



FONDAZIONE
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Sustainable Development Foundation

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Recycling in Italy

SUMMARY

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RECYCLING IN ITALY | 2022

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Working group

Gianni Squitieri, Daniela Cancelli, Stefano Leoni, Lorenzo Galli, Valentina Cipriano, Anna Pacilli, Lorenzo Pisanu, Enrico Rolle.

The chapter “The industry of recycling: the development of a strategic sector for Italy” was developed in collaboration with ECOERVED (Marco Botteri, Manuela Medoro, Donato Molino).

Collaborators to the production of the study:

CONAI, BIOREPACK, CIAL, COMIECO, COREPLA, COREVE, RICREA, RILEGNO, ASSOCARTA, ECOERVED, CENTRO MATERIA RINNOVABILE, ECOPNEUS, CIC, CONOU, ITELYUM, CDCNPA, CDCRAEE, CONOE, RENOILS, ASSOREM, AIRA

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Fondazione per lo sviluppo sostenibile
Via Garigliano 61A - 00198 Roma
tel. 06.8414815
info@susdef.it
www.fondazionevilupposostenibile.org
www.ricicloitalia.it

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New challenges for recycling: the scarcity of resources and high prices of raw materials and energy, and the changes towards a circular economy

The increase in the prices of oil and gas starts in 2021, with a rebound effect following the deep recession due to the most severe phase of the Covid-19 pandemic in 2020, was rapidly followed by an increase in the prices of raw materials, also observing, for some of them, difficulties in supply, together with a robust increase in the demand. The Russian aggression in Ukraine, started on 24 February 2022, fed an ad-

ditional significant increase in the prices of oil and gas, and of raw materials in general, resulting in high inflation and slowing down the economic recovery in Europe. At the time, it appears hard to predict how long the war in Ukraine is going to last and what further impact it is going to have on the European economic situation. Most analysts expect the war to go on for a long time, with enduring effects on the European and global economy.

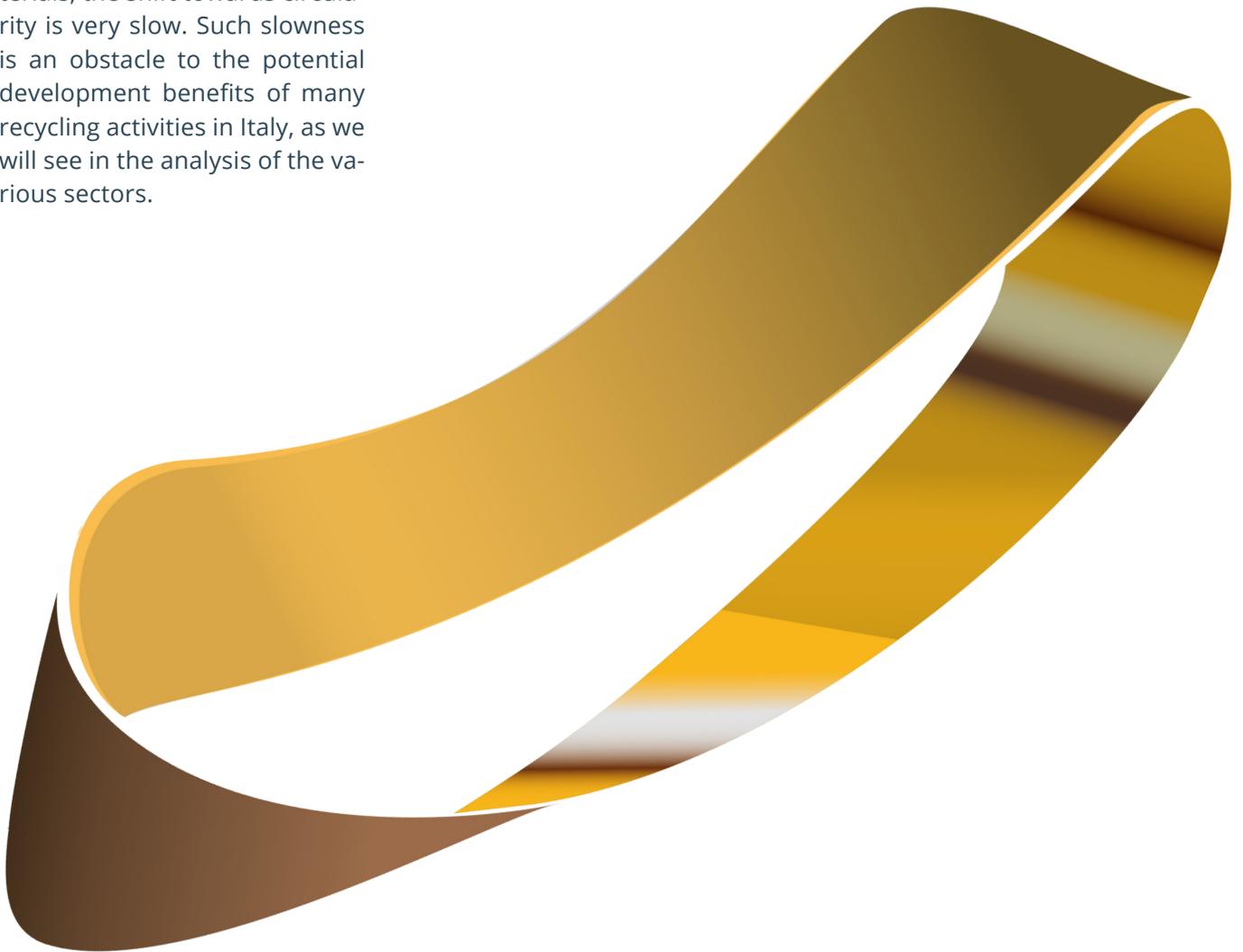
Such a new European and global economic context also affects

the recycling sector. The slowdown of the economic recovery and of the demand on the internal and European market causes commercial outlet difficulties for some recycled materials, worsened by the increase in energy prices and thus by the costs of industrial recycling activities. While for some sectors recycled materials remain cheaper, as they replace materials that are scarce and much more expensive, in other sectors such substitution is still absent or very limited. Also bearing in mind that a depressed market, with high inflation and thus a reduced demand, negatively affects expectations and perspectives of the recycling market.

