28th REPORT

Collection, Recycling, and Recovery of Paper and Board

Data for the year
2022

July 2023

comieco
Consorzio Nazionale Recupero e Riciclo
degli Imballaggi a base Cellulosica

ACRONYMS

PTA	Paper Technical Annex
FMS	Frazioni Merceologiche Similari (similar product fractions)
SC	Separate Collection
UW	Urban Waste
%	Percent rate
n	Number
t	Tons
kt	Thousands of tons
ab	Inhabitants
kg	Kilograms
TJ	Terajoule

FOLLOW US

comieco.org

Scientific Coordination
Antonio Ciaffone
Roberto Di Molfetta

Editorial Coordination
Elisa Belicchi
Eleonora Finetto

Page setting and graphic layout
Boutique Creativa
Communication Design - Milano

Printing completed
in July 2023

Printed on recycled paper

TABLE OF CONTENTS

“The key to win, both on the field and in life, is respect for team mates, as well as for rivals.

No one can win alone, neither on the field nor in life”.

Pope Francis

PREFACE
ALBERTO MARCHI
CHAIRMAN

The primacy of the circular paper and board packaging economy was confirmed in 2022: the target set by the European Union for 2025 was surpassed with a rate above 80%, and a gradual approach to the final surpassing of the 85% target set for 2030 is confirmed.

This figures point out to undisputed success in a year of full operation for all the parties to the pipeline - from the citizens engaged in collection to the final processing and marketing of new paper and board products.

With a system that is by now sound and consolidated, the focus is on maximizing the impact expected from the resources of the National Recovery and Resilience Plan (NRRP), within the framework of the specific measure for the paper sector as a leading one, also capable to drive other industries.

More than 60% of the funds are allocated to the development of paper and board recycling plants in southern Italy. These resources add up to a dedicated plan developed by Comieco to support and assist Cities in southern Italy with extraordinary investments for an amount of 3.5 million EUR.

The system-related results reported above were achieved in just a few months characterized by different phases with Southden and unexpected variations of economic indexes (production data, consumptions, prices), whose impact was mitigated and offset with the tools provided for by the Technical Annex.

The Consortium's operations allowed the appropriate management of faster and faster cycles connected with an unstable and extremely flexible socioeconomic environment.

The strong impact of inflation on raw materials, soaring energy prices in the first half of the year, the decline of paper demand, connected with the decrease of consumptions in the second half of the year, were the main issues we had to address in these months. And we can also see their impact on local data about the collection of paper and mixed waste.

Overall urban waste production is declining significantly. As to separate paper and board collection, projections point out to a slight improvement vs. 2021, however in a varying direction, if the results of the individual regions are considered.

The sum of positive and negative data results into an overall volume above 3.6 million tons (+20thousand tons vs. 2021) and a yield per inhabitant/year of 61.5 kg. In accordance with the principle of market subsidiarity, Comieco managed a total of 2 million tons, i.e. 20% of volumes less than in 2021.

This is the result of the reduction of the household flow that the Cities resolved to recycle outside the agreements in a context (early 2022) of high prices of paper for recycling. Collection was globally ensured in the Italian Cities via the contracts in force, with the Consortium allocating resources for more than 183 million EUR, plus 41 million EUR for in-plant services for integrated contracts.

Milestones include, among other things, the development of collection and recycling of beverage cartons (60% target by 2025), alongside other composite paper and board materials; the development of separate collection in fast food distribution, in the large bags business, in major events; and the Plan for the South to improve qualitative and quantitative performance.

The resources allocated by the Plan are close to 130 million EUR to support 46 approved project; these amounts add up to the investments planned by the sector for a total of almost 500 million EUR.

Investments are intended to improve capture, quality, and processing capabilities and, more generally, efficiency along the pipeline, while reducing average costs.

The main goal is to capture those tons of paper and board that still end up in landfills - no less than 800thousand, according to estimates, including 440thousand in the South. These numbers provide both a warning and a stimulus.

While packaging production is confirmed at the top level of 2022 (5.3 million tons), the domestic use of paper for recycling is reduced and exports have resumed their upward trend.

The navigator is set on the same destination - increase and improve collection. Doing this requires filling the gap between the South and the Centre/North of the Country. This project is under way, but needs to be supported and boosted as much as possible.

EXECUTIVE SUMMARY
CARLO MONTALBETTI
GENERAL MANAGER

The Italians and the value of separate waste collection

The central role of separate waste collection, as a daily habit of citizens, is an added value with a potential positive impact on the community at large, as confirmed once again by this 28th Annual Report on the separate collection, recycling, and recovery of paper and board in Italy.
Data for 2022 points out to substantial continuity with the findings of the previous year. Municipal separate paper and board collection totals just more than 3.6 million tons, with a limited, yet remarkable increase by close to 20thousand tons (+0.6%) vs. 2021.

Such increase equals to one and a half the weight of the dome of St. Peter's Church in Rome and is even better understood if considered within the broader perspective of urban waste management as it emerges from the review of the data - albeit partial and non-final - available as at the date of drafting of this annual report, where a decline of overall urban waste volumes by about 1 million tons (-3.5%) is estimated.

The average paper and board capture rate vs. total urban waste is 12.7% at national level. The stability of collection levels, as compared against the overall waste decline, is a sign to the contrary that can be interpreted positively, even if it implies reviewing last year's estimates and this year's expectations.

Paper and board packaging recycling: consolidating the achieved and surpassed EU target for 2025

Last year, on these pages, reference was made to the "resilience" of the pipeline, i.e. the ability of the paper-making system to withstand and adjust to significant and hard shocks. Several events, since 2017, including the ban to Chinese paper for recycling imports, the 2020 pandemic, and the 2021 fluctuations, have brought about critical global conditions in the paper sector.

The year 2022 began in continuity with the previous one, with a busy paper for recycling market, a stable domestic demand, and a recovery of exports.

The outburst of the Ukrainian war and the subsequent soaring of gas and energy prices in the spring of 2022 resulted into unaffordable costs for companies in the paper sector, which stopped production for a variable length of time due to a reduced domestic demand for raw materials.

Hence the collapse of paper for recycling quotations at an international level in August, and the subsequent price cut; in this scenario, the strategic role of Comieco was once again confirmed in ensuring domestic separate collection of the paper derived from the Cities and recycling in a paper for recycling market that was proving tricky and uncertain.

It is worth reminding that recovered paper is still the main source of cellulose fibre for the paper sector, as confirmed by the 81.2% paper and board packaging recycling rate, which consolidates or, rather, surpasses the EU target set by 2025 for the pipeline (75% provided for by Directive 2018/852/EC).

Best and worst: Italy is split up between an increase and a decrease of paper and board collection

A review of table 1 of this 28th Annual Report highlights some leaps forward, as well as a changing background. The main highlights include the positive and negative changes recorded in 2022 vs. 2021. While ten regions are improving, the other ten are underperforming.

In the ranking of the regions that show the most significant increases and decreases, the best performing one is Lombardy (+10.5thousand tons), and the worst is Piedmont (-5thousand tons).

In the North (+0.4%), Vallée d'Aoste, Lombardy, and Emilia-Romagna offset the decline of volumes of Piedmont, Veneto, and Trentino-Alto Adige, whereas the numbers for Friuli-Venezia Giulia and Liguria remain unchanged. In the Centre (+0.5%), Tuscany and Umbria offset the decline in Latium and Marche.

Of the three macro-areas, the greatest average annual increase is generally still recorded in the South (+0.8%): while Sardinia, Abruzzo, and Campania lose almost 2thousand tons globally, the other regions continue their gradual development of services, albeit with quite limited growth rates (all below 4%).
Let's face it, this result is not too satisfactory in the light of the possible achievable further growth, but provides some encouraging perspectives.

The average paper and board capture rate vs. total urban waste is now 12.7%. If this rate were compared proportionally against changes in 2022 vs. 2021, a 100thousand ton decrease for paper could have been expected, with a 1 million ton decrease of total waste generation, whereas the additional 20thousand tons collected confirm the 2021 levels and support, indeed, the virtuous process that leads towards the recovery of valuable secondary raw materials, also contributing to the increase of overall separate collection rates vs. total waste.

Using this parameter to define progressive targets allows to envisage still untapped growth and development potentials. The short-term target could be 14% of SC vs. total UW. In volumes, this means 350thousand tons per year, which would lead close to the 4 million threshold.

Raising the bar (15-16%) for the medium and long term would allow to reach the 4.5 million annual threshold, with an increase by at least 800thousand tons, including more than half available in the South and in bigger cities. Based on these numbers, Comieco is strengthening its efforts through the Extraordinary Plan for the South, which provides for the allocation of 3.5 million EUR to a development project aimed at involving more than 3 million citizens and 34 Cities in the South (and beyond) across all regions.

This plan for the South digs its roots into the Country's renewed recycling capacity, and thus in the increase of domestic demand for paper for recycling from industries.

Following the recent switchover (from graphic paper to packaging paper production) of three paper mills capable, alone, to transform approximately 1.2 million tons of paper for recycling into new raw material every year, the opening of another plant is expected by 2024; like the others, it will be able to process approximately 400thousand tons per year in full operation.

Subsidiarity as the driver for development and a universal guarantee for transparency: tailor-made agreements for the Italian Cities

In 2022 we celebrated the 25th anniversary of CONAI, the consortium system established with Leg. D. No. 22/97 (the so-called "Ronchi Decree"), of which Comieco is a member as the guarantor for the recycling of paper and board packaging as well as, by its own choice, of graphic paper (books, newspapers, magazines).

The results speak for themselves.
From 1998 to 2022:

- overall municipal paper and board collection grew from 1 to over 3.6 million tons per year;
- in 25 years, a total of 63 million tons were collected, which equals to zeroing the whole of urban waste production in Italy for more than two years;
- the Cities under the agreements were allocated a total of over 2.3 billion EUR;
- the paper and board packaging recycling rate increased from 37% to over 81%.

With the implementation of the fifth cycle of the Framework Agreement, we continue to support the Cities in improving and consolidating their performance and offering them the opportunity to join or withdraw from the agreement every six months, while ensuring the collection and recycling of paper and board against an increased average monthly consideration for both managed collection flows (1.01+1.02 and 1.04+1.05)

Recycling is worthwhile!
This is not just an effective slogan or an encouraging motto. It is good for the environment, while also providing multiple economic benefits. Thus, recycling is good. With 972 agreements in force, Comieco allocated more than 183 million EUR to the Cities in 2022 to take charge of and recycle approximately 2 million tons, equal to approximately 55% of municipal separate collection in Italy.

However, it should be noted that agreement fragmentation in the South still hampers synergic development.

Paper and board, a leading sector in the NRRP: where and how to improve

Paper and board represent an important part of the NRRP. The enhancement and modernization of the existing plants and the increase of the waste paper and board processing capacity, with subsequent benefits for the environment, the regions, and employment in Italy, are the main and crucial goals of the 70 projects for the paper pipeline funded by the NRRP.

Characteristic results and pipeline benefits were recently analyzed in a study promoted by Comieco in co-operation with the Ministry of the Environment and Energy Security, carried out by Nomisma.

With the NRRP, more than 128 million EUR will add up to the investments planned for the paper pipeline, for a total of over 466 million EUR, with significant inputs in terms of modernization, enhancement, and implementation of new facilities.

Divided between 25 facilities in Northern Italy, 18 in the Centre, and 27 in the South, the projects are aimed at reducing the infrastructural gap between the Country's North and Centre/South, the latter being less developed and slower at taking up separate collection and recycling.

Thanks to investments on waste paper processing plants, the study estimates an increase by more than 700thousand tons of paper and board of the pipeline's processing capacity, 50 times the weight of the dome of St. Peter's Church in Rome – as already noted above.

If summed up to the increased production capacity of paper mills, this development will allow to manage the increased separate collection volumes that the Italian Cities will capture in the next few years, and to improve the quality of the recovered paper.

In addition to providing local and environmental benefits through improved energy efficiency and the subsequent reduction of CO2 emissions, the project will provide economic benefits, while establishing the conditions for increased job creation. In short, the NRRP is an important stimulus to the Country's competitiveness and, thus, to our sector as well.

Specific plans for paper and board can further support the increase of separate paper and board collection in Italy.

In fact, more than 800thousand tons are still estimated to end up in landfills in the Country, including more than half in the South. If these were captured and recycled, our Country could surpass the EU's 85% paper and board recycling target set by 2030 ahead of time.
Quality should also be considered.

While the total number of samples collected in 2022 is smaller in absolute terms compared to 2021, it increased with respect to the managed volumes.

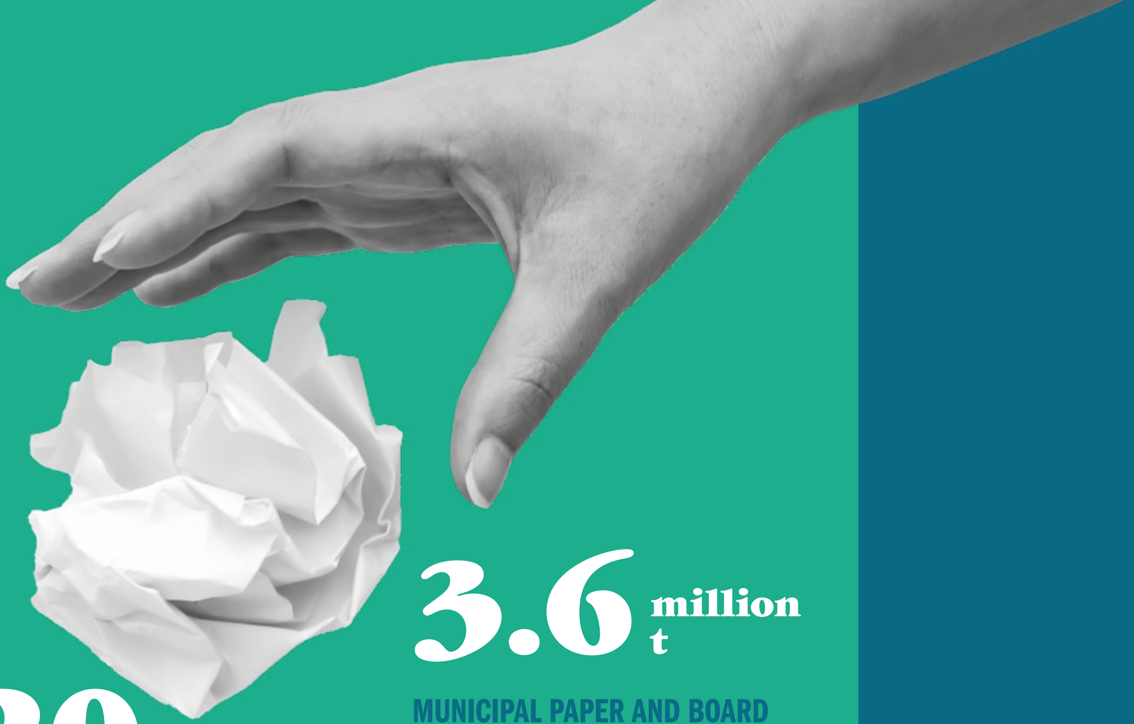
For 1.01+1.02 (household collection), the average value (2%) is confirmed in 2022 for the purpose of calculation of considerations. However, in about 1 out of 4 cases, pre-sorting monitoring upon unloading of "household" collection at the plants does not comply with first-bracket specifications.

This rate is above 50% in the South.
A more positive result is recorded for 1.04+1.05 - business collection - whose excellent quality is confirmed (average content of mixed materials <1%), thus maximizing the economic benefits for the parties to the agreements.

However, more than 15% of these conferments (the same rate applies across Italy) also do not comply with top-quality standards upon unloading. Non-optimal quality at the origin caused by the presence of contaminants is still a structural problem. The pipeline is expected to take care of post-collection sorting and disposal of waste in a context where, unfortunately, landfills, rather than incineration processes or transformation into new products, are still the main outlet.

This information can be used to direct development. Upon collection, in fact, service providers should use effective equipment to ensure regular unloading and collection to minimize initial impurities, reduce interventions on materials upon sorting and, thus, process scraps (sorting residues, etc.). There is much that citizens and other users can do in this respect, since our waste fuels the engine of Italy's circular economy.

A recycling individual is like a chef, who needs high-quality raw materials to cook excellent recipes. And these are the result of careful collection and recycling.



3.6 million t

MUNICIPAL PAPER AND BOARD COLLECTION VOLUME

+20 thousand t

VS. 2021

SEPARATE PAPER AND BOARD COLLECTION IN ITALY: THE STATE OF THE ART

2022: PAPER AND BOARD COLLECTION REMAINS STABLE IN CONDITIONS OF UNCERTAINTY

Data for 2022 points out to substantial continuity with the findings of the previous year. Municipal separate paper and board collection totals just more than 3.6 million tons, with a slight increase by close to 20thousand tons (+0.6%) vs. 2021.

The total balance is positive in the North by just less than 8thousand tons (+0.4%) vs. 2021, a limited growth driven by Vallée d'Aoste, Lombardy, and Emilia-Romagna, with a total of 20thousand tons of newly collected materials. These numbers offset the overall decrease (for a total of 12thousand tons) of Piedmont, Veneto, and Trentino-Alto Adige, whereas the numbers for Friuli-Venezia Giulia and Liguria remain unchanged.

Overall growth in the Centre is just above 4thousand tons (+0.5%) thanks to the input of Tuscany and Umbria (+12thousand tons). Negative data is recorded, instead, for Marche (-5thousand tons, particularly in the province of Pesaro) and Latium (-3thousand tons), as a clear result of the by-now chronic inertia of collection services in the city of Rome.

Data for the South is slightly more positive (+0.8%, i.e. +8thousand tons).

Negative results in this area are recorded in the regions with historically more advanced services, namely Sardinia and Abruzzo, which lose a total of 3thousand tons vs. 2021, but still drive the best local performance.

While Campania can be considered stable, the other regions continue their gradual development of services, albeit with quite limited growth rates (all below 4%) - a result that is not too satisfactory in the light of the possible achievable further growth.

The above scenario provides some food for thought, but takes up a different meaning if framed within the broader perspective of urban waste management that turns out from an analysis of the data - albeit partial and non-final - available as at the date of drafting of this annual report.

Numbers, in fact, point out to a widespread decline of overall urban waste volumes - more than 3 percent points - which translates into about 1 million tons less vs. 2021.

The impact is both on separate collection, which decreases by over 560thousand tons, and on mixed waste, which decreases by almost half a million tons.

The combined effect of these numbers results into a limited increase of the average overall separate collection rate, which grows from a net value of 64% in 2021 to 64.3% in 2022.

The average paper and board capture rate vs. total urban waste is 12.7% at national level.

The "paper SC/total UW" parameter is also non-homogeneous at national level due to, among other things, some differences at the municipal collection level. It is higher in the Centre-North at 13.7%, and three percent points lower (10.6%) in the South.

This data shows that growth margins, though locally different, can be achieved across the whole Country. In particular, the big southern regions (Campania, Sicily, and Puglia) rank last and will need to change their pace to achieve the expected results.

In short, in 2022 the economic environment was characterized by a decline of consumptions with subsequently reduced production of urban waste.

+8.1%

THE REGION WITH THE HIGHEST INCREASE: UMBRIA

+0.8%

LIMITED GROWTH IN THE SOUTH

TABLE 1
MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION BY REGIONS. YEARS 2020 - 2022 AND 2021-2022 VARIATIONS.

SOURCE: COMIECO

The North, the Centre, and the South all contribute to the new 2022 volumes with homogeneous growth rates. Such growth continues, albeit with values below last year's projections, when a 3.7 million ton target was assumed.

Citizens and companies continued to manage their waste with consciousness, but the goal is still to improve current levels to capture those 800thousand tons of paper and board that escaped separate collection circuits in 2022 and ended up, once again, in landfills.

