27th REPORT

Collection, Recycling, and Recovery of Paper and Board

Data for the year
2021

July 2022

comieco
Consorzio Nazionale Recupero e Riciclo
degli Imballaggi a base Cellulosica

ACRONYMS

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

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INDICE

"It is very generous to undertake to care for the planet with little deeds every day, and it is wonderful that education can motivate these to the extent that they develop into a lifestyle.

Educating to be responsible for the environment can encourage behaviours that have a direct and significant impact on care for the environment".

From the encyclical of Pope Francis "Laudato sì"

PREFACE
ALBERTO MARCHI
CHAIRMAN

Paper and board recycling doesn't stop, but rather runs faster and faster. As far as packaging recycling rates are concerned, Italy reached and exceeded, as early as in 2020, the 85% threshold, which corresponds to the target set by the European Union for 2030. But Comieco's philosophy does not include resting on laurels. Continuing to improve is rather our main goal, which drove our operations during this past year.

Another improvement was recorded in separate paper and board collection in our Country in 2021: +3.2% vs. 2020, a year that, as we all know, suffered the impact of the toughest part of the Covid-19 emergency.

In 2021 the joint effort of the citizens, the Cities, and the operators allowed to surpass the 60 kg threshold of collected material per inhabitant at national level for the first time. Moreover, the amounts allocated by Comieco to the Italian Cities under the agreements increased by 67 million EUR (+44% vs. 2020).

In more general terms, the data of the 27th annual report of Comieco point out to a dynamic Italian paper pipeline capable to withstand the shocks of the past few years (restrictions on Chinese exports, pandemic waves, and the current crisis of raw materials and energy procurement triggered by the Russian-Ukrainian war).

"Paper production, in fact, increased by 12.5%, mostly driven by packaging production (+14.7%)".

Also interesting to note is the consumption of paper for recycling within the national boundaries, which recorded a 16% increase and surpassed the 6 million tons threshold for the first time. Recovered paper today accounts for 62% of the total fibres used by the Italian paper mills, a figure that earns our Country the second place in the European ranking (after Germany), and the first if the increase rate is considered. The net balance of paper for recycling exports is 948thousand tons, i.e. 68% less than in 2020.

What does it mean? It means that household recycling is improving and feeding a virtuous circular economy model also in logistic terms. These are amazing results, which we owe to the engagement of the whole Country: of those that collect and those that recycle, as well as of those that process secondary raw materials into new products and packaging. The year 2021 also came with important news in terms of the CONAI Environmental Contribution for paper and board, which fell from 55 EUR per ton in the first half of 2021 to 25 EUR per ton in the second half. Effective from January 2022, the contribution was then reduced to 10 EUR per ton, and further cut to 5 EUR per ton effective from July 1, 2022. This brings significant benefits to the companies

that use paper and board packaging and to the consumers. The reduction of the contribution was allowed by the increase of revenues for paper for recycling transfer, as well as by the management improvements that involved the consortium system.

The regular operation of the new IT system allowed Comieco to monitor flows more closely and thus ensure the recycling of paper and board collected separately.

Lastly, for the first time in 2021 the contract terms of the fifth cycle of the ANCI-CONAI Agreement, launched in mid-2020, were implemented throughout the 12 months. The Cities under the agreements received economic considerations worth more than 218 million EUR to take charge of 2.5 million tons of material (equal to approximately 70% of the overall municipal paper and board collection).

This means approximately 67 million EUR more than in 2020 (+44%) vs. an increase by approximately 84thousand tons (+3.4% vs. 2020) of the amounts managed by Comieco, adding up to the new unit considerations for packaging and to the updated approaches to use similar fractions, which brought significant benefits to collection.

The question is now: what can we expect for the future? The paper pipeline is to take this opportunity with measures in two areas. The first is the gap between the South and the Centre-North of the Country, which needs to be filled.

This process is already under way, but it needs to be supported and accelerated, as far as possible. Hitting the target requires implementing focused solutions to ensure support to the cities that show broad margins for growth, both in terms of volumes and of quality of the collected material, i.e. what drives the recycling process.