There are positive expectations for the recycling sector due to the shift towards circular models of economy, consumption, and production. The change towards circularity will also increase the recyclability of products and the recycling of waste, and it will also promote an increased and favored employment of recycled materials as a replacement of virgin raw materials, supporting the structural stability of the recycling sector, and thus reinforcing its economic strategic role and its economic margins. While urged by the ongoing crisis on supplies and high prices of various materials, the shift towards circularity is very slow. Such slowness is an obstacle to the potential development benefits of many recycling activities in Italy, as we will see in the analysis of the various sectors.

As it is well known from numerous and accurate analysis, recycling also allows to save energy and thus to cut GHG emissions. We were affected by heat waves, drought, and the worst ever extreme weather events, caused by the climate crisis. We thus expect an increased commitment towards a rapid and robust reduction of GHG emissions, in order to reach, as soon as possible, net zero emissions. It is also for climate reasons that we expect an increased support to recycling.

Such increased attention is almost exclusively in the hands of recycling companies and associations, that commendably release data on GHG emissions avoided thanks to specific recycling activities. We expect a greater appreciation in public policies and measures towards this commitment on climate by the recycling sector.



The industry of recycling: the development of a strategic sector for Italy

The adoption of the Ronchi Decree 25 years ago started a modern industrial system for waste treatment. Waste recycling companies and organizations are an important institution with a leadership role in Europe, at the center of a key sector of the economy, that is strategic for the ecological transition.

The amount of waste, of all kinds, recovered in Italy more than doubled over the last 20 years, from 30 mln tons (Mt) in 2000 to some 65 Mt in 2020, 54 Mt of which were recycled. Such a great amount of waste generated a large industrial sector, composed by 4,800 companies in 2020 (operating through 5,400 local units), three quarters of which have recycling as their main activity, generating a significant added value, accounting for 10.5 bln euros with 236,365 employees. In 2020 the production of secondary materials from paper, rubber, wood, metals, organic, plastics, textiles, and glass accounted for over 25 Mt in Italy, by almost 2,500 companies.

The recycling industry in Italy reinforced its leadership role compared to other European

economies, exceeding Germany, the second country, by some 17 percentage points. However, the most interesting element is the increase rate over these 11 years. While it remained unchanged in Europe, it increased by 12 percentage points in Italy, 5 in Spain, it remained unchanged in Germany, and Poland and France saw a decrease in the amount of recycled waste. In particular, Italy has the highest level of waste recycled per inhabitant, 969 kg per inhabitant per year in 2020, followed by Germany at 921 kg per inhabitant per year, Poland at 726 kg per inhabitant per year, France at 625 kg per inhabitant per year, and Spain at 472 kg per inhabitant per year.

The most treated waste in Italy in 2020 are metals (over 18 Mt), organic waste (almost 13 Mt) and paper (little less than 7 Mt). As regards the rate of waste recycled compared to the amount collected, the best performances are for metals (95% recycling compared to the amount collected), glass (91%), and paper (84%).

Overall, 70% of waste, in 2020 just like in 2010, is recycled by

professional operators of the sector, that can be defined as core-business recoverers. The remaining 30% of waste is treated for material recovery by companies registered in the Register of Companies in sectors other than professional recycling and recovery (noncore-business recoverers), first of all in manufacturing, that put in place recycling actions in a circular economy perspective, giving value to scraps that can go back in the productive system, replacing the demand of virgin raw materials, or part of it. An example is Saviola Holding, that operates in the wood sector as a noncore-business company, with a recycling capacity of 1.5 Mt of post consume wood per year. The production model is based on recovery and reuse of secondary raw materials without using trees to obtain virgin raw materials. In the metallurgical sector, Arvedi Group can be mentioned as a noncore-business company, where over 95% of scraps and waste is recovered and recycled.

TABLE 1 Source: Elaboration by Ecocerved on data from the Company Register and "MUD" (Environmental declarations) 2011-2021

Waste recycling: **quantities per area of work of the recoverers** (Mt and % change), 2010-2020

Area	2010	2020	% Change 2020/2010
Core business	37,5	37,1	-1,1
Non-core business	15,9	16,9	+5,7
Total	53,4	53,9	+1,0

Focusing on noncore-business recovery, the main area in the implementation of circular economy principles in company operations is the metallurgical sector, accounting alone for more than 45% of the total; the sectors of wood and of non-metallic minerals follow and, together with the metallurgical sector, account for 75% of non-core-business recovery at the national level.

In 2020, 72% of recycling companies are limited companies (compared to 56% in 2010), followed by single small enterprises at 13% (21% in 2010)

and partnerships at 12% (21% in 2010). Over the last decade, a significant transformation in the business structure of companies operating in waste recovery can be observed, with an increase in limited companies (+7%) and a clear reduction of single small enterprises and partnerships, both reduced to a half between 2010 and 2020.

The distribution of the quantities recycled among companies of different dimensions, sees a reduction, over the time, of the role of small companies, decreased from 61% in 2010 to 53% in 2020, replaced by medium

and large companies (>50 employees), accounting for 47% in 2020, compared to 39% in 2012. This framework is confirmed especially among core-business companies, while a smaller variability over time is observed among noncore-business recoverers, as here the role of medium and large companies was already prevailing (75%, than 80% in 2020) compared to small ones.