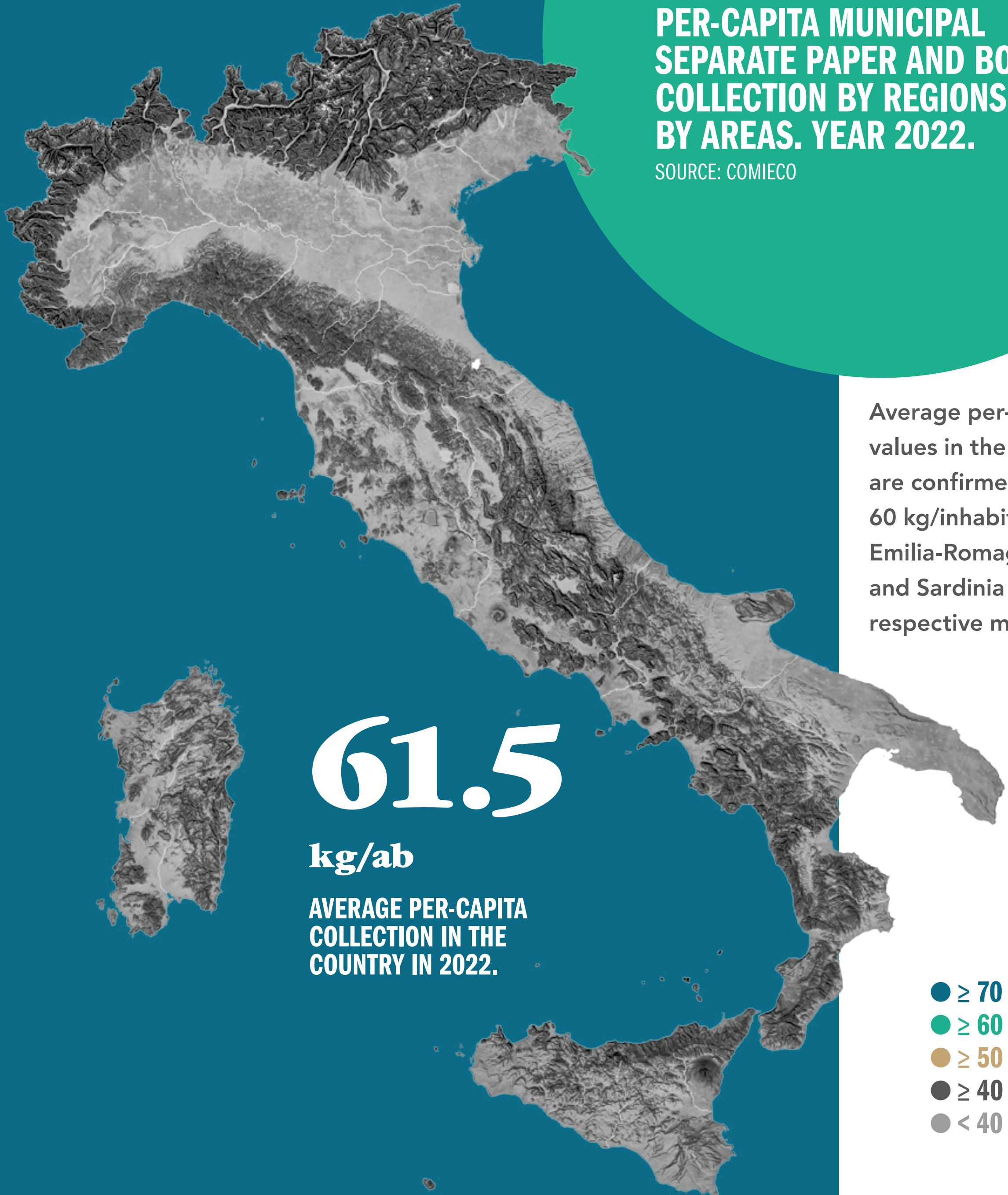
According to estimates for this year, the limited growth recorded in 2022 will be confirmed, particularly in the South, where a further step towards the (symbolic) target of more than 1 million tons collected is expected

Region	2020	2021	2022	Δ 2021/2022	
	t	t	t	t	%
Piedmont	287,309	299,267	294,308	-4,959	-1.7
Vallée d'Aoste	9,209	9,293	9,981	688	7.4
Lombardy	566,785	578,253	588,775	10,522	1.8
Trentino-Alto Adige	78,688	78,643	76,870	-1,773	-2.3
Veneto	289,234	292,647	287,908	-4,739	-1.6
Friuli-Venezia Giulia	70,085	70,656	70,333	-322	-0.5
Liguria	94,454	102,609	102,407	-202	-0.2
Emilia-Romagna	372,104	393,063	401,699	8,636	2.2
North	**1,767,869**	**1,824,430**	**1,832,281**	**7,851**	**0.4**
Tuscany	296,151	315,201	323,092	7,891	2.5
Umbria	56,740	58,097	62,826	4,729	8.1
Marche	100,496	108,970	104,051	-4,920	-4.5
Latium	368,488	371,292	368,046	-3,246	-0.9
Centre	**821,875**	**853,560**	**858,014**	**4,455**	**0.5**
Abruzzo	72,763	72,734	72,346	-387	-0.5
Molise	9,456	10,833	11,146	313	2.9
Campania	218,838	222,426	221,202	-1,224	-0.6
Puglia	200,150	200,485	204,632	4,147	2.1
Basilicata	26,651	29,746	30,661	915	3.1
Calabria	92,254	92,813	96,198	3,385	3.6
Sicily	190,908	204,717	207,758	3,041	1.5
Sardinia	91,209	96,830	94,227	-2,604	-2.7
South	**902,230**	**930,584**	**938,170**	**7,586**	**0.8**
Italy	**3,491,974**	**3,608,574**	**3,628,466**	**19,892**	**0.6**

Note: 2021 data adjusted by approximately 5,700 tons. Updates concern various regions and the relevant macro-areas.

FIGURE 1
PER-CAPITA MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION BY REGIONS AND BY AREAS. YEAR 2022.

SOURCE: COMIECO



Average per-capita collection values in the Country in 2022 are confirmed above 60 kg/inhabitant. Emilia-Romagna, Tuscany, and Sardinia still drive the respective macro-areas.

61.5

kg/ab

AVERAGE PER-CAPITA COLLECTION IN THE COUNTRY IN 2022.

- ≥ 70 KG/AB YEAR
- ≥ 60 – < 70 KG/AB YEAR
- ≥ 50 – < 60 KG/AB YEAR
- ≥ 40 – < 50 KG/AB YEAR
- < 40 KG/AB YEAR

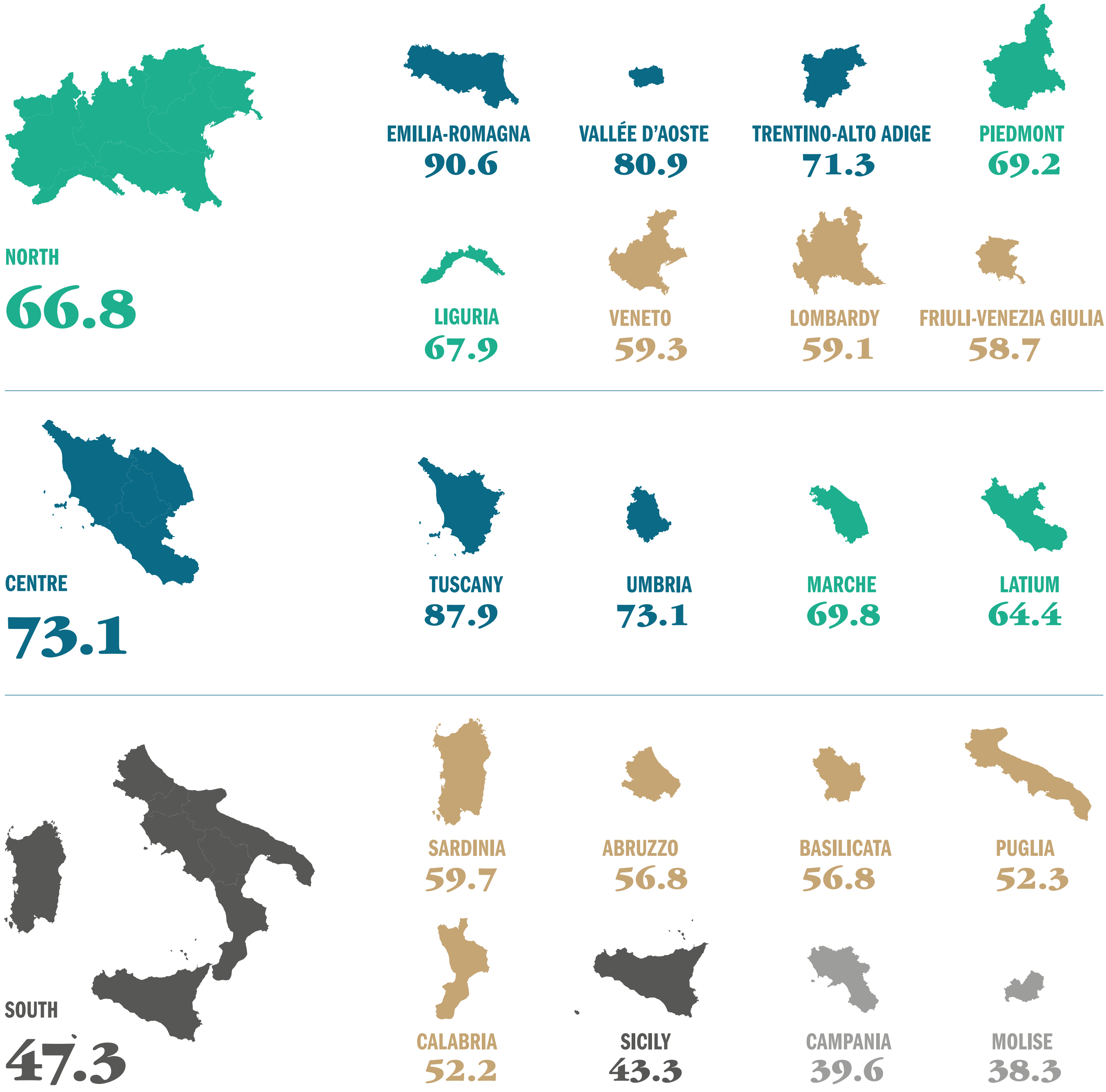
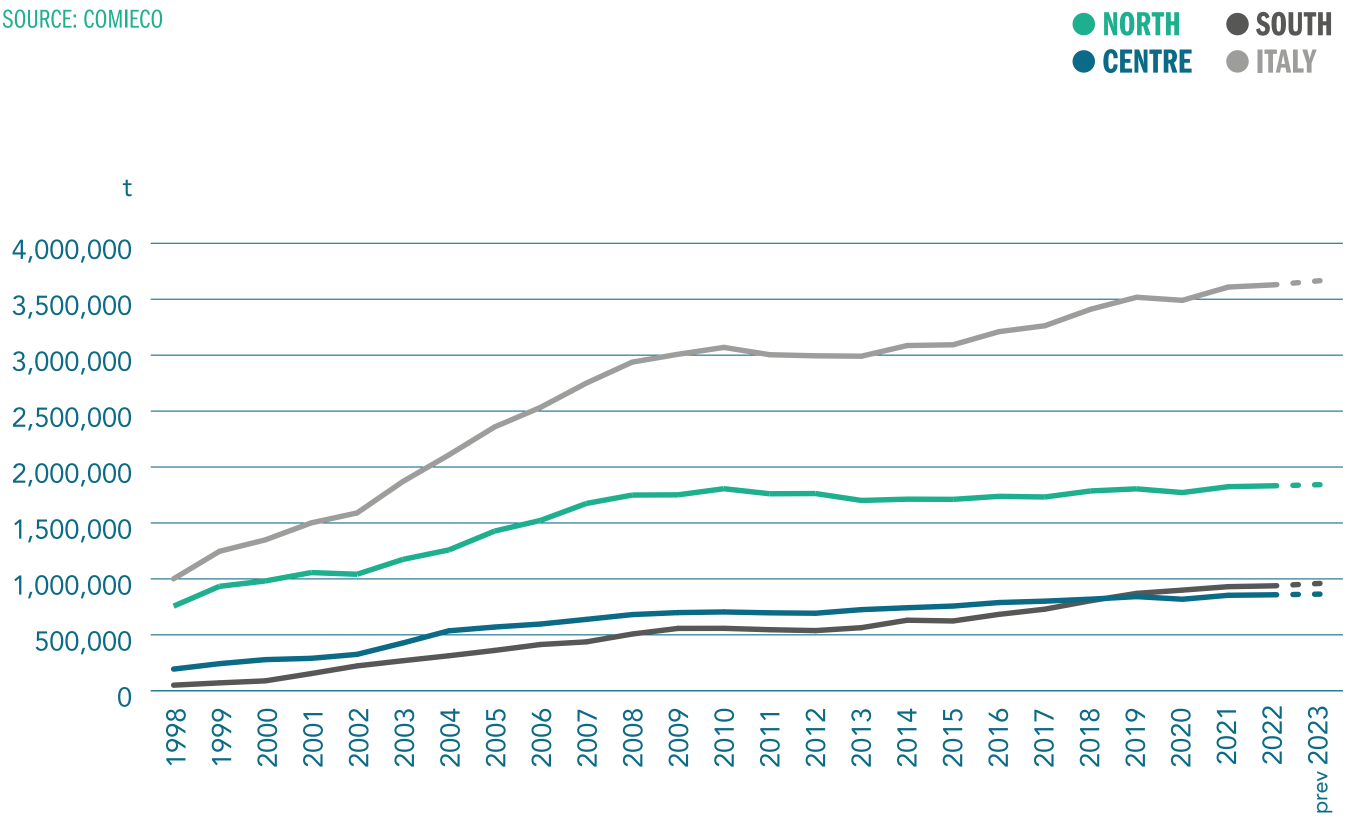

NORTH
66.8
EMILIA-ROMAGNA
90.6
VALLÉE D'AOSTE
80.9
TRENTINO-ALTO ADIGE
71.3
PIEDMONT
69.2
LIGURIA
67.9
VENETO
59.3
LOMBARDY
59.1
FRIULI-VENEZIA GIULIA
58.7
CENTRE
73.1
TUSCANY
87.9
UMBRIA
73.1
MARCHE
69.8
LATIUM
64.4
SOUTH
47.3
SARDINIA
59.7
ABRUZZO
56.8
BASILICATA
56.8
PUGLIA
52.3
CALABRIA
52.2
SICILY
43.3
CAMPANIA
39.6
MOLISE
38.3

FIGURE 2
MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION. 1998-2022 HISTORICAL DATA SET AND 2023 FORECASTS.

SOURCE: COMIECO



	1998	2022	2023 forecast	Δ 2022-2023 forecast
	t	t	t	t
North	756,813	1,832,281	1,842,009	9,727
Centre	193,958	858,014	863,935	5,921
South	50,222	938,170	959,602	21,432
Italy	**1,000,993**	**3,628,466**	**3,665,546**	**37,080**

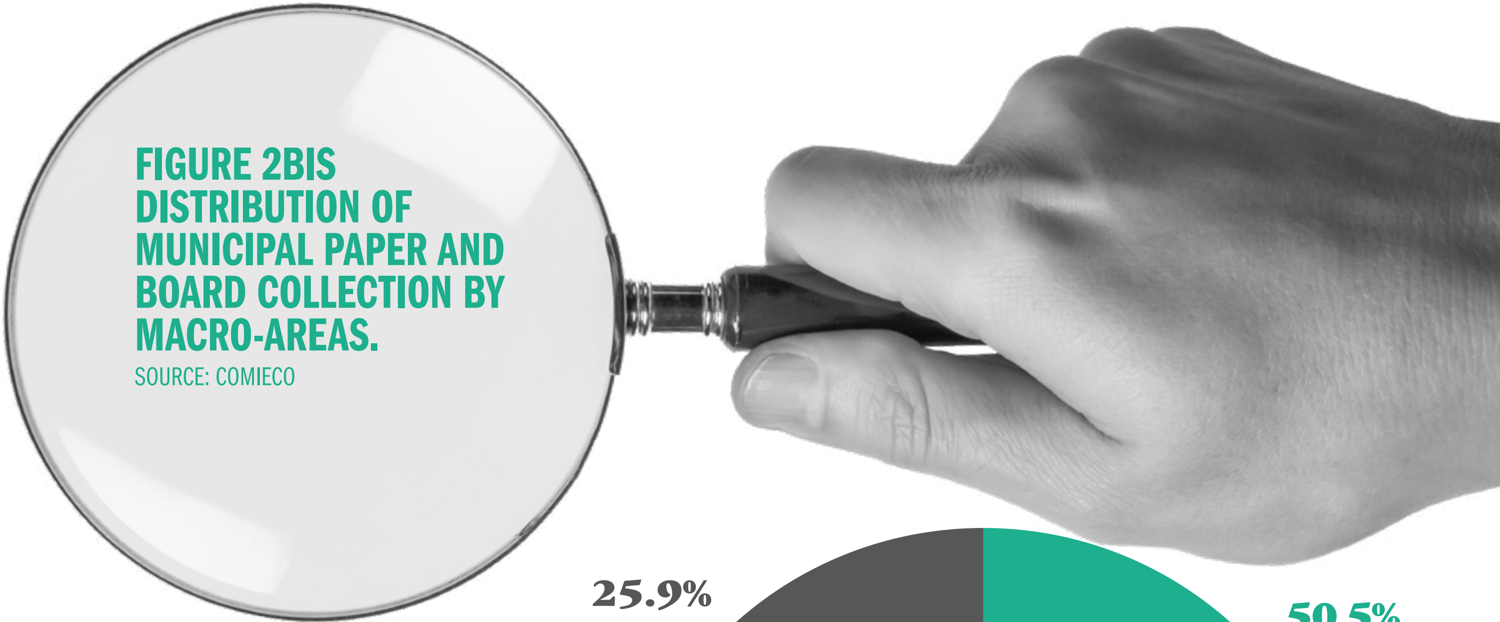
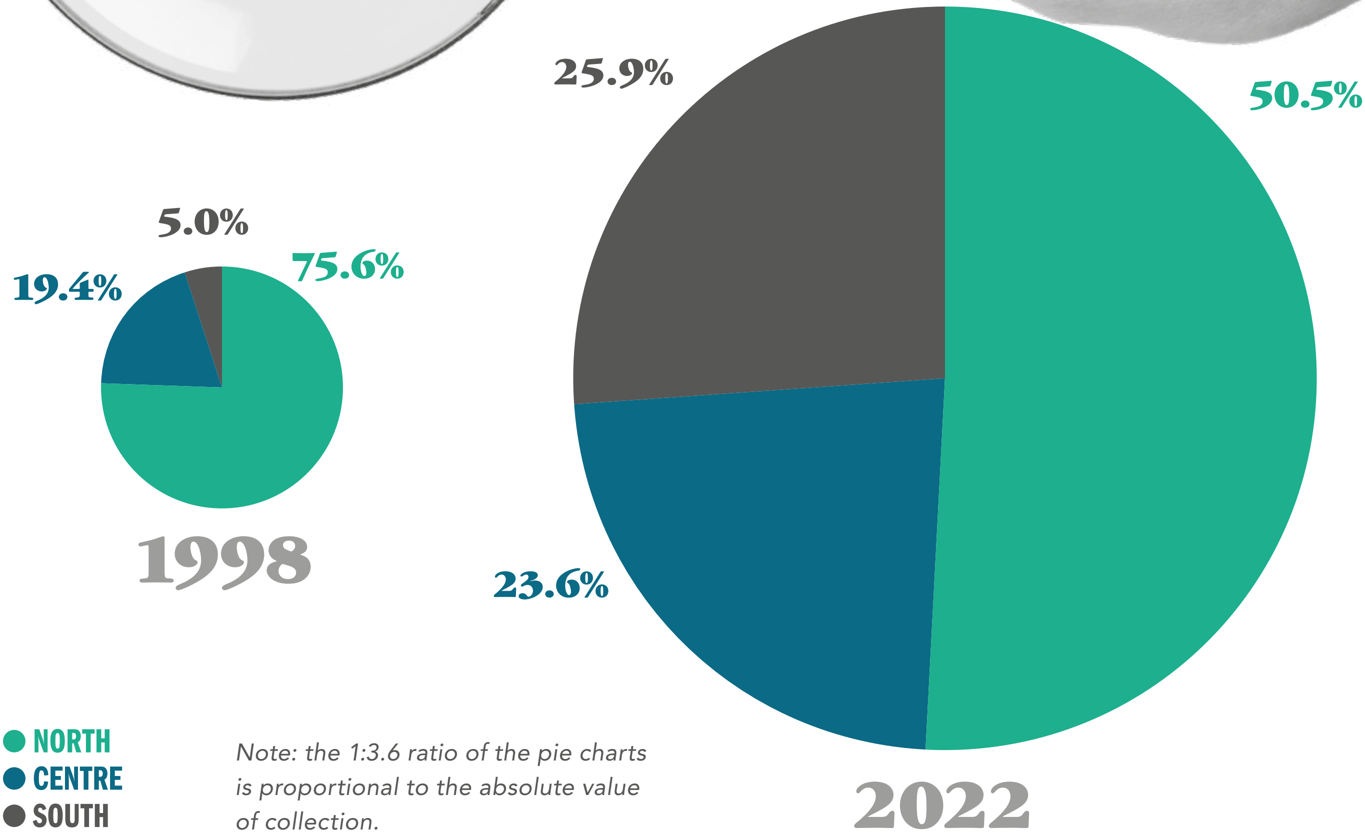


FIGURE 2BIS DISTRIBUTION OF MUNICIPAL PAPER AND BOARD COLLECTION BY MACRO-AREAS.