This relates to the second point, which concerns the ability to make the most of the flows. We need to address, on one hand, the demand for materials with higher and higher manufacturing standards and, on the other the existence of a growing amount of new composite pulp-based materials, which require dedicated processing approaches to ensure the recovery both of the cellulose fibre and of the other components.

Innovation, determination, and team work are the must-have ingredients to cope with the present and future challenges.

EXECUTIVE SUMMARY

CARLO MONTALBETTI

GENERAL MANAGER

The Italians and the value of separate waste collection

First the good news: data in this 27th annual report on paper and board collection, recycling, and recovery in Italy confirms once again the central role of separate collection as a daily practice, a simple deed that may have a positive impact on the entire community.

From Predoi in the far north to Lampedusa in the far south, an increase of separate paper and board collection was recorded in 2021. We owe this first and foremost to the Italians that – as found in a recent survey carried out by IPSOS – see the concerns for the environment and the related issues as a top priority and believe that individual behaviours are part of the solution thereto.

The year 2021 marked the return to normality, with impacts also on collection. On one hand we have seen students return to school in person and a gradual recovery of trade activities, from the tourist to the hospitality sector. On the other, the impact of two years of pandemic resulted into new life and consumption habits as observed, for example, in the constant growth of e-commerce and food delivery.

Recycling of paper and board packaging: consolidating the achieved and surpassed EU target

Having achieved and surpassed the paper and board packaging recycling target set by the European Union (85% by 2030) 10 years ahead of time is a great achievement. Having managed to consolidate such target despite the recent challenges (market fluctuations, the pandemic, the energy and raw material crisis) is an additional reason to be proud.

This would not have been possible without the joint effort of the citizens, the public administrations, the collection service operators, the recycling plants, and Comieco. There is strength in numbers, really. Each piece of this mosaic is important and helps strengthen the made-in-Italy circular paper and board economy, which becomes a reference model for Europe and the world at large.

Paper and board collection is also growing in the more virtuous regions

The first thing that stands out in a review of the figures in this 27th annual report is that nothing decreased. After four years, an additional input to volumes is again recorded in the three macro-areas of the North, Centre, and South. And for the first time more than 60 kg (more precisely, 60.8 kg) of materials were collected by each citizen in one year. Municipal paper and board packaging collection in Italy totals more than 3.6 million tons, with a 111thousand ton growth.

Emilia-Romagna and Tuscany stand out in the North and the Centre, with increases by, respectively, 36 and 37thousand tons of collected materials vs. 2020, when both regions recorded a decrease by over 14thousand tons.

The South continues with its effort to try and fill the gap with the other two macro-areas, with 39thousand tons more vs. 2020 (i.e. 35% of the new national volumes). While the highest percent increase is recorded in Molise (+17.4%), Sicily is the region where the increase of collected volumes makes a difference: 14thousand tons more were collected compared to the previous year, corresponding to over one-third of the growth in the South and to 13% at national level. Sicily is thus confirmed as the region where the most significant developments are expected over the next few years. The toughest challenge is to take valuable materials away from landfills and introduce them into the industrial processes for transformation into new products and packaging. This explains why we have decided to disclose this 27th annual report of Comieco in Messina. The southern regions, and the big cities and metropolitan areas in particular, definitely show the greatest potential. Messina clearly demonstrates that focused measures for separate collection services and the involvement of the users may result into a change of attitudes. After all, improving collection means contributing to environmental protection.

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

In 2022 we celebrate 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).

This anniversary offers the opportunity to take stock of the development of separate paper and board collection in Italy and to disclose some practical data recorded from 1998 to 2021 via the agreements implementing the national Framework Agreement with ANCI:

- municipal paper and board collection grew from 1 to 3.6 million tons. i.e. from 17 to more than 60 kg per inhabitant per year;
- the Cities under the agreements were allocated a total of over 2.1 billion EUR;
- the paper and board recycling rate increased from 37% to 85.1%.

With the implementation of the 5th cycle of the Framework Agreement, we are supporting the Cities in improving and consolidating their performance and offering them the opportunity to join or leave the agreement every six months, while ensuring the collection and recycling of paper and board against a consideration adjusted to the present time and to the market.