In 2020, 62% of recycling companies have less than 10 employees, little more than 30% have between 10 and 49 employees, 5% between 50 and 250 employees, and 2% over 250 employees; however, the small number of large companies is the most relevant in terms of employees, as those companies employ 66% of the total workforce.

Also, in terms of workforce, the relevance of large companies increases over the time, at the expense micro-enterprises (<10 employees), mainly among core-business recoverers; on the other hand, the prevalence of larger companies among non-core-business companies was already clear also in the past.

Over the last ten years, the number of employees of waste recovery companies saw an overall increase by 6%: in particular, in core-business companies, whose development is strictly linked to that of the recycling sector, the increased was over 40%. Such trend, compared to the opposite one related to the number of companies (-15% for core-business), further confirms the structuring process of the sector, with an increasing role played by largest companies, at the expenses of micro-companies (<10 employees).

Lastly, from a geographical point of view, in 2020 over 70% of recycling activities is in Northern Italy, followed by the South and the Islands, with 16%, and the Center, accounting for 13%. Such percentages are even more polarized if only non-core recovery is considered, with the North accounting for 85% of the national total.

FIGURE 1 Source: Elaboration by Ecocerved on data from the Company Register and "MUD" (Environmental declarations) 2011-2021

Share of recycled waste per dimension (%), 2010-2020

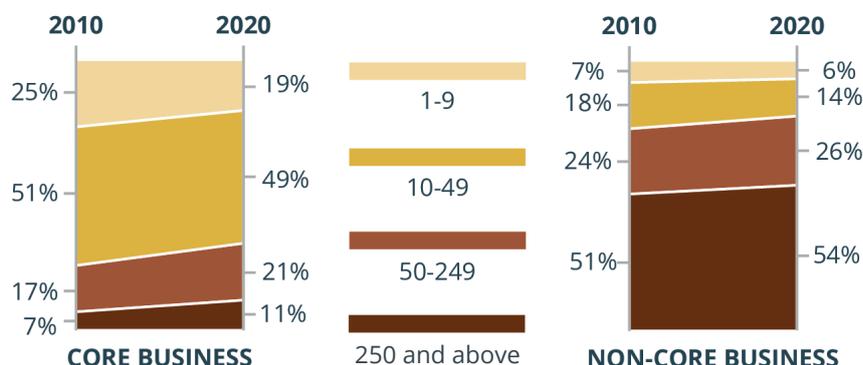


FIGURE 2 Source: Elaboration by Ecocerved on data from the Company Register and "MUD" (Environmental declarations) 2011-2021

Share of employees in recycling companies by dimension (%), 2010-2020

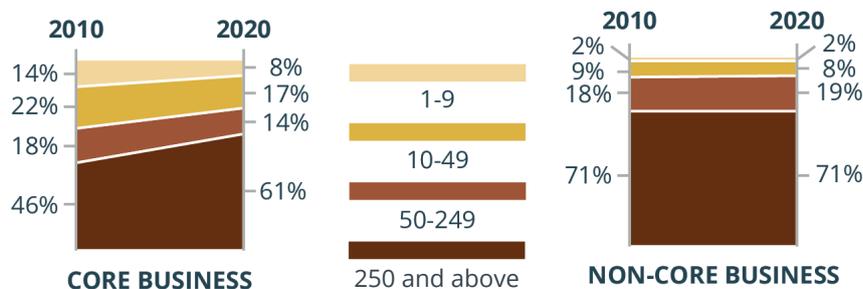


TABLE 2 Source: Elaboration by Ecocerved on data from the Company Register and "MUD" (Environmental declarations) 2011-2021

Waste recyclers: number of employees per sector of work of recoverers (number and % change), 2010 - 2020

Sector	2010	2020	% Change 2020/2010
Core business	90.876	128.581	+41,5%
Non-core business	132.396	107.784	-18,6%
Total	223.272	236.365	+5,9%

Production of secondary materials from waste recovery

Environmental declarations data show and increase in 2021 in the production of secondary materials from paper, rubber, wood, metals, organic, plastics, textiles, and glass accounting for over 25 Mt in Italy, by some 2,600 companies.

Compared to 2014 data, the materials taken into account see an

overall increase by 13%, with rubber and textiles increasing more than the average (both at +85%) and organic (almost +60%).

The number of companies producing secondary materials increases more than its amount. Reaching +16% as compared to 2014, when it accounted for a total of 2,250.

TABLE 3 Source: Elaboration by Ecocerved on data from “MUD” (Environmental declarations) 2015 and 2021

Production of secondary materials and variation compared to 2014, per type of secondary material produced (t and % change), 2020 and 2020/2014

Secondary material	Production	% Change 2020/2014
Paper	5.213.628	+12,3
Rubber	112.173	+86,7
Wood	2.287.234	+3,5
Metals	12.667.611	+8,4
Organic	1.734.397	+58,7
Plastics	972.326	+18,1
Textiles	137.950	+86,2
Glass	2.229.826	+24,0
Total	25.355.146	+13,3

The performance of the processes that treat waste generating secondary materials can be defined as the relationship between the quantity of output secondary materials and that of input waste, and it differs according to the considered product group.

Paper has the best performance: on average, at the national level, the recovery treatment of 100 kg of waste generates 91 kg of secondary materials that can be defined as “paper”. After paper, metals, textiles, and glass have performances little below 90%; wood and plastics at almost 80%; rubber, below 70%. The lowest performance is recorded by organic waste, less than 30%, due to the chemical and physical characteristics of the matrix¹.