SOURCE: COMIECO



Note: the 1:3.6 ratio of the pie charts is proportional to the absolute value of collection.

TABLE 2
THE RATIO OF SEPARATE PAPER AND BOARD COLLECTION TO TOTAL URBAN WASTE. 2022 ESTIMATES.

SOURCE: COMIECO 2022 ESTIMATES ON ISPRA 2021 DATA

The paper capture to urban waste ratio and the residual amount of waste - estimated 2022 data - together with the per-capita figure, allow better understanding of the actual development of separate collection services. In this table, the regions and the macro-areas are listed in decreasing order with respect to the separate paper collection rate vs. total urban waste.

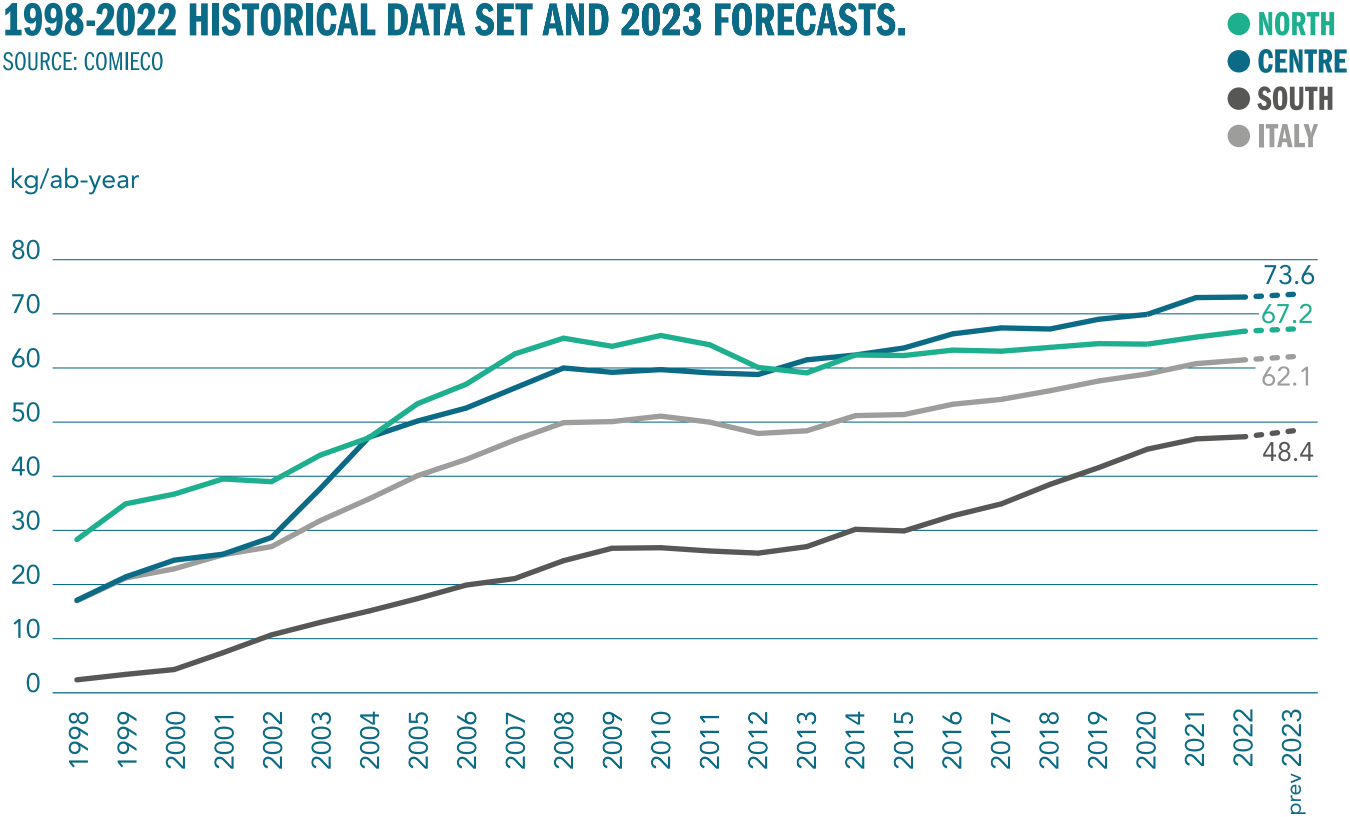
Area	Inhabitants	Total UW	Mixed UW	Total SC		SC of paper	SC of paper to total UW
	n	kg/ab	kg/ab	kg/ab	%	kg/ab	%
North	27,409,776	493.9	142.0	351.3	71.1	66.8	13.5
Centre	11,740,836	517.5	203.0	314.5	60.8	73.1	14.1
South	19,832,510	447.1	196.9	250.1	56.0	47.3	10.6
Italy	**58,983,122**	**482.8**	**172.6**	**310.0**	**64.2**	**61.5**	**12.7**

- <OVER 14%
- ≥13–14%
- ≥12–13%
- ≥10–12%
- UP TO 10%

Region	Inhabitants	Total UW	Mixed UW	Total SC		SC of paper	SC of paper to total UW
	n	kg/ab	kg/ab	kg/ab	%	kg/ab	%
Basilicata	539,999	347.1	128.2	218.9	63.1	56.8	16.4
Tuscany	3,676,285	570.4	201.3	369.0	64.7	87.9	15.4
Trentino-Alto Adige	1,077,932	485.3	131.8	353.6	72.8	71.3	14.7
Emilia-Romagna	4,431,816	617.5	169.9	447.6	72.5	90.6	14.7
Umbria	859,572	514.3	163.2	351.0	68.3	73.1	14.2
Piedmont	4,252,279	494.1	165.5	328.6	66.5	69.2	14.0
Marche	1,489,789	509.1	143.4	365.6	71.8	69.8	13.7
Vallée d'Aoste	123,337	599.7	205.4	394.3	65.8	80.9	13.5
Latium	5,715,190	486.3	225.6	260.7	53.6	64.4	13.2
Calabria	1,844,586	398.9	186.2	212.7	53.3	52.2	13.1
Veneto	4,854,633	454.8	113.2	341.6	75.1	59.3	13.0
Sardinia	1,579,181	458.8	113.5	345.3	75.3	59.7	13.0
Lombardy	9,965,046	454.6	121.0	332.0	73.0	59.1	13.0
Liguria	1,507,438	532.8	225.7	307.1	57.6	67.9	12.8
Abruzzo	1,273,660	447.2	156.7	290.5	65.0	56.8	12.7
Friuli-Venezia Giulia	1,197,295	468.3	144.7	323.6	69.1	58.7	12.5
Puglia	3,912,166	462.4	196.6	265.7	57.5	52.3	11.3
Molise	290,769	374.3	153.1	221.2	59.1	38.3	10.2
Sicily	4,801,468	449.5	237.4	212.0	47.2	43.3	9.6
Campania	5,590,681	460.3	207.5	252.8	54.9	39.6	8.6

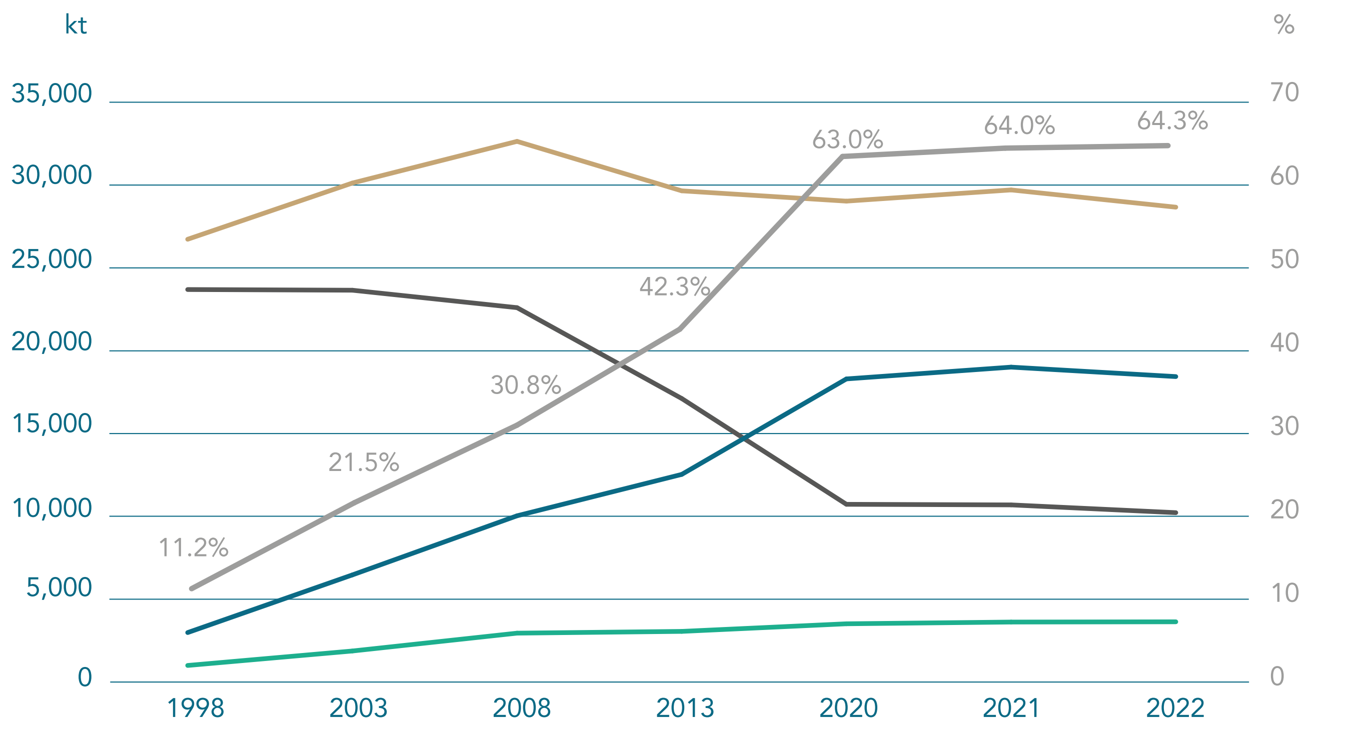
FIGURE 3
PER-CAPITA MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION. 1998-2022 HISTORICAL DATA SET AND 2023 FORECASTS.

SOURCE: COMIECO



	1998	2021	2022	Δ 2021/2022	Δ 1998/2022	
	kg/ab-year	kg/ab-year	kg/ab-year	kg/ab-year	kg/ab-year	%
North	28.3	65.7	66.8	1.1	38.5	136.2
Centre	17.1	73.0	73.1	0.1	56.0	327.4
South	2.4	46.9	47.3	0.4	44.9	1,871.0
Italy	**17.0**	**60.8**	**61.5**	**0.7**	**44.5**	**261.9**

FIGURE 4
COMPARISON OF URBAN WASTE PRODUCTION, TOTAL SEPARATE WASTE COLLECTION, AND MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION IN ITALY. 1998-2022 DATA SET. SOURCE: COMIECO



Campania, Sicily, and Puglia are expected to change their pace and remain the main target regions for growth, alongside metropolitan areas. According to estimates, in fact, paper and board collection can still grow by at least 800thousand tons annually, which can be captured in municipal collection. However, all the regions still present untapped potentials.

BIG CITIES: LESS WASTE, MORE SEPARATE COLLECTION

The focus on Italian regional capitals is also updated with 2022 data. For several years, in fact, Comieco has been punctually monitoring the data of Turin, Milan, Florence, Rome, Naples, and Palermo, which represent the three macro-areas and act as real observatories with a constant perimeter, offering a privileged overview of dynamics across the territory.

These cities are integrated with the city of Genoa in 2022: these seven cities, together, account for 13% of inhabitants and almost 14% of waste generation vs. the values of the whole Country. Urban sanitation service management in these cities is typical of complex systems due to a non-homogeneous territory, urban texture, and anthropic, as well as economic conditions including, among other things, population density or tourist flows.

Each of these factors contributes to make service organization more challenging. At the same time, if a detailed focus could be made on individual neighbourhoods, smaller cities could also be characterized. If these seven cities were considered as a single urban entity, interesting observations could be made.

This urban conglomerate with a population of more than 7.5 million generated approximately 4 million tons of urban waste in 2022, including more than 1.8 million (46.2%) collected separately.

Total per-capita waste generation is 20% greater than at domestic level. This figure shows that big cities are crucial for the developments expected for the next few years, considering that all the indicators (UW, SC, %SC) are less performing than the corresponding average nation-wide and area-specific ones. Except for Milan (+1.2%) and Florence (+1.6%), total waste generation is declining, particularly in Genoa (-2.9%), mirroring a decrease of consumptions, rather than more conscious ones. The aggregate value of separate collections is growing by 0.7%, a figure that, however, derives from individual mismatching trends.

Growth is observable in Genoa (+5.4%), Florence (+5.1%), and Palermo (+3.9%), whereas Milan (+0.5%) and Turin (+0.3%) are stable. On the other hand, a decline is recorded in Naples (-1.5%) and Rome (-0.3%), whose weight in terms of population is significant, despite quite a small delta.

-1.5%

MIXED WASTE VS. 2021

TOTAL SEPARATE COLLECTION 2021

+0.7%

-1.9%

TOTAL SEPARATE PAPER AND BOARD COLLECTION VS. 2021

FIGURE 5
WASTE COLLECTION IN THE SAMPLE CITIES MILAN, TURIN, GENOA, FLORENCE, ROME, NAPLES, AND PALERMO. YEAR 2022 AND 2021-2022 VARIATIONS.
SOURCE: COMIECO

The opposite effect is observed on the share of waste residues (mixed), decreasing by over 32thousand tons (-1.5%), with fluctuations from -8.5% in Genoa to +5.8% in Palermo.

The volumes of paper and board collection in the seven cities surpassed 500thousand tons in 2022, i.e. approximately 14% of the national figure.

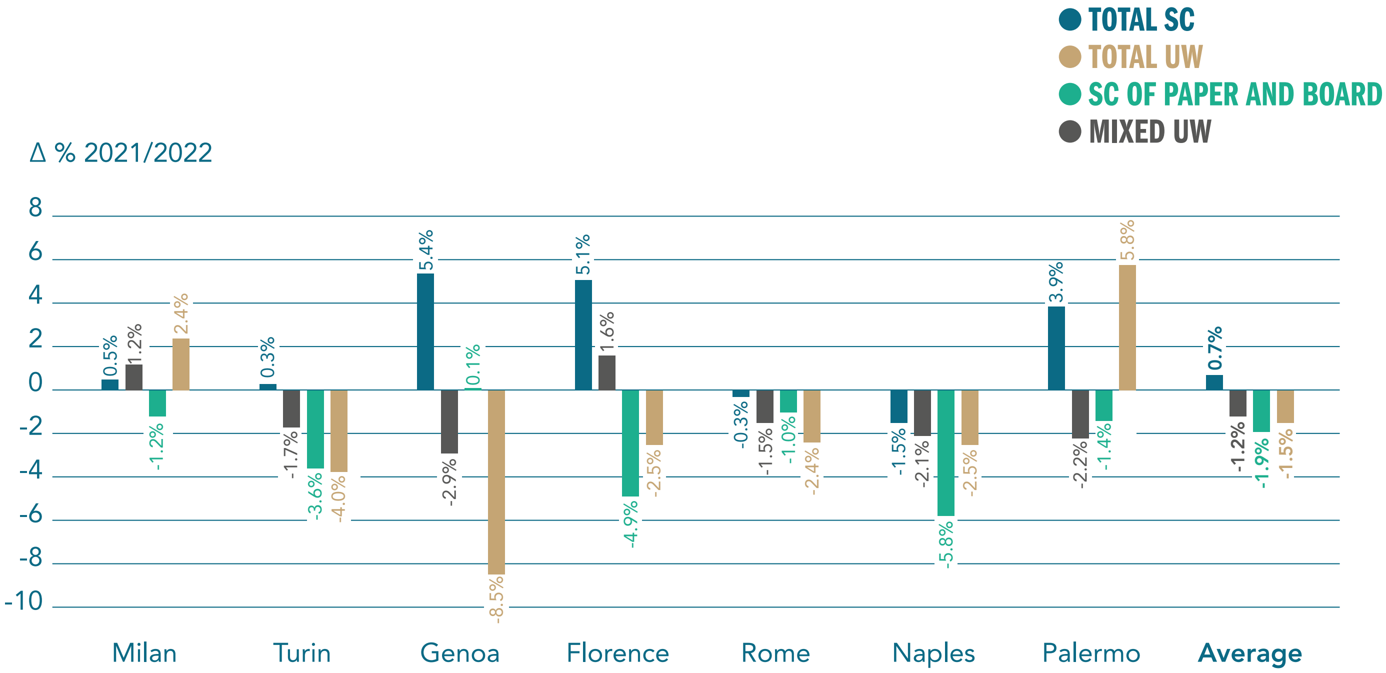
The average per-capita value is now 66.7 kg/ab, 8% up vs. the national average.

However, a collection potential estimated at least at 15% vs. the present one is recorded in big cities – Rome and Naples in particular – but an analysis of average numbers highlights a non-homogeneous performance, as if the “macro-city” were divided in seven neighbourhoods with widely different service standards and performance.

With a total of 9,714 tons less than in 2021 (-1.9), 2022 is following a reversed trend compared to last year. The only city with stable paper and board collection is Genoa (+0.1%).

The most significant decline was recorded in Naples (-5.8%), Florence (-4.9%), and Turin (-3.6%), with more positive results in Milan (-1.2), Palermo (1.4%), and Rome (-1.0%).

With its performance, Genoa - which hosts to the presentation of this 28th Report - stands out among the other cities as a result of a process that started last year and is estimated to lead to a 5thousand ton increase of separate paper and board collection by 2024 with a specific development plan.



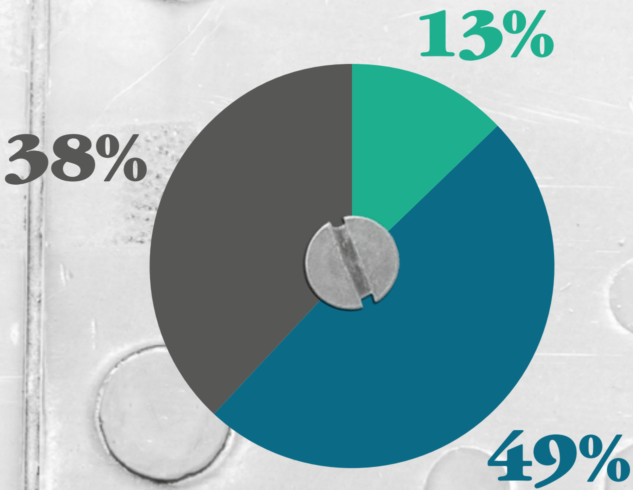
RD carta e cartone		Milan	Turin	Genoa	Florence	Rome	Naples	Palermo	Total
2020	t	77,979	58,825	32,640	26,481	242,263	44,600	18,368	**501,155**
2021	t	80,003	60,247	36,216	29,744	246,125	43,330	16,065	**511,730**
2022	t	79,065	58,077	36,257	28,281	243,694	40,798	15,844	**502,016**
Δ 2021/2022	t	-938	-2,170	41	-1,463	-2,431	-2,532	-221	**-9,714**
	%	-1.2	-3.6	0.1	-4.9	-1.0	-5.8	-1.4	**-1.9**

National dynamics are amplified in big cities. Unlike last year, when post-pandemic consumption recovery had brought about a widespread improvement of all indicators, in 2022 - also as an effect of the Russian-Ukrainian war and of the subsequent energy crisis - the generation of waste, and of paper waste in particular, is declining (-1.9% vs. +2.3% last year). Separate collections are improving everywhere (+0.7%), except in Rome (-0.3%) and Naples (-1.5%).