Recycling is profitable, both because it is good for the environment and because of its many economic benefits.
Through the 983 agreements in force, Comieco allocated 218 million EUR to the Cities in 2021 (67 million EUR more than in 2020) to take charge of and recycle over 2.5 million tons, equal to approximately 70% of municipal separate collection in Italy.

This is the highest figure in the historical set of the amounts managed by the Consortium, but something has changed since mid-2021 and the trend starts to show some signs of reversal.
One of the main reasons is the trend of the recovered paper market: the revamped demand of paper for recycling has resulted into a sharp increase of prices in the early months of 2021.
With the option to adjust the volumes entrusted to Comieco, several Cities – particularly in the North and for the non-packaging share collected at household level – have reverted to operating outside the agreement system.
Based on the overall cost-revenue balance, significant support was provided by the CONAI Environmental Contribution for paper and board,

which was reduced by 90% over one and a half years (from 55 EUR per ton in the first half of 2021 to 5 EUR per ton since July 1), with an estimated saving of approximately 218 million EUR. This is definitely an advantage for companies that use paper and board packaging, as well as for consumers.

The paper and board sector at the focus of the NRRP

The paper pipeline was mentioned in the National Recovery and Resilience Plan (NRRP) as an added-value driver for the circular economy. The allocated resources amount to 150 million EUR, including 90 million EUR for the Centre and the South. This is why in 2021 Comieco worked with the pipeline Associations at an institutional and technical level to support member companies in various respects including, for example, by providing help to interpret decrees and calls for tenders, as well as to map collection processing requirements, with guidelines on the need to revamp, expand, and transfer, and to identify and follow up on certain projects that are of great interest for the pipeline, including:

- flow tracking systems, from collection to labelling of the paper bales for recycling;
- eco-compactors for collection of composite packaging for liquids (i.e. milk and juice packs);
- sorters to sort composite packaging for liquids out from the multi-material and paper collection flow;
- plants for the treatment of pulper scraps and the plasmix derived from recycling processes.

What can be improved?

A positive result is a good starting point and a stimulus to continue to improve. This can be done by increasing and improving collection. Urban waste production data points out to two goals for pursuing. The first is to fill the gap between, on one hand, the South and certain big cities, such as Rome or Naples, and, on the other, the rest of the Country – something that can be done in the short term. The second is to promote a general growth aimed at surpassing 4 million tons and – in the longer term – 4.5 million tons. This growth should allow to capture the share of paper and board that is still contained in non-processed waste, and which represents something we could define as the “potential” for development across the Country. “More is better” is as true as “more and better”: effective recycling also calls for an improvement of the quality of

the collected materials. There is a lot that citizens and other users can do in this respect, including more careful sorting of materials. Remember that recycled fibres account for 62% of the raw materials used for domestic paper production.
When separate collection is duly performed, a virtuous cycle is triggered, because waste is what supplies the engine of the Italian circular economy. Recycling is like cooking: an excellent recipe requires high-quality ingredients.

Where services are well organized and punctual, the quality of separate collection is usually high. This is the case of 1.04 + 1.05 flows – cardboard from trade activities, that usually complies with the first quality bracket standards. Household collection is a different story. While tests on the flows of "IN" agreements yield good results, particularly in the North, most of the volumes managed by Comieco actually come from post-processing.
One of the reasons is pre-cleaning to ensure a higher economic return, but this should not draw our attention away from quality at the source.
The more and more frequent "exploration" tests performed by Comieco arouse some concerns in several regions, particularly in the South and in certain big cities, such as Rome or Naples.
Capturing all the paper and board that currently end up in landfills is strategically important, not just for the value of these materials – which help cope with the shortage of raw materials and energy made more severe by the current geopolitical tensions – but also for the renewed recycling capacity in the Country. This is shown by the conversion of three paper mills, capable alone to process approximately 1.2 million tons of paper for recycling per year into new secondary raw materials. A more efficient circular economy model can only benefit the community, because it generates new jobs and respects the environment.