Overall, the performances in 2020 are unchanged as compared to 2014, in line with the

TABLE 4 Source: Elaboration by Ecocerved on data from “MUD” (Environmental declarations) 2020

Performance, compared to the recovered amount, per type of secondary material produced (%) - 2020

Secondary material	Performance (%)
Paper	91
Rubber	68
Wood	76
Metals	88
Organic	27
Plastics	77
Textiles	89
Glass	85
Total	75

general framework: no relevant improvements can be seen in terms of technical efficiency. In other words, those operators recovering more waste produce more secondary materials, but the capacity to generate secondary materials per unit of treated waste is unchanged.

The material that shows the most relevant improvement is rubber: in 2014 100 kg of waste generated, on average, 57.2 kg of secondary materials and in 2020 such quantity increases to 68.1 kg, with an increase of almost 20% in this time.

¹ Specifically on organic waste, the performance is significantly lower than the other materials due, on the one hand, to the quality of waste collected, that is not always optimum, and, on the other, to the loss of weight from the input material (wet) to the output material (dry). This reduces the performance of the recycling process, but, at the same time, does not necessarily generate additional waste.

Packaging: from the excellence of the Italian recovery and recycle system to a challenge for the entire recycling sector

The packaging sector was among the first ones to be regulated, 25 years ago, at the European level, with an approach that can now be defined as circular economy, before the term was invented.

The national regulation, derived from the European directives on packaging and packaging waste (directive 1994/62/CE, updated by directive 2004/12/CE and today with the European Circular Economy package of directives 2018/851/CE and 2018/252/CE), is the legislative decree 152/2006 and subsequent mo-

difications and integrations, the so-called Testo Unico Ambientale (TUA), that integrates the regulations set by the legislative decree 22/1997.

While the national regulation framework saw significant changes, following the transposition of the European directives, the two key principles of the managing system remained unchanged:

- the extended producer responsibility (EPR), in line with the “polluter pays” principle, establishes the responsibility of produ-

cers and users in the “adequate end effective environmental management of packaging and packaging waste generated by the employment of their products” (art. 221). The pursuit of recycling and recovery set by the law is a responsibility of the “producer”.

- the shared responsibility and cooperation among all economic operators, both public and private, relevant in the management of packaging waste².

FIGURE 3 Source: Elaboration by CSEC CONAI

Packaging waste recycling rate per sector in 2021, compared to 2025 and 2030 European targets



² <https://www.conai.org/download/programma-generale-di-prevenzione-e-gestione-degli-imballaggi-e-dei-rifiuti-di-imballaggio-2022/>

Italian performances in Europe

25 years after the implementation of the directives on packaging in the various EU member states, a variety of different managing systems developed, with specific characters. The research “Screening the efficiency of packaging waste in Europe”, promoted by CONAI e supported by EXPRA (Extended Producer Responsibility Alliance), aims at evaluating the performances of the activities carried out by the Producer Responsibility Organizations (PROs), in the context of the various European EPR schemes, in terms of both economic efficiency and recycling efficiency.

The research is based on the available data collected via two ad hoc surveys and desk research, until years 2018/2019. In the research, EPR schemes and corresponding PROs have been assessed according to clusters, so to make them easily distinguishable and describable; while EPR schemes can be distinguished between Competitive and Non-Competitive, PROs can be either Profit and Not-for-Profit or Single or Multiple. PROs can be Single, such as those Not-for-Profit organizations holding over 90% of shares in a Non-Competitive EPR scheme, such as CITEO in France, Multiple and Not for Profit and operating in a Non-Competitive EPR scheme, such as Ecoembes and Ecodrio in Spain; Multiple and Profit and operating in a competitive EPR scheme, such as DGP (DerGrune-Punkt) in Germany.

The econometric analysis processed information on system costs (FEE's per tons of packaging released for consumption vs. tons of packaging recycled) and recycling rates (amount of material recycled vs. released for consumption) in relation to the different PROs' characteristics. Within this framework, two normalized (value scale from 0 to 1) key performance indicators (KPI) have been applied to compare PROs performances: an Economic Efficiency indicator and a Recycling Effectiveness indicator. All assessed PROs are presented in a 4-quadrant chart, which aims to outline the relationship between Efficiency and Effectiveness. This analysis shows that the Italian system based on CONAI is the less

expensive among countries with over 10 mln inhabitants. In addition, three key considerations emerged on the systems operating in Europe.

- 1) High recycling performances do not necessarily imply high costs.
- 2) Single PROs active in Non-competitive EPR Schemes usually have higher recycling rates and lower costs.
- 3) In a Competitive EPR scheme with Multiple PROs, a centralized coordination can be a solution to ensure competition and homogeneity in a context that sees different PROs operating in the same market segment.

FIGURE 4 Source: Bocconi for CONAI
All packaging material average of eu pros performances for economic efficiency and recycling effectiveness indicators