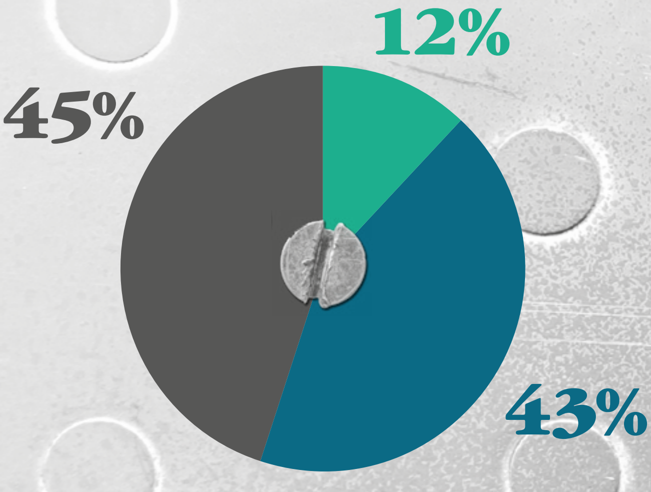
FIGURE 5BIS
WASTE COLLECTION IN THE SAMPLE CITIES MILAN, TURIN, GENOA, FLORENCE, ROME, NAPLES, AND PALERMO. YEAR 2022.

SOURCE: COMIECO

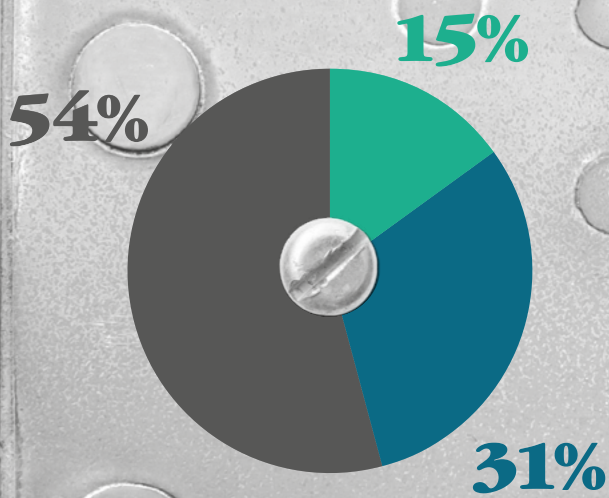
- SC OF PAPER
- SC OF OTHER MATERIALS
- MIXED UW



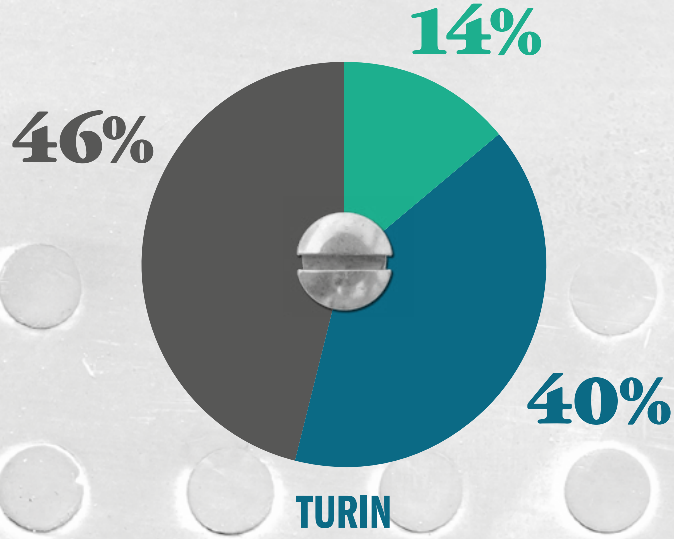
MILAN

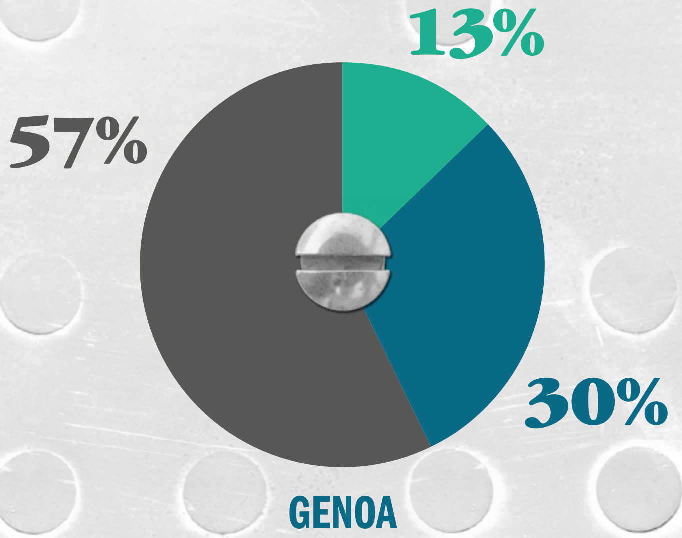


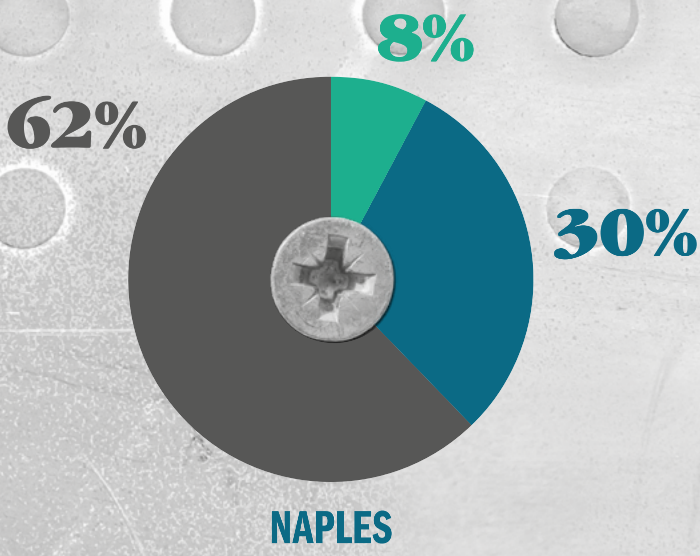
FLORENCE



ROME


14%
46%
40%
TURIN


13%
57%
30%
GENOA


8%
62%
30%
NAPLES

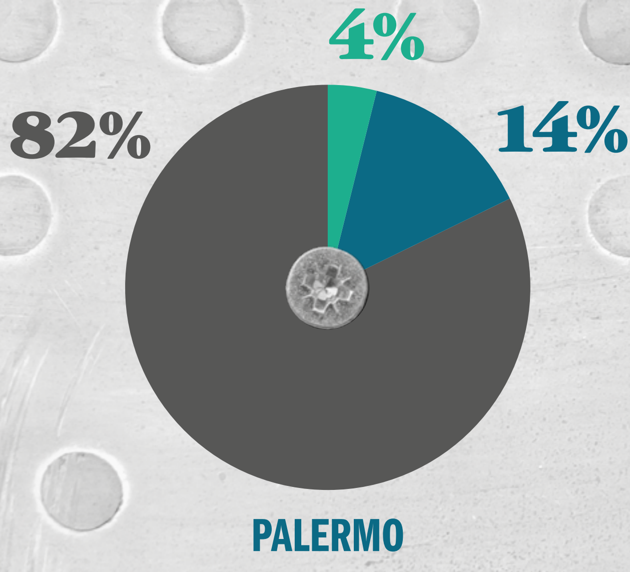
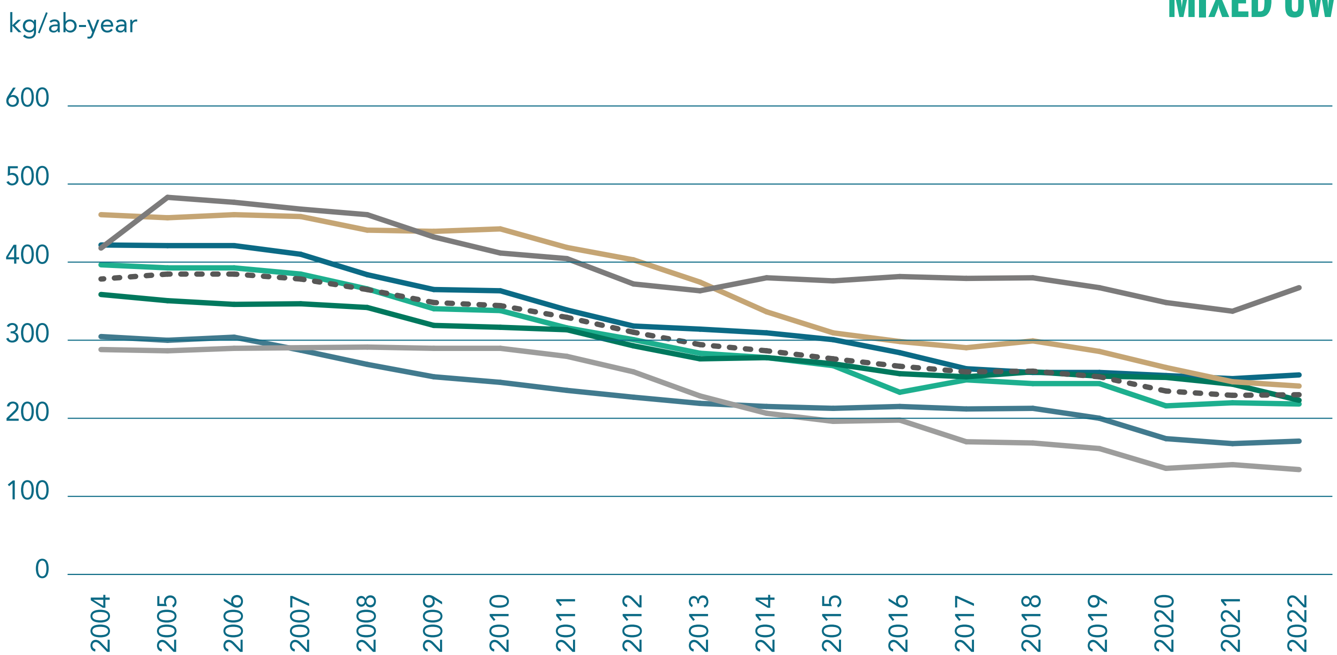

4%
82%
14%
PALERMO

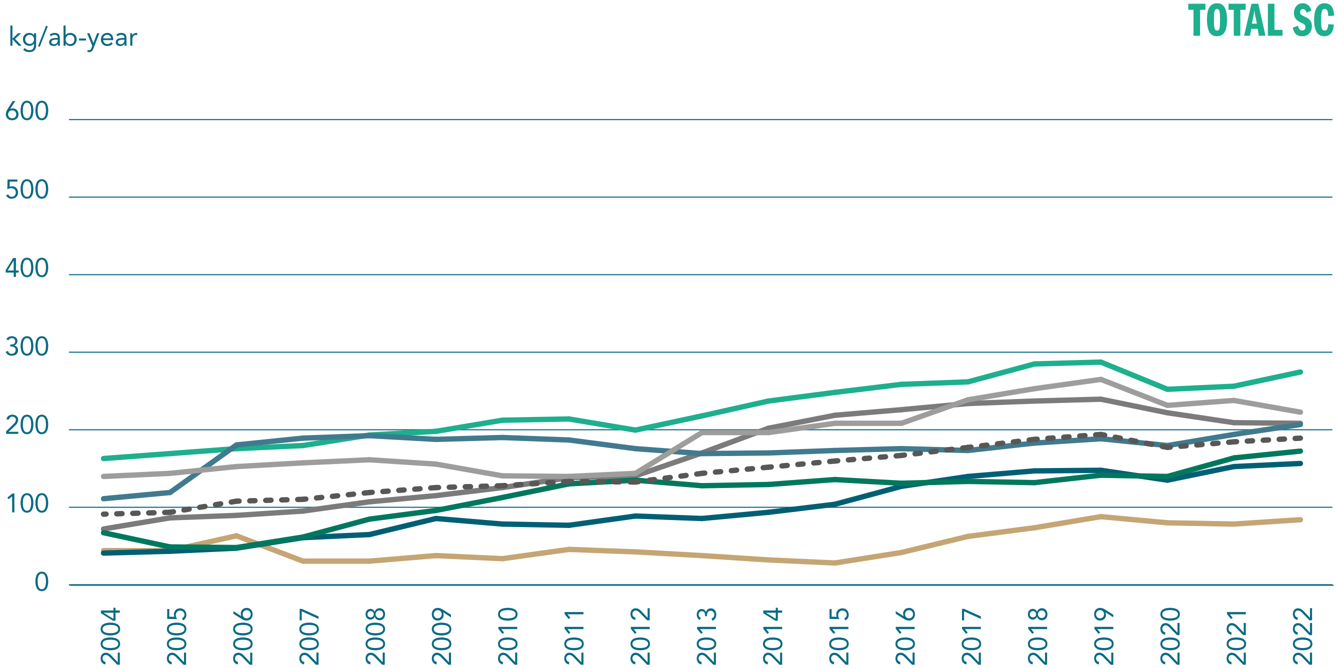
FIGURE 6
WASTE COLLECTION IN THE SAMPLE CITIES MILAN, TURIN, GENOA, FLORENCE, ROME, NAPLES, AND PALERMO. 2004-2022 PER-CAPITA DATA.

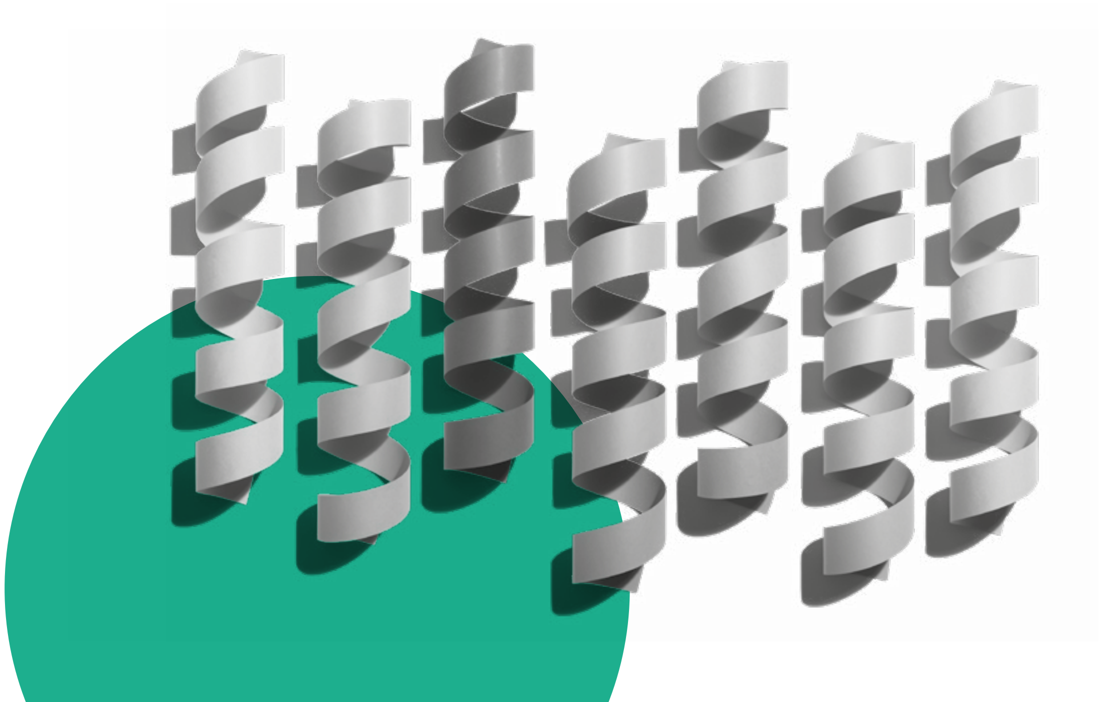
SOURCE: COMIECO

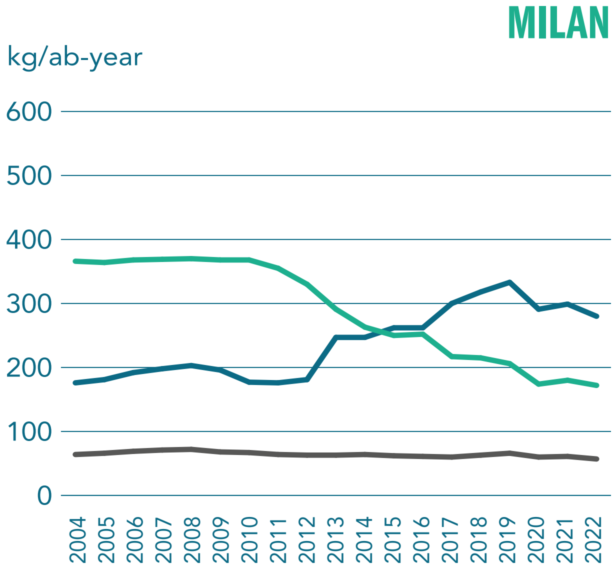
MIXED UW

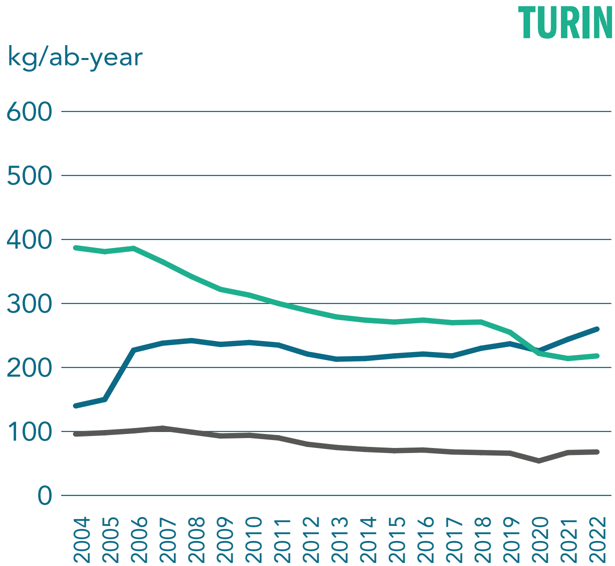


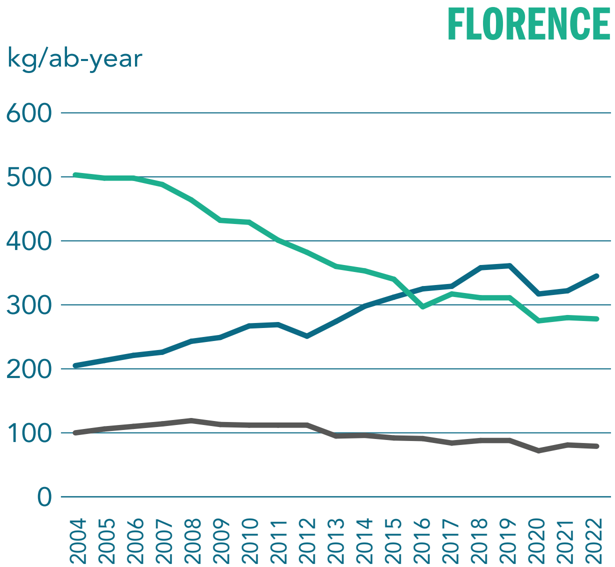
TOTAL SC

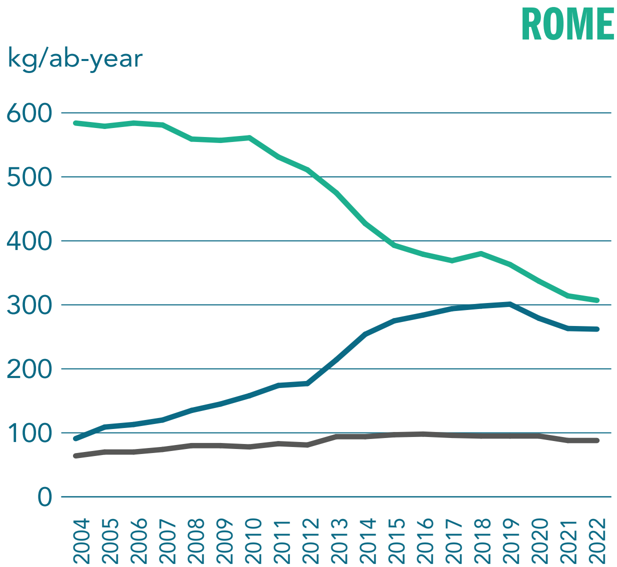

kg/ab-year
600
500
400
300
200
100
0
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
MILAN
TURIN
GENOA
FLORENCE
PALERMO
NAPLES
ROME
AVERAGE