+111 thousand t

VS. 2020

3.6 million di t

OF MUNICIPAL PAPER AND BOARD COLLECTION VOLUMES

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

2021: PAPER AND BOARD COLLECTION REFLECTS THE RECOVERY PATTERN IN ITALY

For the first time ever, the national average per-capita collection amounts to more than 60 kg, more precisely 60.8 kg. Overall municipal collection volumes at national level total more than 3.6 million tons. The 3.2% increase, i.e. 111thousand tons, is equal to the annual collection of three regions: Friuli-Venezia Giulia, Molise, and Basilicata.

"The trend is substantially positive across the Country, and for the first time the additional volumes are homogeneously distributed across the three macro-areas".

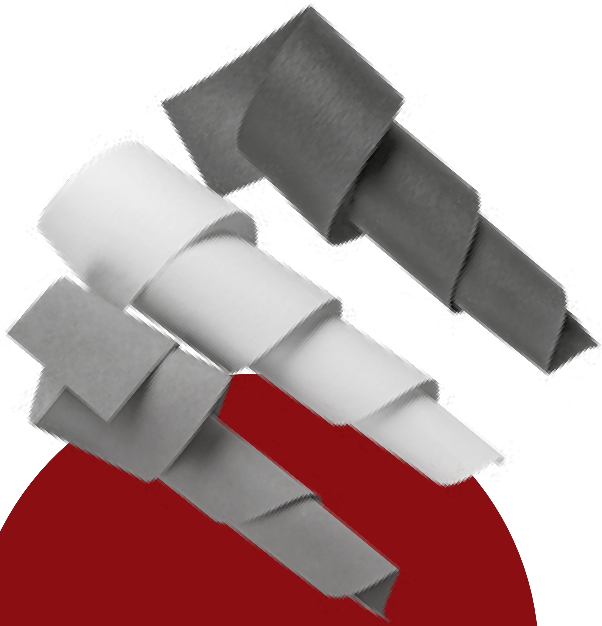
With an additional 36thousand tons in 2021, the North regains what it lost in 2020, particularly with the 21thousand ton increase of Emilia Romagna (+5.6% vs. 2020), thus reaching a per-capita collection of 88.4% kg/ab-year. If absolute volumes are considered, Lombardy accounts, alone, for approximately 16% of all of the Country's municipal paper and board collection, with 573thousand tons.

As we move down along the peninsula, we find that the positive balance in the Centre is close to 37thousand tons (+4.5%), also in this case offsetting, and even exceeding, the decline recorded last year.

All the regions have improved, and Tuscany accounts for almost 50% of the growth in the area, probably due to the recovery of the tourist-related business

> ***“Growth is slower in Latium, which is improving, however to a lesser extent than may be expected from developments in Rome”.***

The increase of separate paper and board collection is confirmed for the South also in 2021: with an additional 38thousand tons and a 4.3% increase (vs. +4% last year), the region is gradually filling the gap with the other macro-areas. All the regions record positive values – only Abruzzo is stable – but a more lively course can reasonably be expected compared to last year.



88.4 kg/ab

EMILIA-ROMAGNA, THE REGION WITH THE HIGHEST PER-CAPITA VOLUME

While the first in ranking in terms of percent increase is Molise (+17.4%), Sicily offers the greatest input in terms of absolute values: an additional 14thousand tons of paper and board were captured vs. 2020, and there is still a broad margin for improvement over the next few years.

The per-capita figure for the South (46.9 kg/ab-year) is still below the national average.

"With 60.6 kg/ab-year, Sardinia is confirmed as the first in ranking among the southern regions, and in line with the average national value".

+17.4%

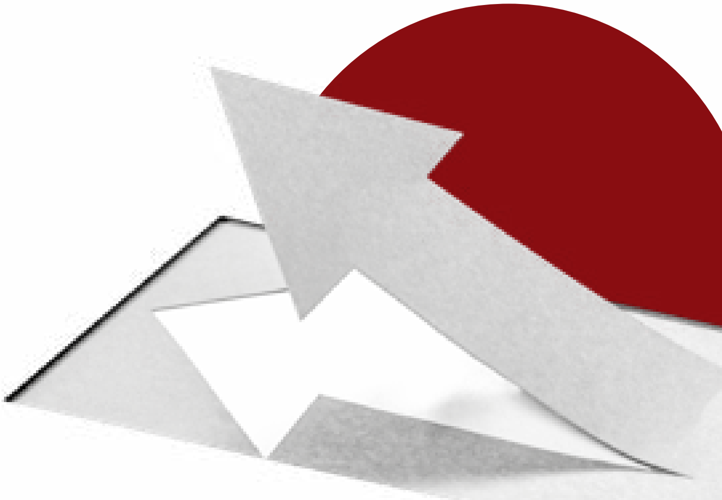
MOLISE, THE REGION WITH THE HIGHEST PERCENT INCREASE