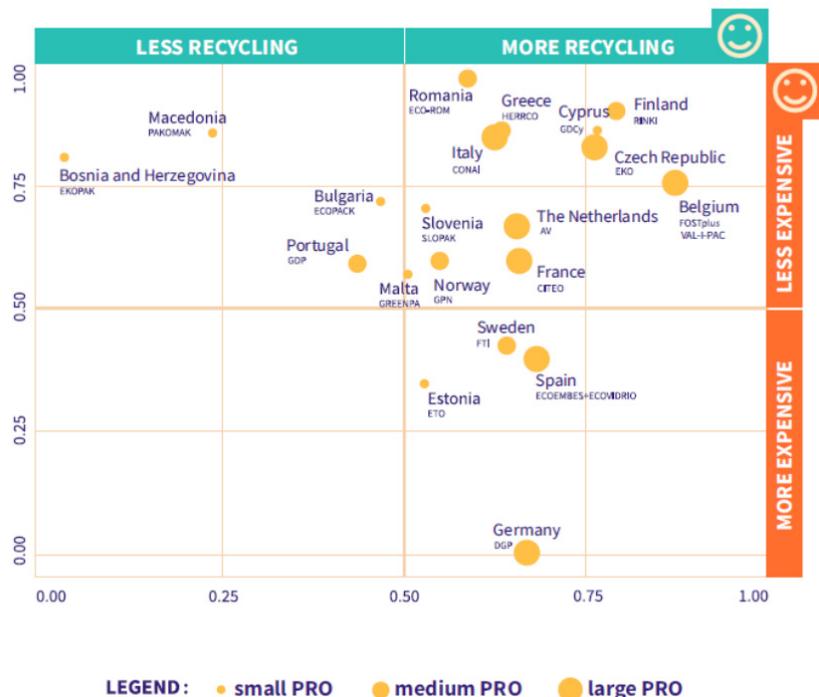


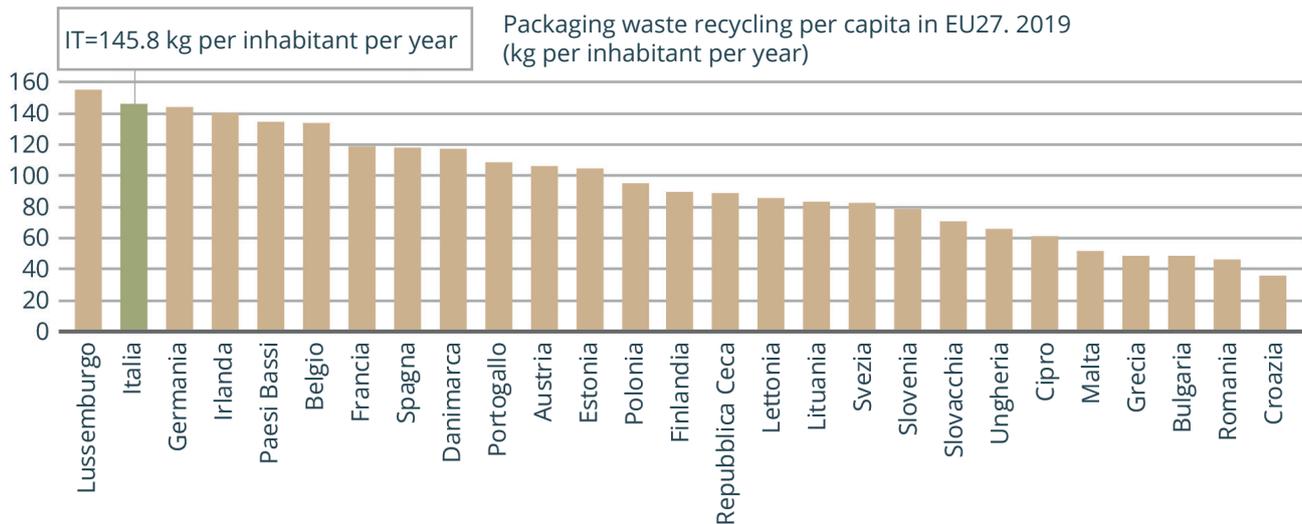
FIGURA 5 Source: EUROSTAT

Italian recycling performances compared to Europeans ones

ITALY RANKS FIRST AMONG THE MOST DENSELY POPULATED COUNTRIES



ITALY RANKS SECOND IN EUROPE IN PACKAGING WASTE RECYCLING, ABOVE GERMANY



Focus on the reporting systems of national data

The European Decision n. 270 of 22 March 2005 and subsequent modifications and integrations establishes the new calculation and measurement points for the database system on packaging and packaging waste.

The objective of the Commission is to review and harmonize at the European level the different formats for the database system of waste produced and of the various phases of management, recycling and reuse.

The Decision covers five main areas:

- Waste generation,
- Reuse,
- Recycle,
- Composite packaging,
- Repaired wood packaging.

In addition, in April 2020 the “Guidance for the compilation and reporting of data on packaging and packaging waste according to Decision 2005/270/EC” was published, as a guide for Member States to fulfill their communication obligations, with detailed information on all packaging materials and production processes (e.g., chemical recycling, biodegradation).

In addition, following the entry into force of the updated SUP targets for 2025-2029 related to the collection of PET bottles up to 3 liters, art. 2 of the Commission Implementing Decision (UE) 2021/1752 sets some regulatory requirements on the methodology for the calculation of the amount of separately collected

waste single-use bottles.

CONAI, as the national entity responsible for the national targets on packaging waste, has thus started a series of dialogues with institutions in the first place (ISPRA), as well as with the various relevant actors (sectoral consortia and autonomous systems) in order to assess the peculiarities and the effects of the new reporting models. In this context, it should be noted that the national reporting model has always been oriented towards an accurate and transparent calculation; as a consequence, the new methodology will not have substantial effects on the results that were so far communicated.

News from Europe

The year 2022 closes with a new revision proposal of the regulation on packaging and packaging waste. The Commission's mandate focuses on strengthening the measures to prevent packaging waste, with a number of regulations addressed to manufacturers and distributors, especially those of packed good, that are expected

to result in a reduction and redesign of packaging released for consumption.

This is an even more tight mandate than in the previous years, as the draft that was circulated in October 2022 during the Interservice Consultation (ISC) among the Commission DGs is a proposal for

a Regulation by the Parliament and the Council, that is expected to be released in the first days of December. It will then follow the ordinary legislative process and is expected to be adopted in the second four-month of 2024.

Draft proposal for a European Commission Regulation on packaging and packaging waste (PPW)

In the draft proposal for a PPW Regulation, not only the Commission sets some targets allowing Member States to organize and decide the best ways to reach the target on the basis of their peculiarities, but it also dictates the modalities to be adopted at the national level to reach the new targets, in both packaging waste management and packaging design, thus proposing a model, with related costs, without an adequate attention to the levels of effectiveness and efficiency that countries reached after 25 years of choices and regulations set at the national level. Such choices generated the development of infrastructures and investments in the end-of-life packaging waste, creating and strengthening an entire sector devoted to recycling (mechanical, chemical, and organic) and leading to the creation of markets for secondary raw materials. The draft requires a more in-depth evaluation, that needs to be conducted elsewhere; however, two elements should be noted here, one more general, and one more specific.