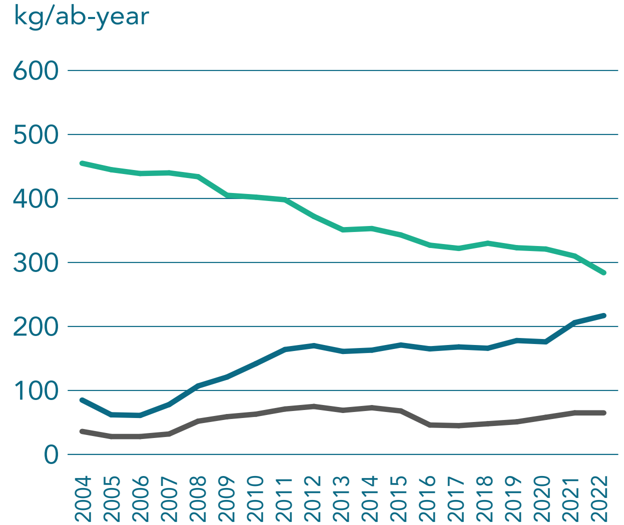

MILAN
kg/ab-year
600
500
400
300
200
100
0
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022


TURIN
kg/ab-year
600
500
400
300
200
100
0
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022


FLORENCE
kg/ab-year
600
500
400
300
200
100
0
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

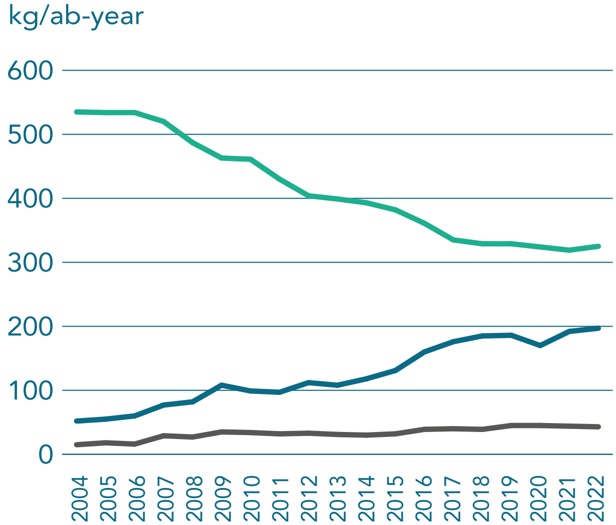

ROME
kg/ab-year
600
500
400
300
200
100
0
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

GENOA

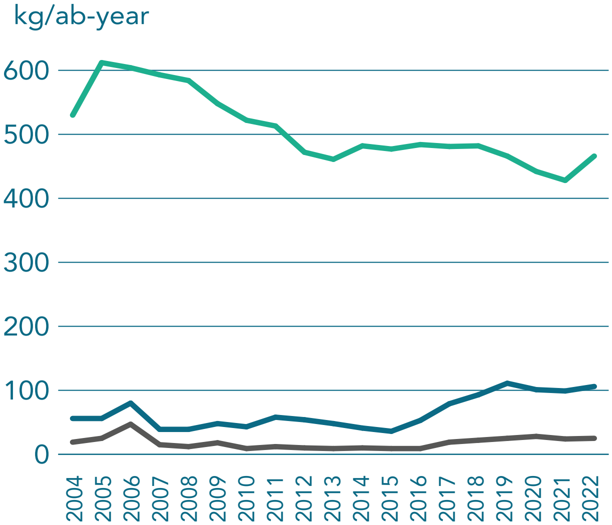


- SC OF PAPER AND BOARD
- TOTAL SC
- MIXED WASTE

NAPLES



PALERMO



86.5%

OF CITIES UNDER THE AGREEMENTS

93.3%

OF ITALIAN CITIZENS COVERED BY THE AGREEMENTS

THE CITIES UNDER THE AGREEMENTS: FIGURES AND RESULTS IN 2022

COLLECTION

972 agreements signed by Comieco with Cities and operators regulate the acquisition and recycling of paper and board from separate collection in 6,840 Italian Cities.

While the Centre and the North have 87 and 160 agreements in force, respectively, 725 are in force in the South. This shows that the South suffers from a chronically fragmented management of agreements also in 2022.
The effects of this fragmentation are significant and impact on collection levels and speed.

It can understood from the results of these 25 years of separate collection that a more "coordinated" management style could improve the organization of administrations by super-municipal areas, as well as with scale economies, greater efficiency, and cost reduction both upon collection and in subsequent recycling-related activities.

In numbers, the average is still one agreement every 3 Cities in the South, one every 10 in the Centre, and one every 23 in the North.

The Consortium recycled just less than 2 million tons of paper and board in 2022, i.e. 55.0% of national municipal collection.

The amount managed vs. 2021 decreased by over 500thousand tons (-20.6%) as a result of the decision of several parties to the agreements to manage part of their 1.01+1.02 (particularly similar product fractions) out of the agreements in the North; the amounts of board collected by households with bin-based collection systems, whose consideration was zeroed in conditions of high-priced paper for recycling until the end of August 2022, also declined.

This scenario suddenly changed towards the end of last year and leads to a renewed growth of volumes under the agreements in 2023, with an expected result of about 2.4 million tons.

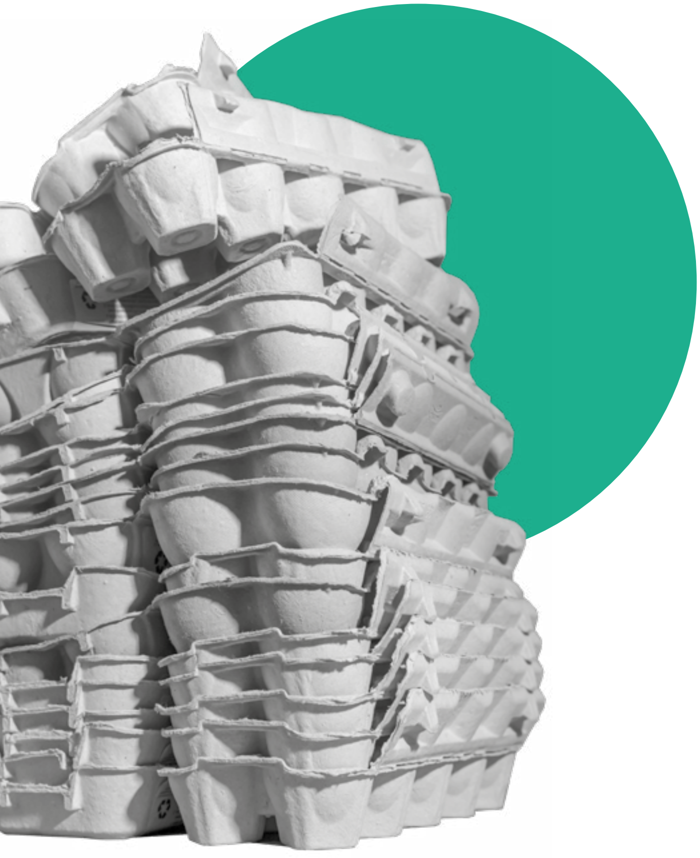
More specifically, in 2022 the Consortium managed 1.31 million tons of paper and board packaging (-16.5% vs. 2021) and more than 689thousand tons of similar product fractions (-27.4% vs. 2021) in the relevant collection mix.

TABLE 3 LOCAL COVERAGE BY REGIONS AS AT DECEMBER 31, 2022.

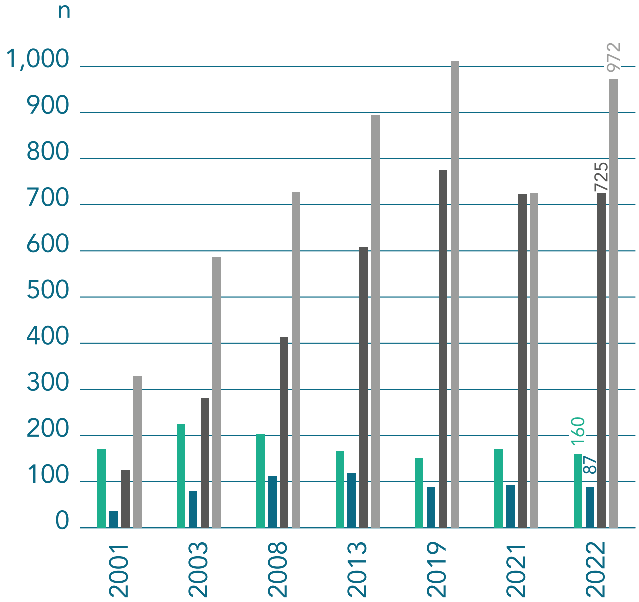
SOURCE: COMIECO

Area	Cities under the agreements	Average No. of inhabitants per agreement	Average amount managed under
	n	n	t
North	160	155,562	4,956
Centre	87	129,708	5,513
South	725	26,023	999
Italy	**972**	**56,626**	**2,054**

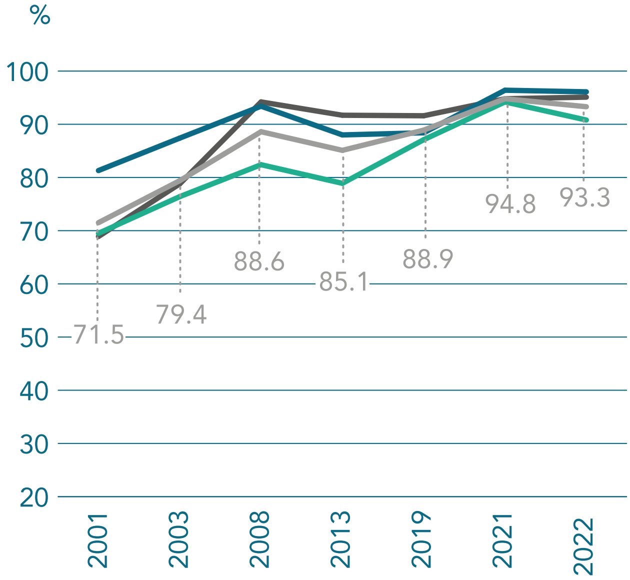
Region	Cities under the agreements		Inhabitants under the agreements		Managed under the agreements	
	n	%	n	%	t	% vs. total SC of paper
Piedmont	1,125	95.3	4,074,277	95.8	131,763	44.8
Vallée d'Aoste	74	100.0	123,337	100.0	9,737	97.6
Lombardy	999	66.3	8,025,224	80.5	260,816	44.3
Trentino-Alto Adige	273	96.8	1,054,769	97.9	61,140	79.5
Veneto	525	93.3	4,643,468	95.7	159,129	55.3
Friuli-Venezia Giulia	214	99.5	1,190,427	99.4	30,893	43.9
Liguria	227	97.0	1,456,440	96.6	57,233	55.9
Emilia-Romagna	311	94.8	4,321,914	97.5	82,279	20.5
North	**3,748**	**85.5**	**24,889,856**	**90.8**	**792,990**	**43.3**
Tuscany	264	96.7	3,644,348	99.1	182,686	56.5
Umbria	90	97.8	847,552	98.6	39,526	62.9
Marche	206	90.7	1,408,284	94.5	57,615	55.4
Latium	294	77.8	5,384,399	94.2	199,781	54.3
Centre	**854**	**88.0**	**11,284,583**	**96.1**	**479,608**	**55.9**
Abruzzo	295	96.7	1,264,206	99.3	64,680	89.4
Molise	132	97.1	285,570	98.2	8,483	76.1
Campania	458	83.3	5,334,162	95.4	177,269	80.1
Puglia	245	95.3	3,853,825	98.5	159,850	78.1
Basilicata	107	81.7	500,281	92.6	19,186	62.6
Calabria	366	90.6	1,784,900	96.8	58,741	61.1
Sicily	350	89.7	4,596,759	95.7	166,193	80.0
Sardinia	285	75.6	1,246,686	78.9	69,910	74.2
South	**2,238**	**87.8**	**18,866,389**	**95.1**	**724,313**	**77.2**
Italy	**6,840**	**86.5**	**55,040,828**	**93.3**	**1,996,911**	**55.0**



SIGNED AGREEMENTS



COVERED INHABITANTS

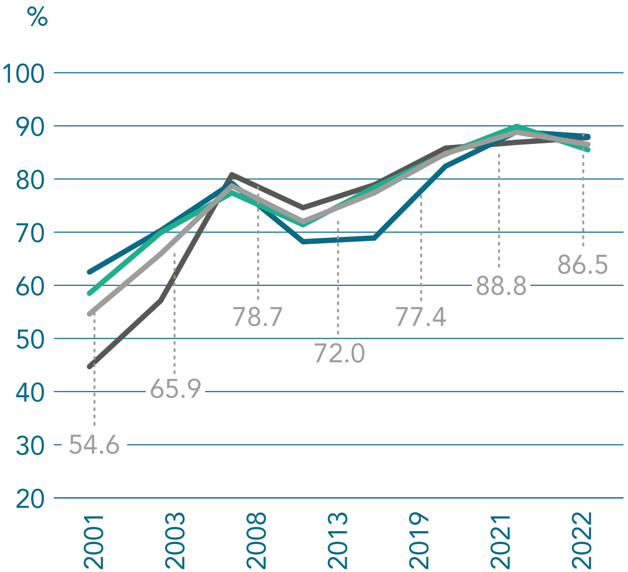


NORTH
CENTRE
SOUTH
ITALY

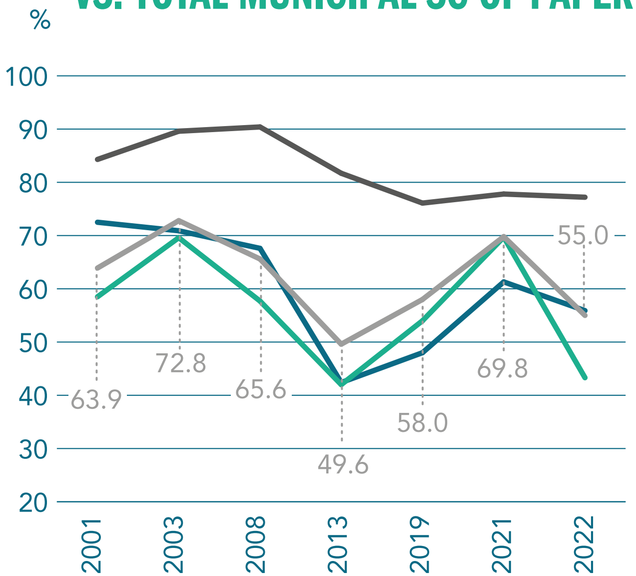
FIGURE 7
STATUS OF THE AGREEMENTS UPON THE EXPIRATION OF EACH FRAMEWORK AGREEMENT AND COVERAGE RATES OF THE AGREEMENTS. 2001-2022 HISTORICAL DATA SET.

SOURCE: COMIECO

COVERED CITIES



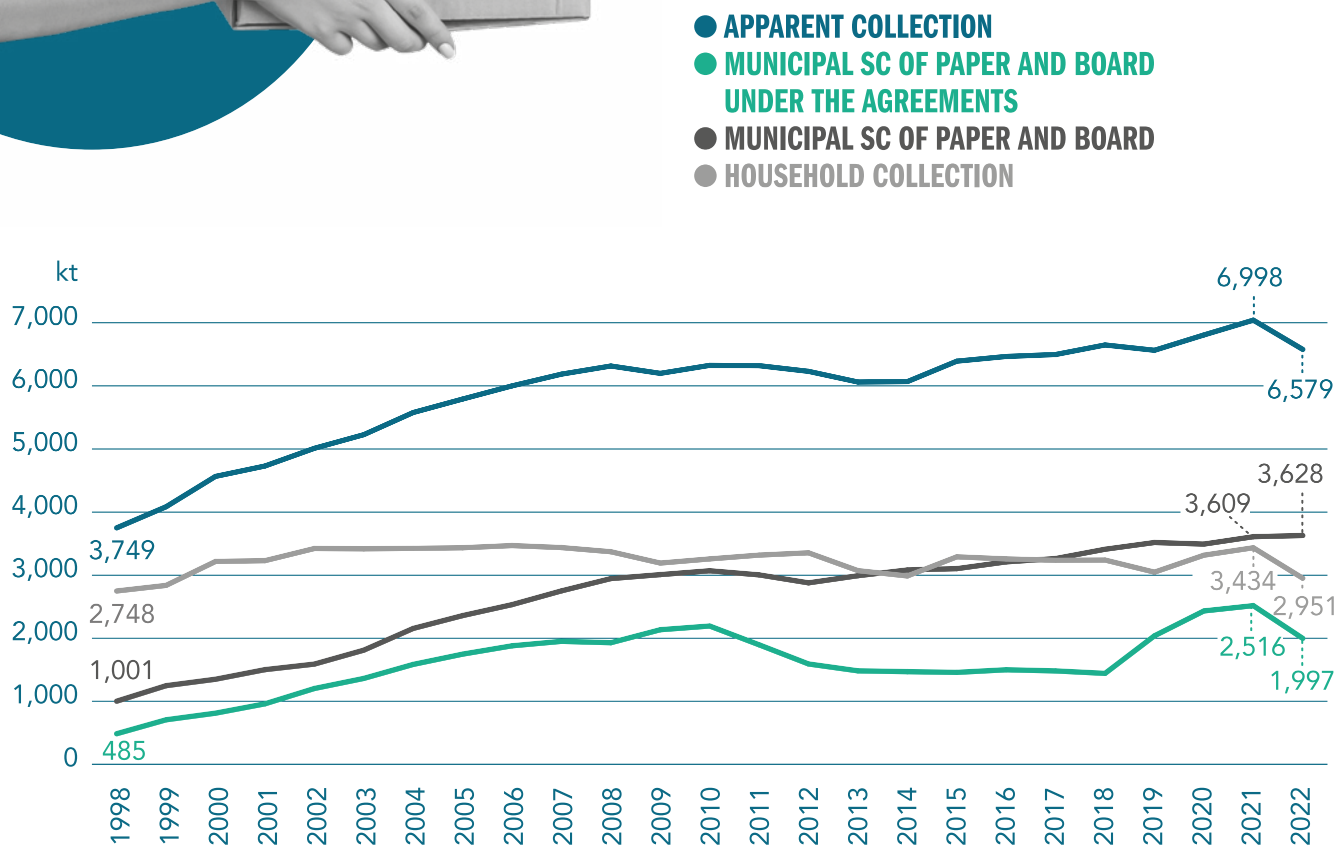
AMOUNTS MANAGED BY COMIECO VS. TOTAL MUNICIPAL SC OF PAPER



Agreement fragmentation in the South still hampers synergic development. In a busy market environment, Comieco is reducing its share of managed material (55% of municipal collection) consistently with the principle of subsidiarity.

FIGURE 8
RATIO OF OVERALL PAPER AND BOARD COLLECTION MANAGED UNDER THE AGREEMENTS TO APPARENT COLLECTION. 1998-2022 HISTORICAL DATA SET AND 2021-2022 COMPARISON.

SOURCE: COMIECO



	1998	2003	2008	2013	2020	2021	2022	Δ 1998/2022		Δ 2021/2022	
	kt	kt	kt	kt	kt	kt	kt	kt	%	kt	%
Apparent collection*	3,749	5,227	6,316	6,062	6,808	7,043	6,579	2,830	75.5	-464	-6.6
Municipal SC of paper and board	1,001	1,810	2,945	2,991	3,492	3,609	3,628	2,627	262.5	20	0.6
Municipal SC of paper and board under the agreements	485	1,362	1,928	1,482	2,432	2,516	1,997	1,512	311.7	-519	-20.6
Household collection	2,748	3,417	3,371	3,071	3,316	3,434	2,951	203	7.4	-484	-14.1

	1998	2003	2008	2013	2020	2021	2022
	%	%	%	%	%	%	%
Municipal SC of paper and board under the agreements vs. apparent collection	12.9	26.1	30.5	24.4	35.7	35.7	30.4
Municipal SC of paper and board under the agreements vs. municipal collection	48.5	75.2	65.5	49.6	69.6	69.7	55.0

**Apparent collection: consumption of paper for recycling - import + export*

ALLOCATIONS TO THE PARTIES UNDER THE AGREEMENTS

Over 183 million EUR is the global amount of the allocations made by Comieco in 2022 for the management of just less than 2 million tons of paper and board from municipal collection operated under the agreements.

The total is the sum of 149.6 million EUR for packaging and 33.6 million EUR for graphic paper.

183.2

million EUR

ALLOCATED TO THE CITIES IN 2022

The investment declined (-35 million EUR vs. 2021) in absolute terms for two different reasons: on one hand, the reduction of managed volumes (-20%) and, on the other, the impact of the monthly quotations of paper for recycling. The unit consideration for packaging increased by over 5%.

This increase is particularly significant for cardboard 1.04+1.05 (business circuits) and for the share (42% flat rate) of 1.01+1.02 (households).