+4.3%

GROWTH CONTINUES IN THE SOUTH

Based on the ISPRA data for 2020, projections on the regional trend for 2021 can be made.

Over half of the Italian regions (close to 60% of the population) have by now reached or are about to reach the 65% threshold of separate collection (the EU 2030 target).
The average capture of the paper and board fraction amounts to 12% in three-quarters of the Country and growing.



TAB. 1 MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION BY REGIONS. YEARS 2019-2021 AND 2020-2021 VARIATIONS.

SOURCE: COMIECO

"The top two regions in this specific ranking – with figures above 15% - are Trentino-Alto Adige and Basilicata, whose values can be taken as a reference target for development in the South".

The three macro areas contribute homogeneously to the new volume for the first time. The south confirms its upgrowth trend trend in 2021 with a 4.3% increase vs 2020.

Based on Comieco's estimates for 2021 we can expect that overall waste production will increase vs. 2020, but that total separate collections will improve even further in volumes, and the share of mixed waste will shrink.

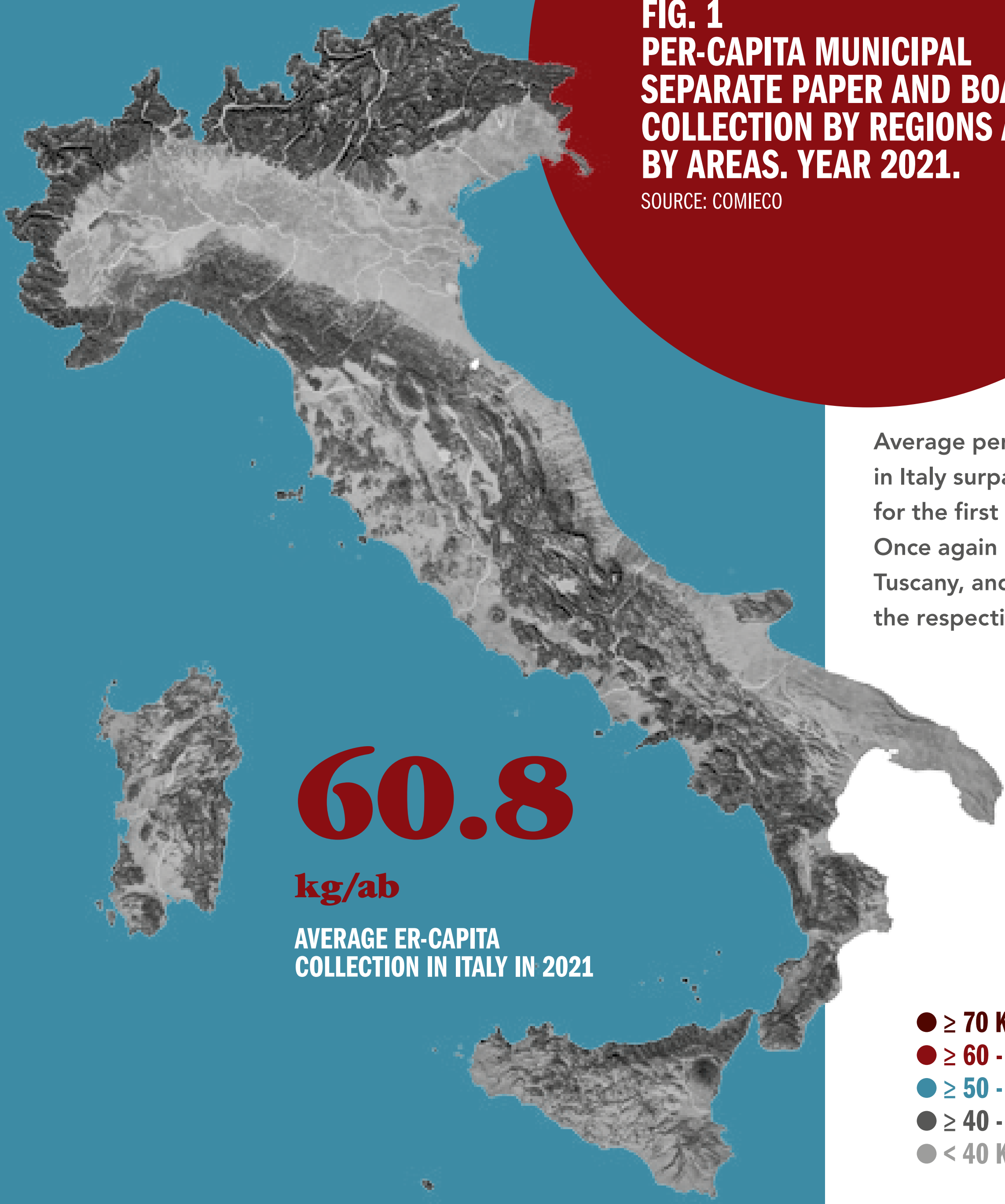
The "paper/urban waste" index is a valuable tool to outline future scenarios and define specific growth targets for the different regions. On one hand, in the South and in the cities there is room for alignment with the levels that the Centre and the North have already reached.
There is also a margin for growth across the national territory worth at least 800thousand tons, which represents a good "hunting field" for the next few years.

