUNICIPALITY OF **CASARANO**