The average value of the share of graphic paper (similar product fractions) in 1.01+1.02 decreased, instead, with its price updated on a monthly basis via a connection with the quotations of the Chamber of Commerce for paper and board for recycling.

As a consequence, the average value per inhabitant under the agreements also declined (-14.6%) from 3.9 EUR/ab in 2021 to 3.3 EUR/ab in 2022 (it was 2.6 EUR/ab in 2020).

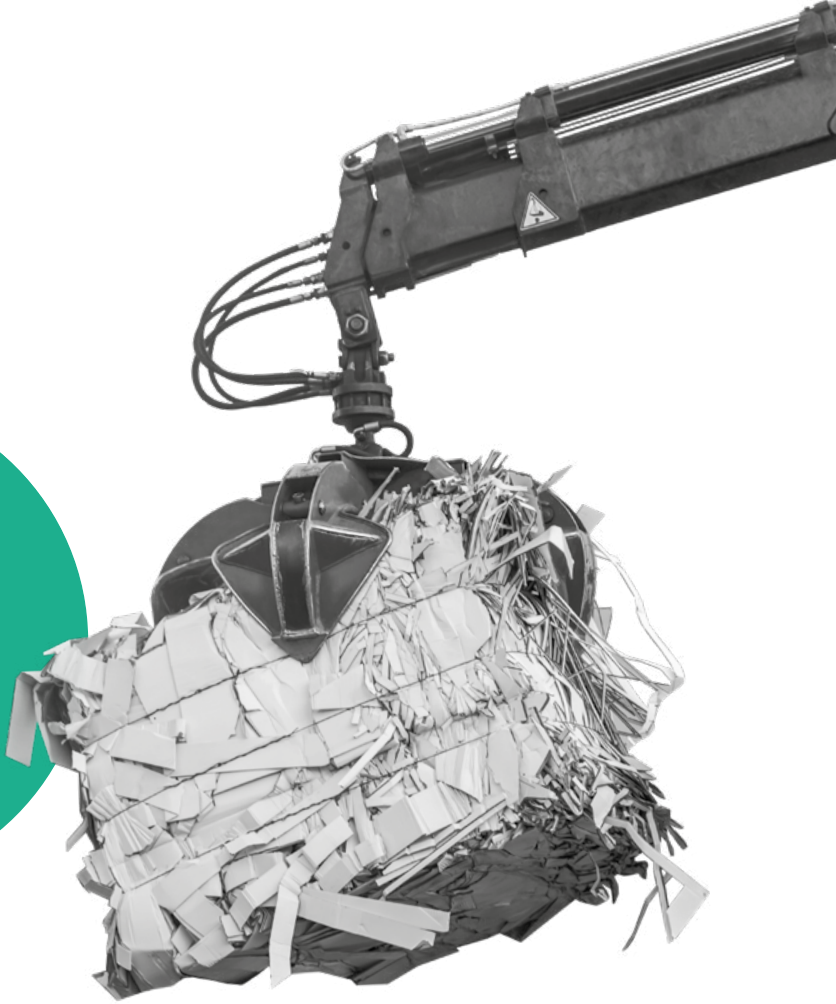
In addition to considerations for collection - in the so-called "OUT" agreements - Comieco invests resources in the processing and improvement of paper for recycling.

These resources are intended for plants operating on account of the parties covered by the agreements, and their amount totalled just more than 41 million EUR in 2022, leading to a growth.

2.32

billion EUR

FROM 1998 TO 2022



3.33

EUR/ab-year

AVERAGE CONSIDERATION PER INHABITANT

All the paper and board collected at municipal level from 1998 to 2022 amounts, together, to 63 million tons,

from 1 to over 3.6 million tons a year, including just less than 64% (40.2 million) managed by Comieco.

In 25 years of operation (1998-2022) of the ANCI-CONAI agreement, the Consortium allocated almost 2.1 billion EUR globally to the Italian Cities to support paper and board collection, plus 230 million EUR for processed similar product fractions (frazioni merceologiche similari, FMS) and over 260 million for plant-based processing.

The allocations made to the Cities under the agreements amount to more than 183 million EUR. The average value per inhabitant is in line with the value of the South, the macro-area with the highest number of agreements

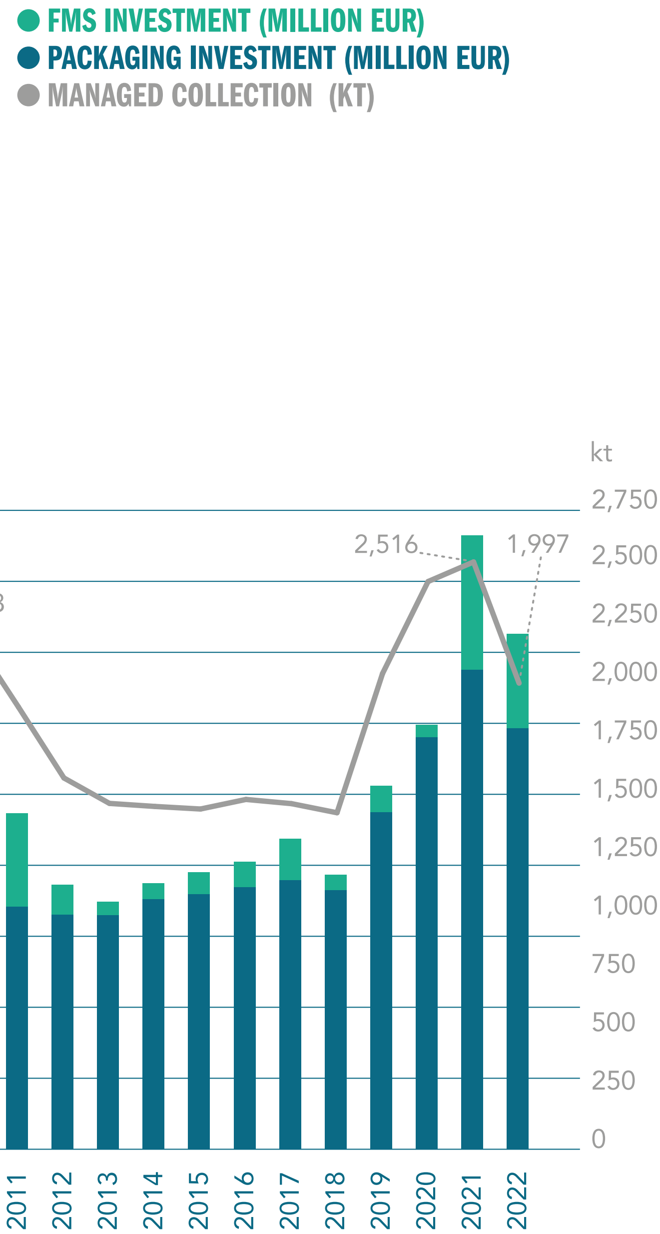
TABLE 4
MANAGED AMOUNTS AND ALLOCATIONS TO THE PARTIES UNDER THE AGREEMENTS IN 2022. DETAILED BY AREAS.

SOURCE: COMIECO

		Amount					
Area	**Inhabitants under the agreements**	**Managed packaging**	**FMS**	**Total**	**Managed packaging**	**FMS**	**Total**
	n	t	t	t	kg/ab	kg/ab	kg/ab
North	24,889,856	553,603	239,387	792,990	22.2	9.6	31.9
Centre	11,284,583	296,074	183,535	479,608	26.2	16.3	42.5
South	18,866,389	457,668	266,645	724,313	24.3	14.1	38.4
Italy	**55,040,828**	**1,307,345**	**689,567**	**1,996,911**	**23.8**	**12.5**	**36.3**

		Considerations for collection					
Area	**Inhabitants under the agreements**	**Managed packaging**	**FMS**	**Total**	**Managed packaging**	**FMS**	**Total**
	n	EUR	EUR	EUR	EUR/ab	EUR/ab	EUR/ab
North	24,889,856	64,847,061	11,983,994	76,831,055	2.61	0.48	3.09
Centre	11,284,583	34,273,322	9,167,230	43,440,552	3.04	0.81	3.85
South	18,866,389	50,428,565	12,418,906	62,847,471	2.67	0.66	3.33
Italy	**55,040,828**	**149,548,948**	**33,570,130**	**183,119,078**	**2.72**	**0.61**	**3.33**

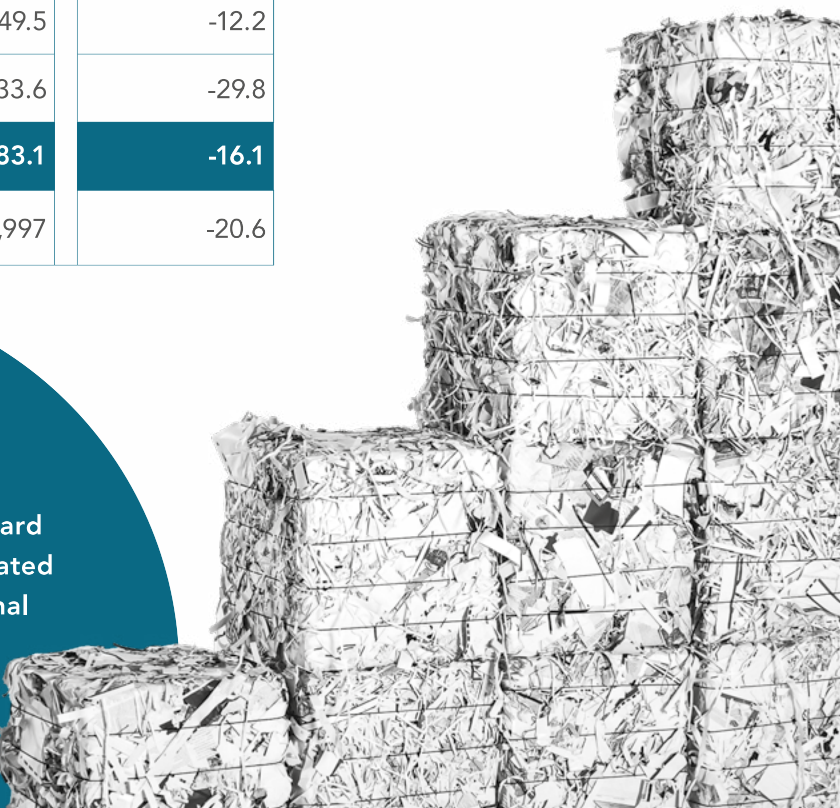
FIGURE 9
INVESTMENTS.
1998-2022 HISTORICAL DATA SET.
SOURCE: COMIECO

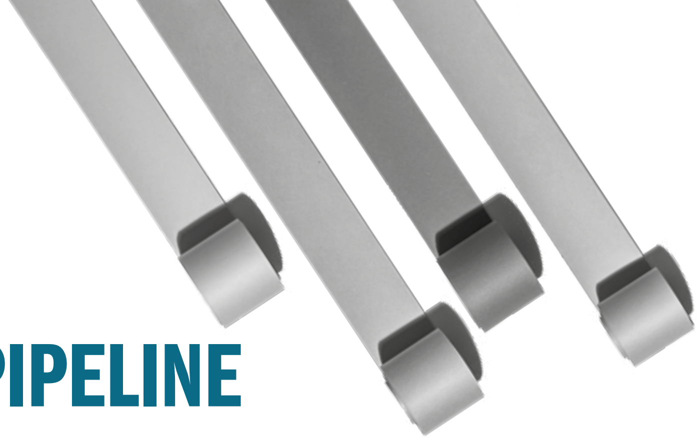


		1st ANCI-CONAI agreement 1998-2003	2nd ANCI-CONAI agreement 2004-2008	3rd ANCI-CONAI agreement 2009-2013	4th ANCI-CONAI agreement 2014-2019	5th ANCI-CONAI agreement 2020-2024	Total
Packaging	million EUR	204.2	400.3	439.0	579.6	466.2	**2,089.3**
FMS	million EUR	0.4	15.3	80.2	52.6	85.9	**234.4**
Total	**million EUR**	**204.6**	**415.6**	**519.2**	**632.2**	**552.1**	**2,323.7**
Managed collection	kt	5,524	9,088	9,296	9,387	6,945	**40,240**

		2021	2022	Δ 2021-2022 %
Packaging	million EUR	170.4	149.5	-12.2
FMS	million EUR	47.8	33.6	-29.8
Total	**million EUR**	**218.2**	**183.1**	**-16.1**
Managed collection	kt	2,516	1,997	-20.6

In 25 years of life of the CONAI System, Comieco managed 40.2 million tons of paper and board derived from the cities, and allocated a total of 2.3 million EUR additional resources to support plant-based processing.





QUALITY: MORE TESTS FOR A MORE RELIABLE PIPELINE

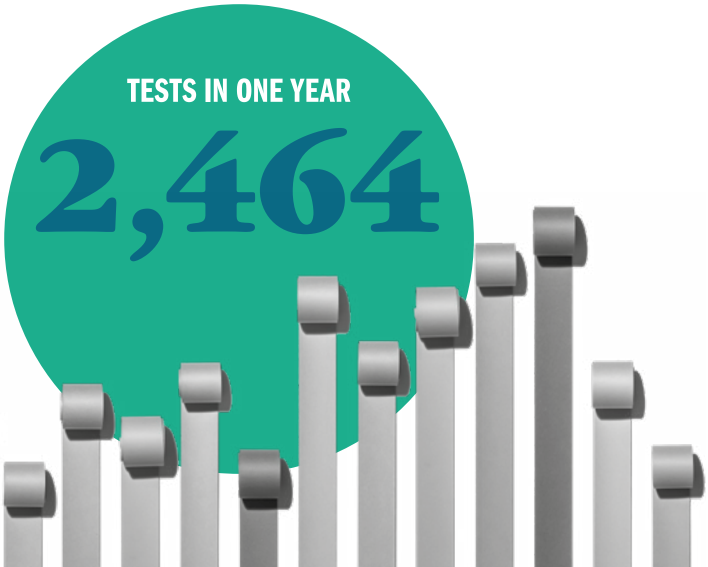
Tests on quality performed in 2022 outline once again different behaviours in the Country's macro-areas for the individual collection flows 1.01+1.02 (households) and 1.04+1.05 (business).

While the total number of collected samples decreases vs. 2021, the frequency of tests is higher if compared against the reduced volumes managed and the sampling criteria (provided for by the quality and audit document contained in the Technical Annex).

The ratio of performed tests to managed volumes is close to 1 sample collected per 1,000 tons; after all, the baseline quality of collection is a crucial feature in the organizational and industrial paper and board recycling system of the Country.

Fewer impurities at the outset mean a reduced need for waste treatment, fewer process scraps (sorting residues) and, thus, lower costs.
On the other hand, a better baseline quality results into maximized recycling. In this respect it is crucial for collection services to use effective equipment and ensure regular emptying and pick-up.

A more objective assessment of the 2022 performance requires extracting the national figure and observing how the different macro-



2.00% AVERAGE AMOUNT OF CONTAMINANTS IN 1.01-1.02

0.70% AVERAGE AMOUNT OF CONTAMINANTS IN 1.04-1.05

areas perform: the Centre (1.61% of contaminants) is approaching the performance of the North for the first time and drives improvement at national level, while offsetting the more negative data of the North and the South.

While the North's – albeit declining - is still the reference average value at national level (1.50% in 1.01+1.02), the South's (3.73%) remains above the first quality bracket threshold specified in the Technical Annex.

However, a more thorough understanding of the issue requires an analysis of the method, which partly makes the above scenario less comforting.

The majority of the amounts managed under the agreements (55%) is by now incinerated as so-called "OUT" post-processing flows: in this case the parties to the agreements identify the service provider for sorting and incineration of the collected material in view of entrusting End-of-Waste material to Comieco.

This allows to maximize revenues while securing first-bracket positioning. The remaining share - approximately 45% of volumes - is managed, instead, on the basis of the amounts transferred to the plant immediately after collection, i.e. via "IN" contracts.

This is something that most often concerns high-quality sources, ensuring maximized considerations a priori. In most cases, the "OUT" contract is entered into in order to work on the material by sorting out its components (packaging and similar fractions), but in other cases it is required by reason of low-quality collection. In this case measures are taken to remove impurities.

Considering the importance of quality at the origin, according to the provisions of the Quality Annex, the Consortium uses “fact-finding” tests to monitor incoming conferments under “OUT” contracts, which are also relevant to identify the facilities that need some operational and information support to improve collection at the origin, particularly in the household circuits.

The tests performed according to this more punctual criterion provide different insights.

In about 1 out of 4 cases, household collection at national level does not comply with first-bracket specifications. This rate is above 50% in the South.

While a more positive result is recorded for 1.04+1.05 - business circuits - more than 15% of the relevant samples (the same rate applies across Italy) also do not comply with first-bracket standards.

Non-optimal quality at the origin implies, indeed, costs for the operator, which translate either into a reduction of the allocated consideration or – alternatively – into charges due to the plants for the processing of materials.

TABLE 5
QUALITY OF THE COLLECTED MATERIALS (AVERAGE AMOUNT OF CONTAMINANTS). 2021-2022 COMPARISON BY MACRO-AREAS.

SOURCE: COMIECO

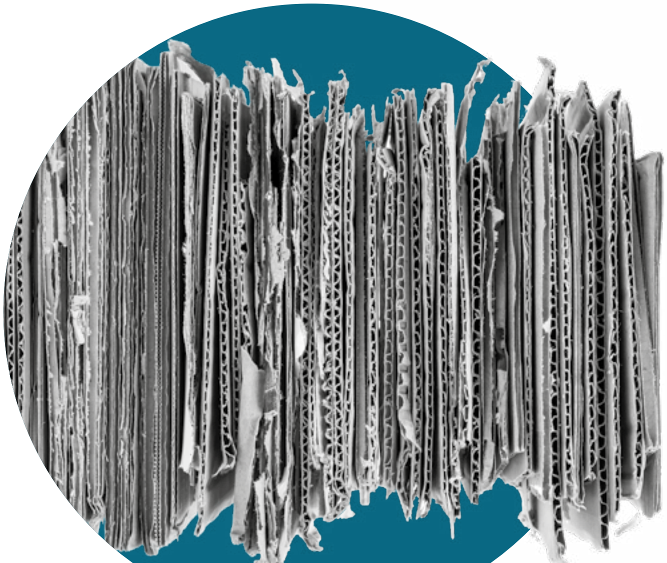
	Year 2021		Year 2022		Δ 2021/2022
	Tests	Contaminants	Tests	Contaminants	Contaminants
	n	%	n	%	%
1.01+1.02	First quality bracket threshold: 3.0%				
North	1,189	1.50	1,025	1.59	0.09
Centre	470	1.61	504	1.50	-0.11
South	418	3.73	379	3.60	-0.13
Italy	**2,077**	**1.98**	**1,908**	**2.00**	**0.02**
1.04+1.05	First quality bracket threshold: 1.5%				
North	130	0.59	120	0.64	0.05
Centre	175	0.89	172	0.53	-0.36
South	273	0.85	264	0.85	0.00
Italy	**578**	**0.79**	**556**	**0.70**	**-0.09**

1.01+1.02: the average value of last year (2%) is confirmed. Since 2019, the flows monitored for the purpose of allocations have been falling within the range of the parameters set for the first quality bracket (3%). 1.04+1.05: slight improvement in business collection, whose average value points out to excellent quality.

TABLE 5 BIS
DISTRIBUTION OF TESTS PERFORMED ON COLLECTION AT THE SOURCE PER QUALITY BRACKETS IN 2022.