While sharing the need for a strengthening of the European hierarchy of waste management towards circular economy, and thus the importance

of preventing waste production, including reuse, sharing and the target declared by the draft Regulation of strengthening the waste cycle, it is essential to remember that the Directive 2018/851/UE, in order to improve the implementation of the hierarchy of waste management allows Member States to choose among a wide and effective range of 15 measures, detailed in Annex IV bis: a range of measures that allows the Member States to choose the most effective ones, taking into account the differences of the national systems, while also, on the other hand, avoiding to hinder the most virtuous ones, such as Italy, that ranks first among the large European states in the per capita recycling of packaging waste.

The draft Regulation by the Commission identifies the Deposit Return System (DRS) as the only return system that countries should implement by 1 January 2028 for some types of packaging (single use plastic and metal beverages containers), with the only exception of countries reaching 90% or recycling.

The Italian model for packaging waste management, based on recycling and

on the responsibility of EPRs to meet the targets, reaches 73.3% of recycling. Integrating the traditional recycling with selective collection systems, the target of 77% (amount collected for recycling) set by the Single Use Plastic (SUP) for PET liquid food packaging can be met in 2025, as well as the target of 90% of collection for PET liquid food packaging in 2029. For liquid food packaging made of other materials, rates are already around 90%, thanks to traditional recycling, such as for aluminum cans.

The introduction of a DRS for recycling where an effective packaging collection and exploitation system is already in place would be an unnecessary duplication of economic and environmental costs: it would just be at the side of existing recycling and collection systems. The DRS for recycling, if compared to a selective collection, has many inflexibilities that make it a solution that is not only unnecessary, but also inadequate for countries like Italy, with a well-developed recycling system and where future and most advanced recycling targets for packaging waste can be met in time, if need be, with additional measures for selective collection.

Recycling industries in Italy

A synthesis of the sectors

Below is a synthesis of the results of the various national sectors over the last years.

The year 2021 confirms that the targets for recycling of packaging waste are already met at the national level. CONAI contributes for a half of the national packaging waste recycling rate. With over 10.5 mln tons (Mt) collected and recycled, as compared to a total amount released for consumption of 14.3 Mt, accounting for 73.3%, Italy meets and exceeds by over 8 percentage points the 2025 65% target for post consume packaging and by 3.3 percentage points the 2030 target.

Paper and paperboard packaging recycled in Italy in 2021 significantly increased (+9.7%), reaching 4.5 Mt, the highest amount ever recorded, also thanks to the starting up of new productive capacity in the national territory, supporting the internal demand for paper to be recycled. The recycling rate for paper and paperboard packaging reaches 85.1%, exceeding the target set by the new Directive for 2030 (the EU27 average in 2019, last available year, was 82%). Despite the difficulties due to the extreme high costs of energy, gas and fibrous raw materials, that are bringing some companies to stop the production, the national paper production is still at a good level, with a 55% of the production deriving from recycled fibers.

Plastic packaging in 2021 recorded a significant increase in the amount recycled, +11.8% as

compared to 2020, reaching 1.2 Mt. Such increase represents the exploitation of 55.6% of packaging released for consumption, meeting in advance the 2030 target. The introduction of a new calculation point for the recycling target, that is more downstream, makes meeting the target even more challenging. In order to meet the new recycling targets, an increased amount of packaging in both urban collection systems and dedicated selective collection systems will be needed, together with an increase in the amount selected for recycling and the development of other forms of recycling to go side by side to the traditional one.

In 2021, **glass** packaging recycling from the national collection system reached 2.2 Mt. The share reached 77%, compared to the amount released for consumption, reaching the 2030 target (EU27 average in 2020, last available year, is 76%). The sector of collection and recovery of glass packaging, thanks to the significant increase in the treating capacities of the last period, was able to completely solve the difficulties encountered in the biennium 2018-2019. However, it also resulted in the need to import significant amounts of scrap glass (over 230.000 t in 2021), that could not be found on the national market, in order to meet the demand of national producers of glass containers, thus demonstrating that the national industry is able to employ much higher amounts than those that are currently collected.

The **steel** sector saw a decrease in 2021 in the amount recycled, -6%, due to a very high amount released for consumption, resulting in a recycling rate of 72%. The 2025 target was met, while the 2030 80% target is still far away. The challenge for the future is to significantly reduce the production derived from blast furnace (energy demanding and mostly powered by iron and coal mineral), replacing it with electric furnace (powered by recycled steel scraps).

Post-consumption **aluminum** packaging waste recycled in 2021 accounted for a total of 53,000 t, 67.5% of packaging released for consumption, exceeding the EU 2025 and 2030 targets. Promoting the full exploitation of the potential capacity of recycling plants is essential to support proximity in recycling, as well as to avoid scraps flight towards other countries. Such phenomenon is indeed very relevant, and it drains an important resource from Italy and Europe, which is a demand that is significantly increasing, also thanks to the key role aluminum should play in the ecological transition. The amount of aluminum scraps that are exported every year from the EU, both legally and illegally, should be minimized in order to implement an effective circular model.

As concerns **wood** packaging waste, the specific targets are 25% by 2025 and 30% by 2030, both already met and significantly exceeded by our country: 64.7% (EU average is 32.4% in 2020), recycling some

2.2 Mt. A 97% share of wooden recycled material is transformed into particleboards employed by furniture and home decor industry. Over the years, there has been an increase in the costs of transport paid by RILEGNO, in order to make the system more and more sustainable, with the aim to progressively boost the collection and the development of areas that were not much involved in the past. The recycling capacity of the wood sector is concentrated in Northern Italy, both historically and geographically, with an operational capacity in the Center and the South that is still limited.