SOURCE: COMIECO

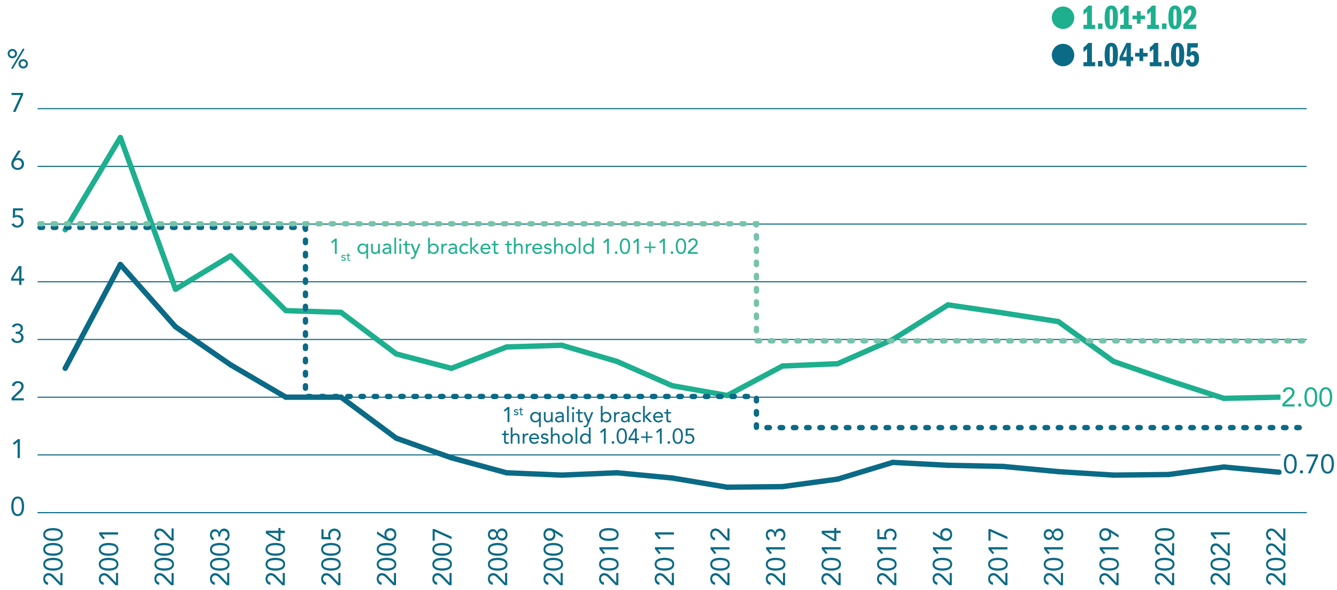
		1.01+1.02 CER200101				1.04+1.05 CER150101			
		Bracket 1	Bracket 2	Bracket 3	Bracket 4	Bracket 1	Bracket 2	Bracket 3	Bracket 4
North	%	83.8	11.2	3.4	1.6	82.0	8.6	0.8	8.6
Centre	%	80.9	12.1	3.7	3.3	87.8	5.2	0.6	6.4
South	%	47.0	26.3	14.8	11.8	82.5	11.9	1.5	4.1
Italy	**%**	**74.2**	**15.1**	**6.2**	**4.5**	**84.0**	**9.2**	**1.1**	**5.8**



"OUT" flows highlight a wide quality gap between the South/Centre and the North.

FIGURE 10
QUALITY OF THE COLLECTED MATERIALS (AVERAGE TREND OF CONTAMINANTS). 2000-2022 PERIOD.

SOURCE: COMIECO



Tests performed		1st ANCI-CONAI agreement 1998-2003	2nd ANCI-CONAI agreement 2004-2008	3rd ANCI-CONAI agreement 2009-2013	4th ANCI-CONAI agreement 2014-2019	5th ANCI-CONAI agreement 2020-2022	Total 1998-2022
1.01+1.02	n	1,006	3,456	4,040	4,286	5,484	18,272
1.04+1.05	n	594	3,591	4,204	2,931	1,674	12,994

Note: Until June 2014 the above results refer to the total tests performed at the sorting plants both on incoming and on outgoing materials in order to determine the considerations due to the parties to the agreements. From July 2014 these results only refer to tests on incoming materials under the so-called "IN" contracts valid for being entitled to the consideration for collection.

RECYCLING PLANTS, A WIDESPREAD NETWORK

The conferment of the paper and board collected under the management of Comieco was ensured across the national territory through 344 waste management plants that collected the material and performed preliminary sorting and pressing for recycling at the mills.

This network of plants that spreads across the national territory promotes cost containment by ensuring that vehicles are unloaded at a short distance away from the collection points (16.7 km on average).

344

WASTE MANAGEMENT PLANTS

PAPER-MILLS IN ITALY THAT RECYCLE SC OF PAPER AND BOARD MANAGED BY COMIECO

57

Logistic optimization, which is key to improve recycling, needs to reconcile the possibility to confer the material at a short distance from the collection point, but its limit is the need to create a critical mass to achieve scale economies and investments to improve processing.

The recovered paper is transferred to the industrial paper-making process in two ways:

- 60% of the amount managed by Comieco (over 1.2 million tons) is entrusted to 57 paper-mills on a pro-quota basis;
- the other 40% (approximately 800thousand tons) is awarded - by regular auctions - to eligible parties. In 2022, 39 different parties were awarded at least one lot.

Area	Waste management plants	Average conferment distance	Waste management plants under the agreements with >20thousand t/year of incoming materials	Paper mills
	n	km	n	n
North*	134	16.9	6	32
Centre	67	16.7	4	18
South	143	16.6	5	7
Totale	**344**	**16.7**	**15**	**57**

**one paper mill is located in the territory of the Republic of San Marino*

FIGURE 11
THE RECYCLING PLANTS NETWORK. YEAR 2022.
SOURCE: COMIECO

● PAPER MILLS
● WASTE MANAGEMENT PLANTS

THE ITALIAN PAPER INDUSTRY IN 2022: A DOUBLE-FACED YEAR

5.3 milioni di t

APPARENT PAPER AND BOARD PACKAGING CONSUMPTION

87.0%

RECOVERY OF PAPER AND BOARD PACKAGING

81.2%

RECYCLING OF PAPER AND BOARD PACKAGING

Last year reference was made on these pages to the "resilience" of the pipeline, i.e. the ability of the paper-making system to withstand and adjust to significant and hard shocks.

Several events, since 2017, including the ban to China's paper, the 2020 pandemic, and the 2021 fluctuations, have produced global impacts on the paper sector.

The year 2022 began in continuity with 2021, with a busy paper for recycling market, a stable domestic demand, and a recovery of exports.
The burst of the Ukrainian war and the subsequent soaring of gas and energy prices affected this scenario.

Due to soaring costs, in the spring of 2022 companies in the paper-making sector started to consider stopping production for a variable length of time. The result was a decline of the domestic demand for raw materials and a collapse of paper for recycling quotations in the second half of the year, with a -85% variation of average prices.

For more thorough understanding, annual data should take this situation into account, which clearly shows that 2021 and the first half of 2022 were characterized by a demand driven by the need to rebuild stocks along the entire pipeline.

In summary:

- paper production declined by almost 900thousand tons (-9.1%) with a stronger impact on the packaging business;
- with +750thousand tons, we see a significant recovery of raw material imports (rolls, in particular), while exports decline (-11.2%). The balance grows from 750thousand to almost 2 million tons;
- the trend of domestic consumption of paper for recycling is reversed, returning to 5.4 million, from over 6 million in 2021, in line with 2020 (-11%);

- however, recovered paper is still the main source of cellulose fibre for the paper sector; the global effect is noticed on the rate of recycling of paper and board packaging that reaches 81.2%, anyway above the EU target set for the pipeline (75%, as provided for by Directive 2018/852/EC).

The above-described scenario is also the foundation for what looks like a cautious trend in the first part of 2023.

After the minimum values of last fall, paper for recycling sees a steady, yet cautious recovery. The present scenario sees prices at about one-third of the maximum level of mid-2022, comparable with the pre-2017 period.

These values also impact on the expected agreement-based volumes, which resumed their growth in 2023 (2.4 million tons) and are reasonably unlikely to suffer shocks in 2024.

TABLE 6
PAPER AND BOARD PACKAGING RECOVERY AND RECYCLING TARGETS ACHIEVED IN 2022.

SOURCE: COMIECO

Calculation of recycling and recovery rates	year 2022	Δ 2021/2022
	t	%
Apparent paper and board packaging consumption	5,308,916	0.2
Waste paper and board packaging contained in paper and board for recycling in 1.01+1.02, recycled in Italy	835,795	-13.7
Waste paper and board packaging contained in paper and board for recycling in 1.04+1.05, recycled in Italy	2,447,386	-7.5
Waste packaging recycled abroad	1,027,783	18.2
Total waste paper and board packaging conferred for recycling	**4,310,964**	**-3.9**
Paper and board packaging recovered as energy	**305,548**	**-8.5**
Recovered paper and board packaging	**4,616,512**	**-4.2**

	year 2022
Recycling %	**81.2**
Energy recovery %	**5.8**
Recovery %	**87.0**

The apparent consumption data for 2013 was adjusted by CONAI, the apparent consumption data for 2014 includes tubes and rolls subject to the CAC (the CONAI environmental contribution) effective from 1/1/2014. The apparent consumption data and, consequently, the recycling and recovery rates for 2020 and 2021, were adjusted by CONAI.

TABLE 7
DIRECT AND INDIRECT BENEFITS OF MANAGED PAPER AND BOARD PACKAGING RECYCLING. 2022 DATA.

SOURCE: CONAI - LCC TOOL (DATA AS AT 30/05/2023) PENDING VALIDATION

The benefits generated by the recycling of managed packaging (1.31 million tons) in 2022 can be estimated at 172 million EUR. The 2005-2022 aggregate data highlights benefits for over 1.75 billion EUR, calculated as the value of raw materials and avoided emissions.

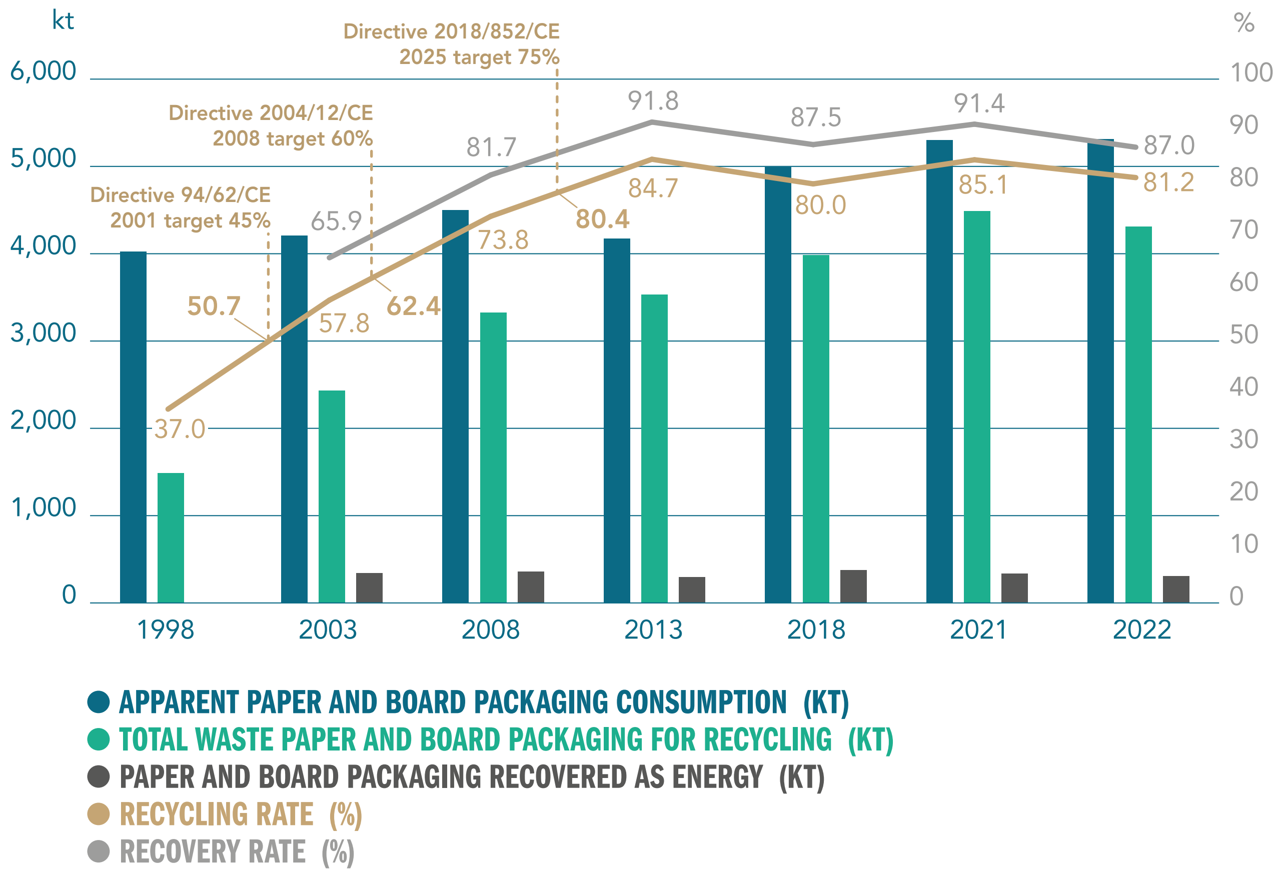
Indicators within the CONAI boundaries (managed by Comieco)			
Indicator		**2022**	**tot. 2005-2022**
Amount of conferred packaging	kt	1,307	19,781
Fractions for recycling	kt	1,307	19,781
Fractions for energy recovery	kt	0	0
Fractions intended for other forms of disposal	kt	0	0

Environmental benefits			
Indicator		**2022**	**tot. 2005-2022**
Saving of raw material, paper	kt	1,100	18,914
Electric energy generated from energy recovery	TJ	0	0
Thermal energy generated from energy recovery	TJ	0	0
Primary energy saving through recycling	TJ	15,319	258,000
CO_2 production avoided through recycling	kt CO_2 eq	1,071	17,579
CO_2 production avoided through energy recovery	kt CO_2 eq	2	2

Economic value				
Category			**2022**	**tot. 2005-2022**
Direct benefits	Economic value of the secondary raw material obtained from recycling	millon EUR	108	1,115
	Economic value of the power generated from energy recovery	millon EUR	0	0
Indirect benefits	Economic value of the avoided CO_2 emissions	millon EUR	64	635
Overall benefits		**millon EUR**	**172**	**1,750**

FIGURE 12
PAPER AND BOARD PACKAGING RECYCLING AND RECOVERY TARGETS ACHIEVED. 1998-2022 HISTORICAL DATA SET.

SOURCE: COMIECO



Notes:

- Energy recovery before 2003 only monitored for the amounts managed under the agreements. Overall data not available.
- The apparent consumption data for 2013 was adjusted by CONAI, the apparent consumption data for 2014 includes tubes and rolls subject to the CAC (the CONAI environmental contribution) effective from 1/1/2014.
- The apparent consumption data and, consequently, the recycling and recovery rates for 2020 and 2021 were adjusted by CONAI.

TABLE 8
PAPER AND BOARD PRODUCTION IN 2022.

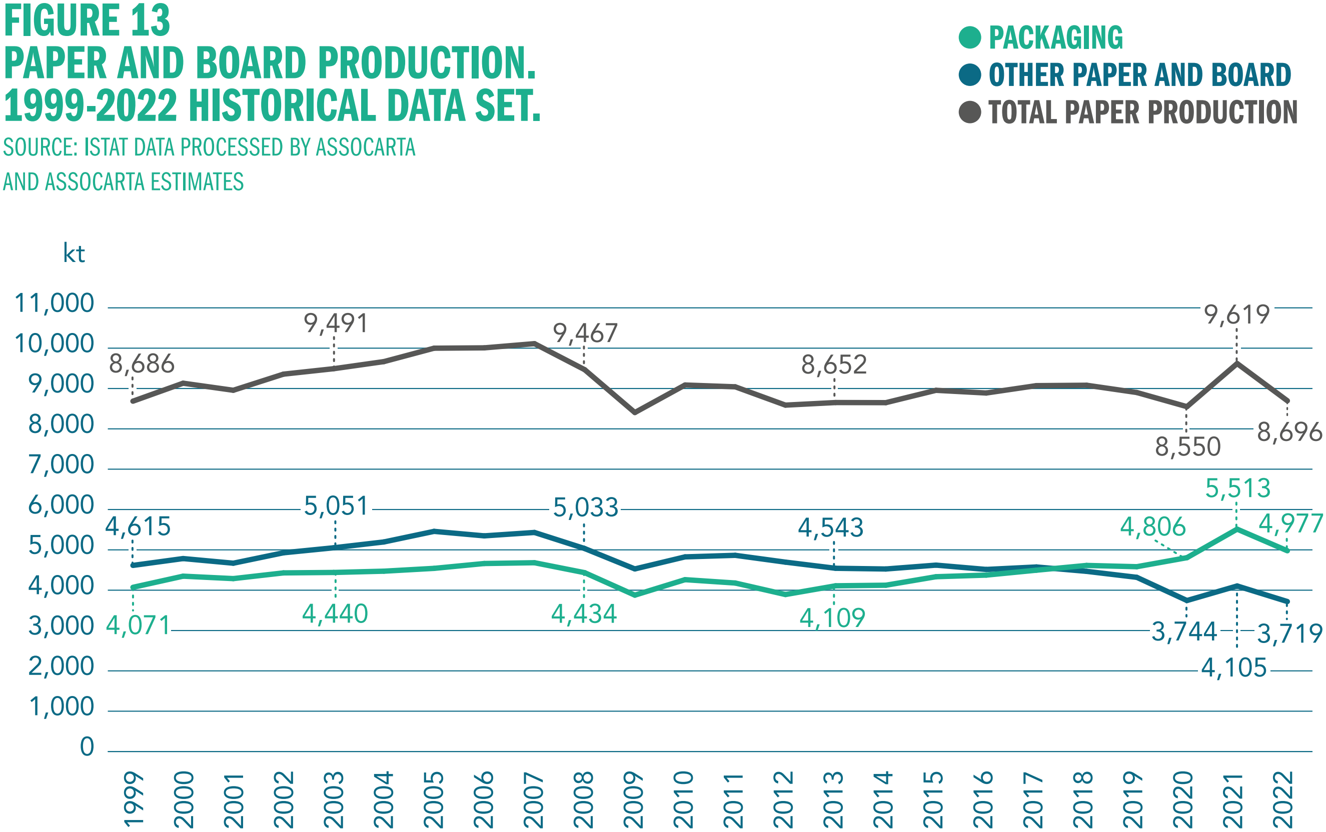
SOURCE: ISTAT DATA PROCESSED BY ASSOCARTA AND ASSOCARTA ESTIMATES

With an additional 1.2 million tons compared to other paper productions, the packaging production sector is confirmed as the main user of paper and board in the entire national paper industry.

		Production (A)	Import (B)	Export (C)	Apparent consumption (A+B-C)
Paper and board packaging (paper, board, and cardboard)	t	4,976,613	3,859,343	1,564,588	7,271,369
Δ 2021/2022	%	-10.0	19.4	-19.1	6.5
Other paper and board (paper for graphic and sanitary use)	t	3,719,373	1,799,978	2,119,392	3,399,959
Δ 2021/2022	%	-7.8	8.0	-4.2	-2.6
Total paper production	**t**	**8,695,986**	**5,659,321**	**3,683,979**	**10,671,328**
Δ 2021/2022	**%**	**-9.1**	**15.5**	**-11.2**	**3.4**

FIGURE 13
PAPER AND BOARD PRODUCTION. 1999-2022 HISTORICAL DATA SET.

SOURCE: ISTAT DATA PROCESSED BY ASSOCARTA
AND ASSOCARTA ESTIMATES



		1999	2003	2008	2013	2020	2021	2022	Δ 1999/2022		Δ 2020/2022	
									kt	%	kt	%
Paper and board packaging	kt	4,071	4,440	4,434	4,109	4,806	5,528	4,977	906	22.2	-551	-10.0
Other paper and board	kt	4,615	5,051	5,033	4,543	3,744	4,035	3,719	-896	-19.4	-315	-7.8
Total paper	**kt**	**8,686**	**9,491**	**9,467**	**8,652**	**8,550**	**9,563**	**8,696**	**10**	**0.1**	**-867**	**-9. 1**

TABLE 9
CONSUMPTION, IMPORT, EXPORT OF PAPER FOR RECYCLING AND APPARENT COLLECTION*. 2021-2022 VARIATIONS.

SOURCE: ASSOCARTA DATA PROCESSED BY COMIECO

		Import (A)	Export (B)	Consumption (C)	Apparent collection* (B+C-A)
2021	t	366,480	1,349,400	6,059,911	7,042,830
2022	t	295,553	1,480,771	5,393,836	6,579,054
Δ 2021-2022	%	-19.4	9.7	-11.0	-6.6

FIGURE 14
CONSUMPTION, IMPORT, EXPORT OF PAPER FOR RECYCLING AND APPARENT COLLECTION*. 1998-2022 PERIOD.

SOURCE: ASSOCARTA DATA PROCESSED BY COMIECO

	1998	2003	2008	2013	2020	2021	2022	1999/2022		2021/2022	
	kt	kt	kt	kt	kt	kt	kt	Δ kt	Δ %	Δ kt	Δ %
Import	854	589.	520	338	255	366	296	- 558	- 65	- 70	- 19
Export	42	528	1,507	1,685	1,851	1,349	1,481	1,439	3,426	132	10
Consumption	4,561	5,288	5,329	4,715	5,212	6,060	5,394	833	18	- 666	- 11
Apparent collection	**3,749**	**5,227**	**6,316**	**6,062**	**6,808**	**7,043**	**6,579**	**2,830**	**75**	**- 464**	**- 7**
Net export	**-812**	**-61**	**987**	**1,347**	**1,596**	**983**	**1,185**				

Apparent collection: Consumption - Import + Export

Domestic consumptions of paper for recycling (5.4 million tons) return below 6 million tons, the maximum figure recorded in 2021. Exports grow to close to 1.5 million tons. The net balance (exports - imports) is close to 1.2 million tons.