At the world level, 1.6 Mt of compostable **bioplastics** were produced in 2021, with an increase compared to 2020 (+25%). Despite the increase in the production, it still represents less than 1% of the total annual production of plastic. According to estimates, the sector is expected to continue expanding. The national production accounted for 125,350 t (+13% as compared to 2020), exceeding for the first time €1 billion in revenues. As of November 2020, the sector gained recognition of Biorepack Consortium by the Ministries of the Ecological Transition (MITE) and of Economic Development (MITE). The overall objective of the consortium is the management of packaging and packaging waste made of compostable and biodegradable plastics, to be recycled in the collection system for the organic fraction of municipal waste.

The **organic fraction** has always been the largest share of recovered urban waste. In 2020, 7.2 Mt of organic waste were collected and recycled in 359 plants in the entire national territory. As little as 65 integrated plants treat 52%

of organic waste, as they have a capacity that is higher, on average, than composting plants. In 2020, the transformation of organic waste generated some 2.2 Mt of compost, a natural fertilizer that returns to the soil revitalizing it. As regards biomethane, the approval of the Decree is a first step towards new investments; this long-awaited measure can enable the biogas and agricultural biomethane to contribute to respond to the energy crisis.

In 2020, over 3 Mt of **sewage sludge** were treated. 53.5% of the total amount was treated for disposal operations, while 44.1% was treated for recovery. As compared to 2019, the amount treated for disposal operations decreased by more than 117 kt, accounting for a 6.7% decrease, while the amount treated for recovery increased by 55 kt, accounting for 4.3%.

The quantity of **End-of-Life Tires (ELTs)** serving the aftermarket accounted for 323,000 t in 2020, with a decrease compared to 2019 (-13% approximately), due to the effects of the pandemic. As regards ELTs waste treatment, 79% of ELTs (over 349,000 t) was treated for material recovery, 2.8% (over 12,000 t) was treated in plants for energy recovery, while 80,000 t (18.1%) remained stored in warehouses to be treated during the following year. In the context of the activities by ECOPNEUS consortium, 52% of ELTs collected in 2021 were treated for energy recovery, while 48% were treated for material recovery. The use of recycled rubber for infills for synthetic sports fields is expected to be banned at the EU level, thus undermining a relevant sector that accounts today for 30% of the material recovery of ELTs at the national level.

In order to implement a real transition towards a circular economy it is thus essential to develop new recycling sectors, such as pyrolysis recycling, as well as to support those already existing, implementing End of Waste criteria and effective green public procurement policies.

In 2021, 1.3 Mt of **electrical and electronic equipment (EEE)** were released for consumption. According to the new methodology set out by the relevant regulations, the national collection rate for WEEE (for both household and non-household) is 39.4% of the average amount released for consumption over the last three-year period, very far away from the 2019 65% target, and among the worst performances at the European level. Per capita collection in Italy accounts for 6.64 kg per inhabitant, with a 5.2% increase as compared to 2020. The approval of the new decree on categorization would allow to bridge the regulatory gap experimented over the last four years on the correct categorization of waste, as well as to promote an appropriate communication aimed at an increase in the collection and at meeting the EU targets.

In 2021, 410,000 t of **batteries and accumulators** were released for consumption. In 2021, 10,200 t of portable batteries and accumulators were collected, -7.4% compared to 2020. According to Eurostat data, the collection rate in 2021 reaches 36% of the amount released for consumption over the three-year period, 9 percentage points below the 2016 target (45%). In 2019, among the main EU economies, the best performances are recorded by Poland with a 72.6% recycling rate, France with

48.7%, and Germany with 52.2%; behind them are Spain with 45.6% and Italy with 43.9%.

Mineral oils released for consumption in 2021 amounted to 403,000 t. The collection rate was well above 46% of the amount released for consumption, with a collection of about 186,000 t. The amount regenerated was 184,000 t, with a production of 125,000 t of new bases, as well as 38,000 t of bitumen and gas oils. The relationship between the amount collected and that regenerated is above 98%.

In 2021, 260,000 t of **waste vegetable oil** were produced. Approximately 62% is from household, while 38% is from professional sectors, divided among catering, industry, and handicraft. In 2021, the total amount of recycled vegetable and animal oils and fats accounted for 77,000 t, with a 5% increase compared to 2020. The main critical issue in the sector is the inadequate perception of the polluting potential of waste vegetable oils and fats from catering, resulting in an underestimation of the environmental impacts derived by an inadequate management.

In 2020, **end-of-life vehicles** management recorded an increase in recycling and recovery, as compared to 2019. Overall, the sector sees a share of reuse and recycling accounting for 84.7% of the average vehicle weight, in line with the 2015 85% target set by the legislative decree n. 209/2003. Similarly, the overall recovery accounts for 84.7%, far from the 95% target, thus stressing that the lack of energy recovery jeopardizes the achievement of the overall target. Waste produced by shredding

plants is the main fraction sent to disposal and is one of the main problems of the entire sector.

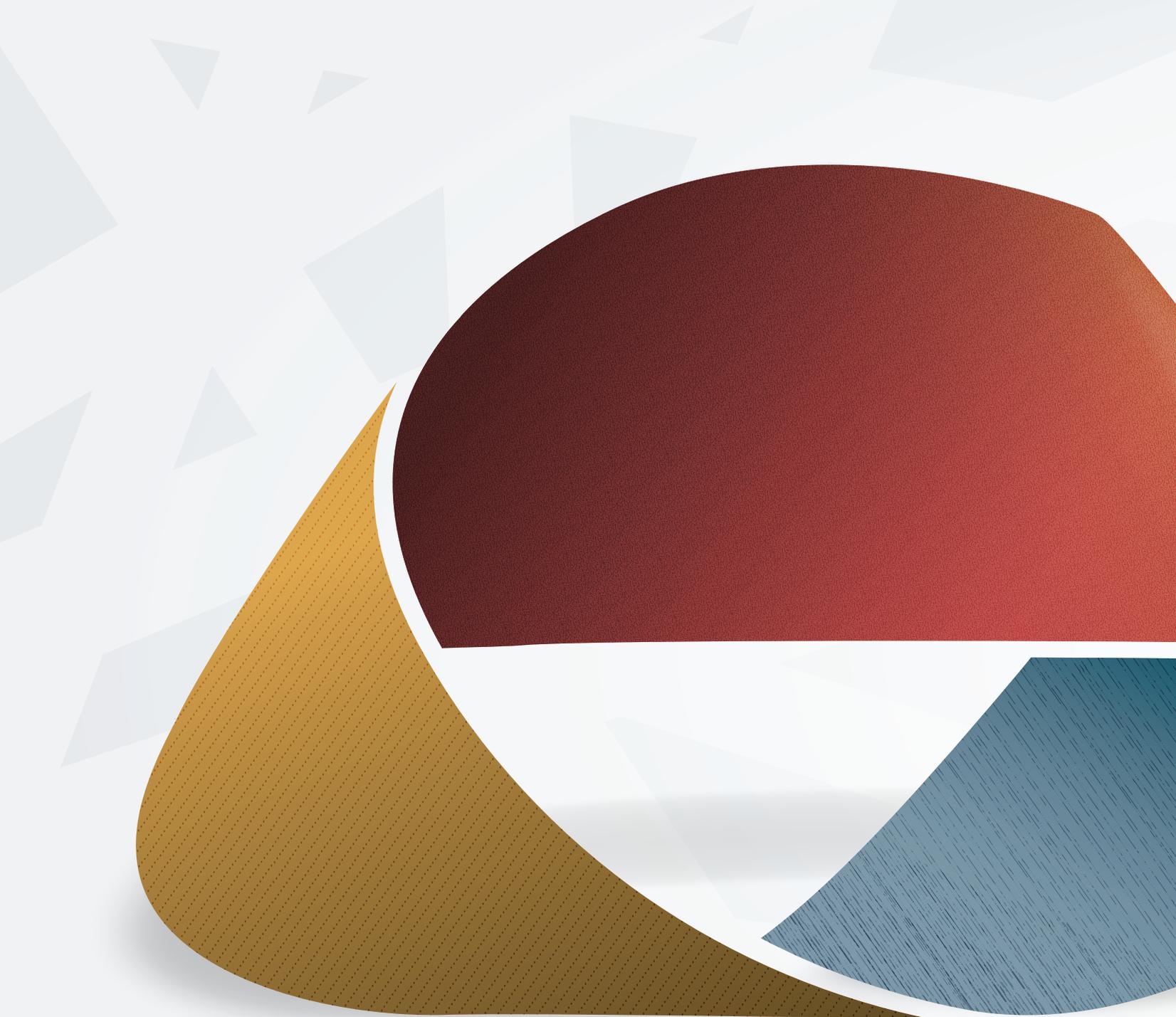
The production of **inert construction and demolition (C&D) waste** is estimated around 50.2 Mt in 2020, with a 3.6% reduction as compared to 2019; similarly, material recovery sees a 3.9% reduction, about 39.1 Mt, amounting to almost 1.6 Mt less. Such reductions show the significant negative effects due to the pandemic and the closure of construction sites, especially in public works. The recovery rate for C&D waste is at 77.9% in 2020, above the 70% target set by the Directive 2008/98/CE for 2020, a target that is already met by most EU Member States. However, at the national level, a significant amount of C&D waste is not traced and C&D waste recycling is not sufficient, while the largest part is recovered in road embankments and foundations. Allocating funds to implement the recycling of C&D waste in the construction of buildings and infrastructures, also by means of EoW criteria and CAM, is the key to reduce the production of waste, as well as the employment of extractive raw materials.

According to data collected from the main national recovery plants, the potential average annual production of **streets sweeping waste** is estimated around 17-22 kg per inhabitant per year: with a population of 60 mln, the potential production of street sweeping waste is estimated around 1.02-1.32 Mt per year. According to ISPRA, recovered street sweeping waste in 2020 amounted to 422,000 t, equivalent to 7.12 kg per inhabitant. The largest share is recovered in Northern Italy (260,000 t), followed by the Center (86,000 t)

and the South (76,000 t). At the regional level, Lombardy accounts for a quarter of the total national amount of recovered street sweeping waste, with 115,000 t.

In 2020, 143,300 t of **urban textile waste** was collected, with a 9% reduction as compared to 2019, accounting for as little as 1% of the national separate collection. As of 2020, 73% of Italian cities have implemented a separate collection of textiles, but 5.7% of the undifferentiated collection is still composed by textiles: it is clear that collection systems could be significantly improved. Italy anticipated the implementation of textiles separate collection to 1 January 2022, thus anticipating the 2025 European deadline, with a very important stimulus to urban collection systems. The National Strategy for Circular Economy requests the implementation of an EoW mechanism in the textile sector, with a dedicated ministerial decree by the end of 2022.

In 2020, approximately 200,000 t of **spent solvents** were treated in Italy: 78% in recycling (EU27 average is 42%), 21% in incineration, and 1% in energy recovery. In a context with no changes in both the number of operators and in their authorized capacity, and without official statistics, the main operators estimate a 5% overall increase in the amount of waste recovered. In order to solve the shortcomings that result in national distortions in the reuse of materials and mixtures, it is essential to accelerate the development of the regulatory framework chemical products waste.



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