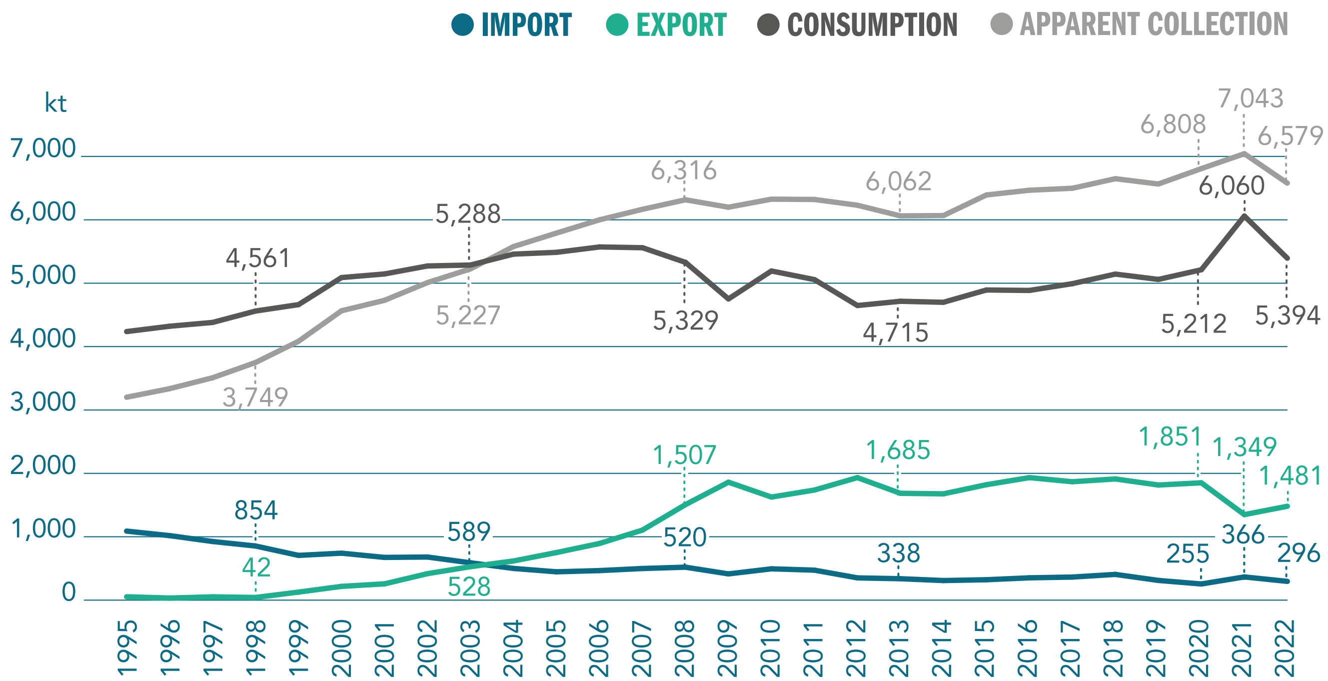
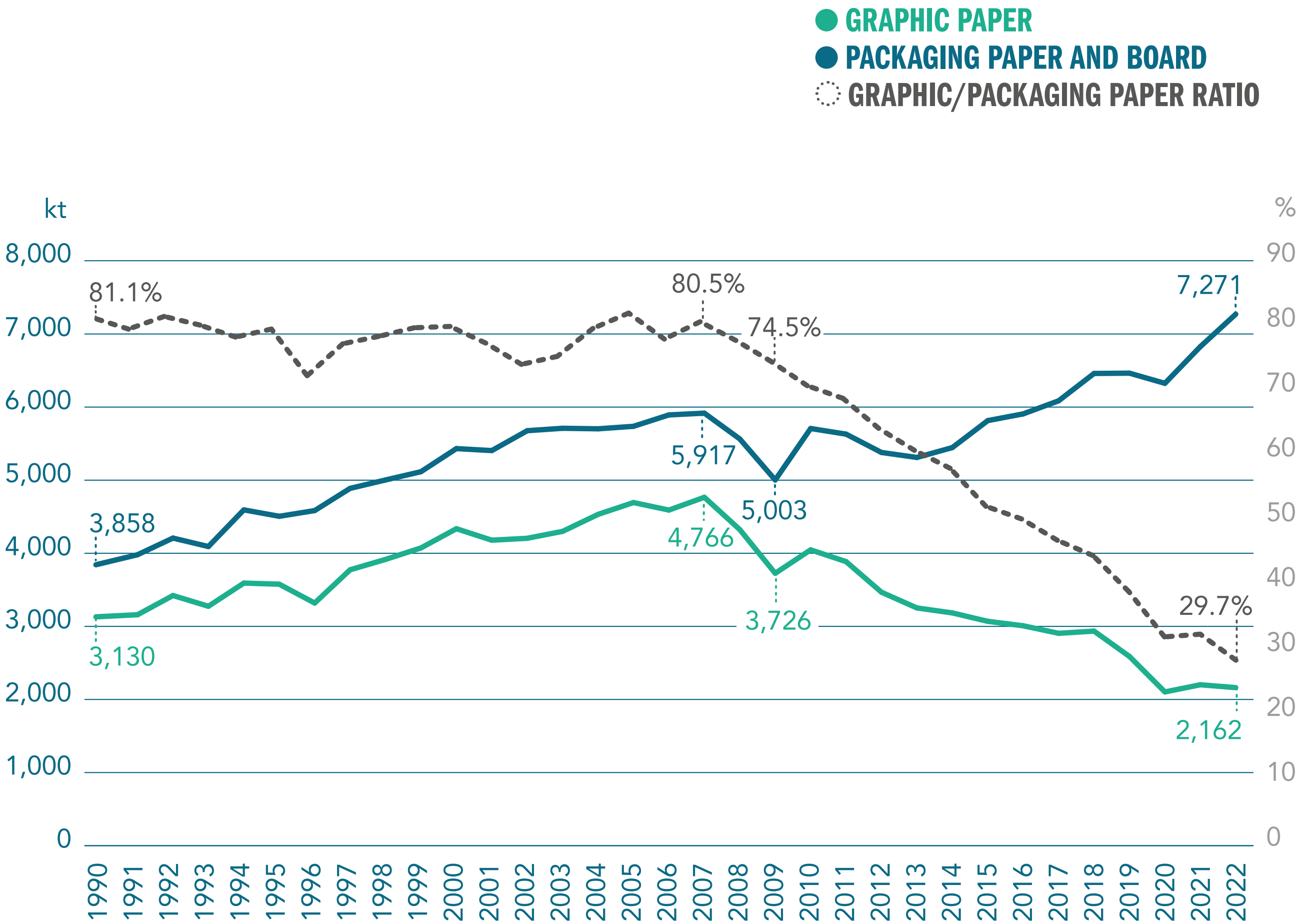


FIGURE 15
RATIO OF APPARENT GRAPHIC PAPER TO PACKAGING CONSUMPTION. 1990-2022 HISTORICAL DATA.

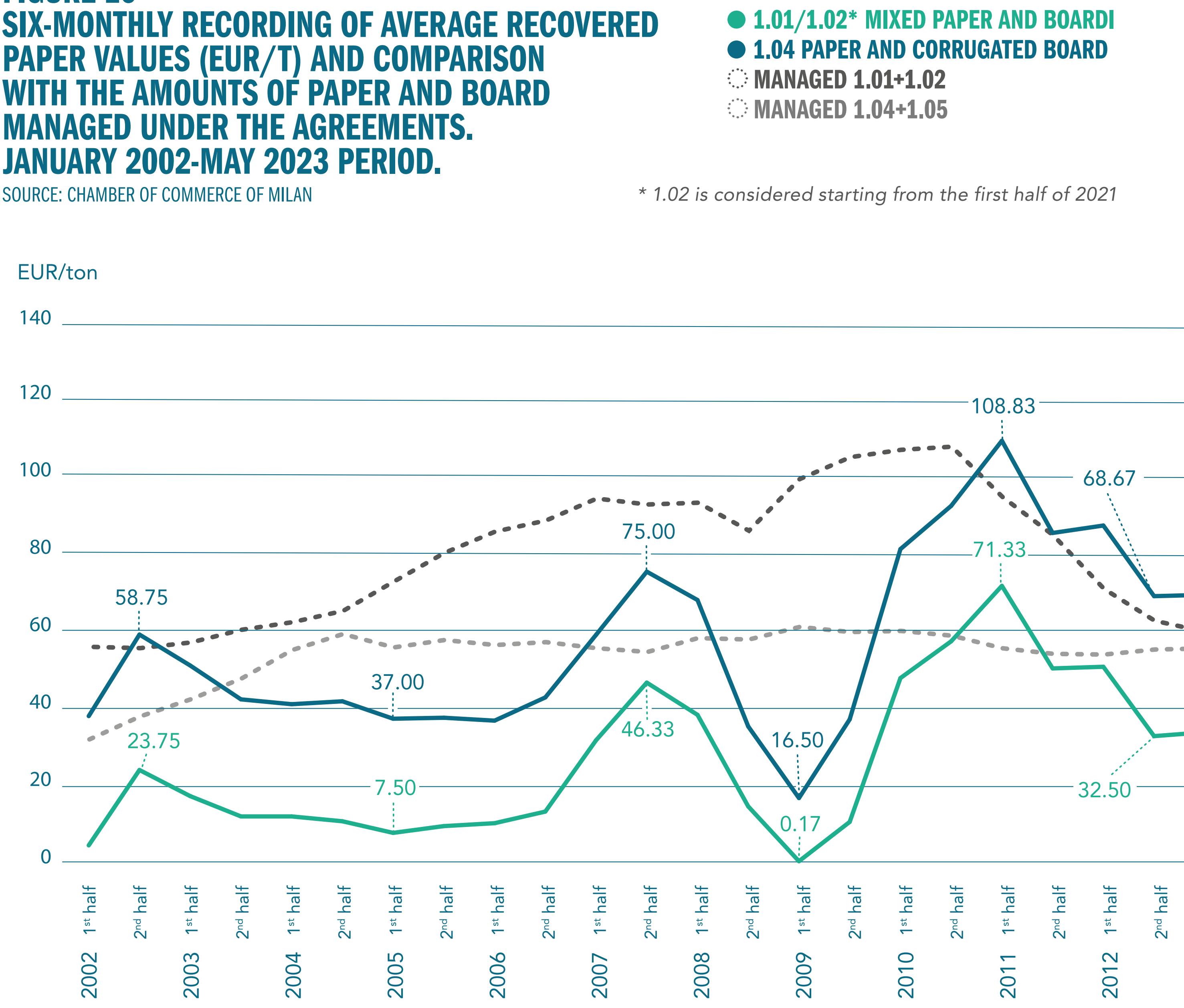
SOURCE: ASSOCARTA DATA PROCESSED BY VALUE QUEST

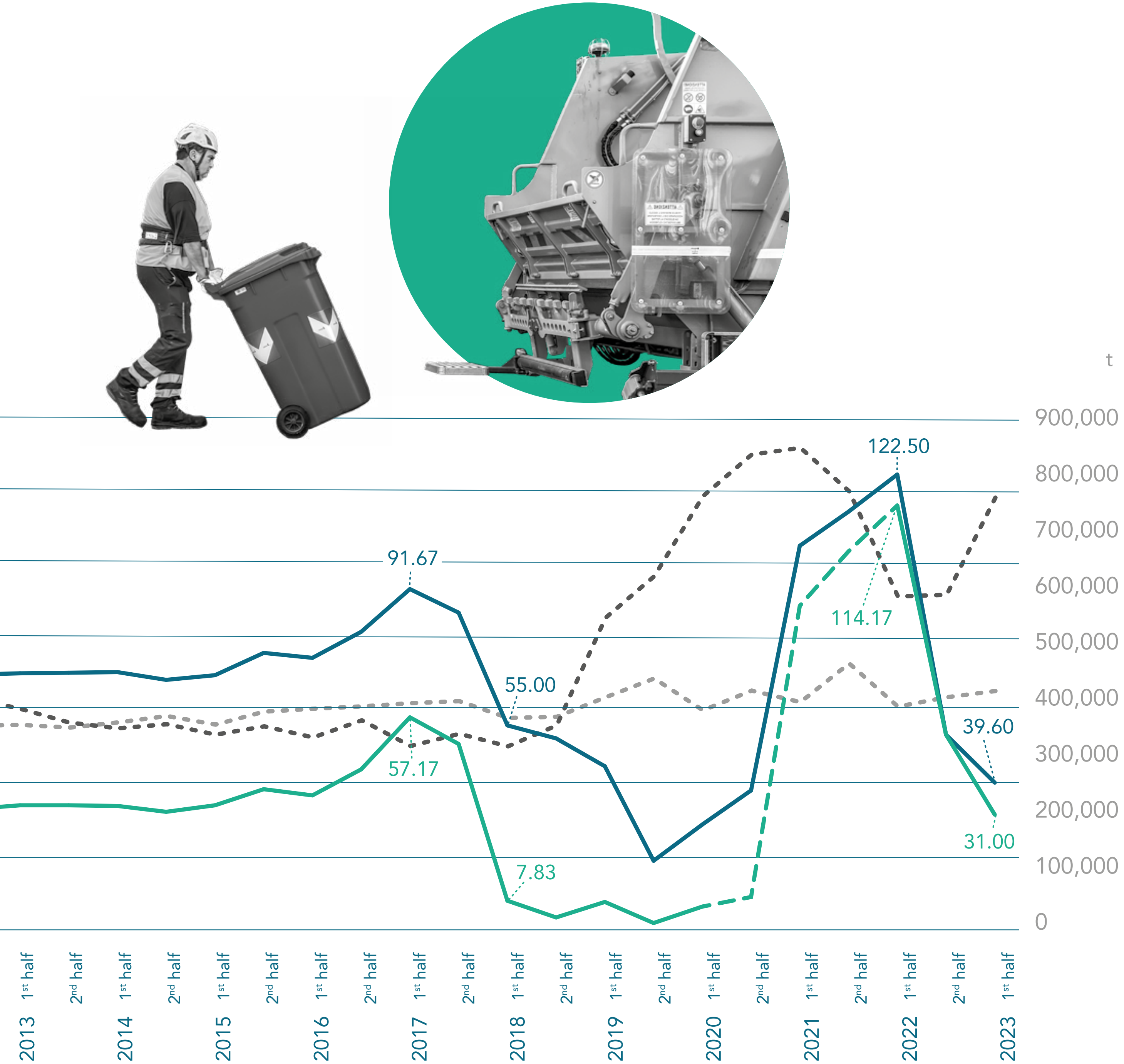


The ratio of graphic paper consumption to packaging paper consumption was gradually reversed over time. This phenomenon emerged in 2009 and developed for graphic paper, until values fell below the 1990 threshold. The different composition of the consumption mix also brings about a significant change in the "quality" of the collected materials and in subsequent issues connected with the re-processing of paper for recycling. This by-now consolidated trend was strengthened in 2022 with a ratio of both pipeline data below the 1:3 threshold.

FIGURE 16
SIX-MONTHLY RECORDING OF AVERAGE RECOVERED PAPER VALUES (EUR/T) AND COMPARISON WITH THE AMOUNTS OF PAPER AND BOARD MANAGED UNDER THE AGREEMENTS. JANUARY 2002-MAY 2023 PERIOD.

SOURCE: CHAMBER OF COMMERCE OF MILAN




t
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
122.50
91.67
114.17
55.00
39.60
57.17
31.00
7.83
2013 1st half
2nd half
2014 1st half
2nd half
2015 1st half
2nd half
2016 1st half
2nd half
2017 1st half
2nd half
2018 1st half
2nd half
2019 1st half
2nd half
2020 1st half
2nd half
2021 1st half
2nd half
2022 1st half
2nd half
2023 1st half

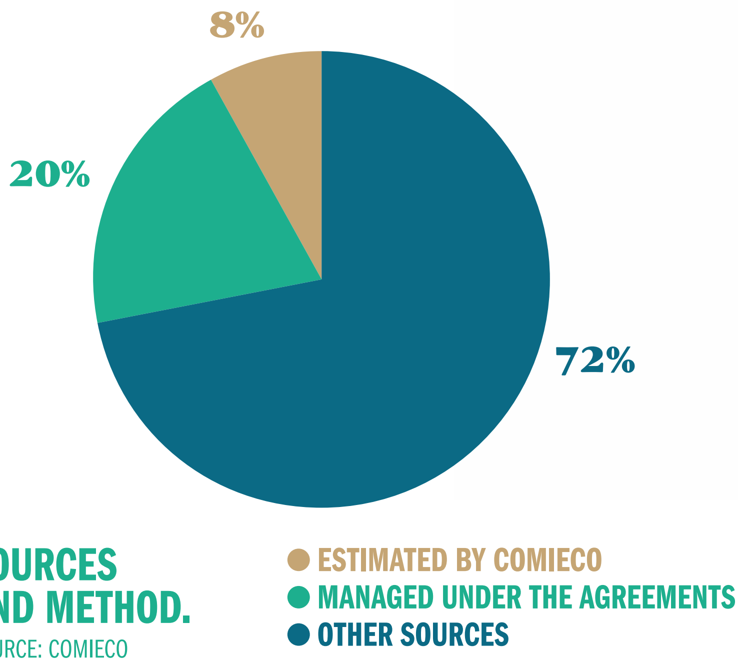
NOTE ON THE METHOD

The processing method adopted for data on national paper and board collection is the same as in the previous years.

The data processed by the Entities and/or organizations in charge of data collection, monitoring and validation, such as ISPRA, Regions, Regional Agencies (e.g. Arpa Campania), Provinces, Work Groups, ANCI, or those in charge of collection management (Cities, operators, plants, etc.), is mainly used to determine paper and board collection levels.

The data thus acquired, as available at the end of May and, therefore, in practice, still not final and consolidated, is combined with the data available to Comieco within the framework of its activity (management of the agreements) and compared to ensure consistency. Wherever necessary, specific analyses are performed.

Processing is usually carried out at provincial level but, in specific cases and for a more punctual historical data sets and its own data base (collection by the parties under the agreements).



SOURCES AND METHOD.

SOURCE: COMIECO

Separate paper and board collection is assumed to be actively in place across the national territory.

As to 2022 evaluations, constituting the object of this report, while the share of estimated data is reduced, it is significant in the South, where local work groups are still quite slow at processing data.

More specifically, 72% of collection data comes from third-party sources, 20% refers to the amounts managed directly by the Consortium, i.e. disclosed by the parties to the agreements as provided for by the Technical Annex (without any other sources), and 8% is based on estimated amounts.

Province-based data verification is also extended to the year preceding the one that constitutes the object of the current report. Where necessary, some data is updated (year 2021) by implementing the values published by ISPRA; the related data (area and national totals, per-capita, etc.) is updated accordingly.

Data processed as at 2023

THE BOARD OF DIRECTORS AS AT 30/06/2023

Comieco

National Consortium for Recovery and Recycling of Paper and Board Packaging

Chairman
Alberto Marchi

Deputy Chairman
Amelio Cecchini

Directors
Stefano Benini
Michele Bianchi
Andrea Bortoli
Lorenzo Cini
Andrea D'Amato
Carlotta De Iuliis
Silvia Ferraro
Fausto Ferretti
Paolo Giacchi
Michele Mastrobuono
Fabio Montinaro
Enzo Scalia
Andrea Trevisan

Board of Auditors
Alessia Bastiani
Sergio Montedoro
Luigi Reale

General Manager
Carlo Montalbetti

Deputy Manager
Roberto Di Molfetta


comieco
Consorzio Nazionale Recupero e Riciclo
degli Imballaggi a base Cellulosica

MILANO OFFICES
via Pompeo Litta 5, 20122 Milano
tel 02 55024.1

ROME OFFICES
via Tomacelli 132, 00186 Roma
tel 06 681030.1

SOUTH OFFICES
c/o Ellegi Service S.r.l. via Delle Fratte 5,
84080 Pellezzano (SA)
tel 089 566836

Follow us

www.comieco.org

Comieco fa parte del sistema
CONAI