Region	2019	2020	2021	Δ 2020/2021	
	t	t	t	t	%
Piedmont	289,758	287,309	287,705	396	0.1
Vallée d'Aoste	9,813	9,209	9,293	84	0.9
Lombardy	572,454	566,785	572,700	5,915	1.0
Trentino-Alto Adige	83,045	78,688	80,590	1,902	2.4
Veneto	300,516	289,234	292,647	3,413	1.2
Friuli-Venezia Giulia	71,031	70,085	70,656	571	0.8
Liguria	91,934	94,454	97,057	2,603	2.8
Emilia-Romagna	386,425	372,104	393,063	20,959	5.6
North	**1,804,975**	**1,767,869**	**1,803,711**	**35,842**	**2.0**
Tuscany	310,326	296,151	313,712	17,561	5.9
Umbria	59,086	56,740	58,097	1,356	2.4
Marche	104,000	100,496	108,970	8,474	8.4
Latium	368,305	368,488	377,673	9,186	2.5
Centre	**841,717**	**821,875**	**858,452**	**36,577**	**4.5**
Abruzzo	73,299	72,763	72,734	-29	0.0
Molise	8,117	9,456	11,101	1,645	17.4
Campania	208,135	218,838	222,426	3,588	1.6
Puglia	198,752	200,150	206,063	5,913	3.0
Basilicata	26,155	26,651	28,738	2,087	7.8
Calabria	86,820	92,254	97,495	5,241	5.7
Sicily	172,455	190,908	205,351	14,443	7.6
Sardinia	96,831	91,209	96,830	5,622	6.2
South	**870,563**	**902,230**	**940,739**	**38,509**	**4.3**
Italy	**3,517,255**	**3,491,973**	**3,602,902**	**110,929**	**3.2**

Note: adjusted based on 2020 data for Piedmont, Vallée d'Aoste, Lombardy, Trentino-Alto Adige, Latium, Abruzzo, Molise, Puglia, Basilicata, Calabria, Sicily, Sardinia, and the relevant Macro-Areas

FIG. 1
PER-CAPITA MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION BY REGIONS AND BY AREAS. YEAR 2021.
SOURCE: COMIECO

Average per-capita collection in Italy surpasses 60 kg/ab for the first time in 2021. Once again Emilia-Romagna, Tuscany, and Sardinia drive the respective areas.



60.8
kg/ab

AVERAGE ER-CAPITA COLLECTION IN ITALY IN 2021

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

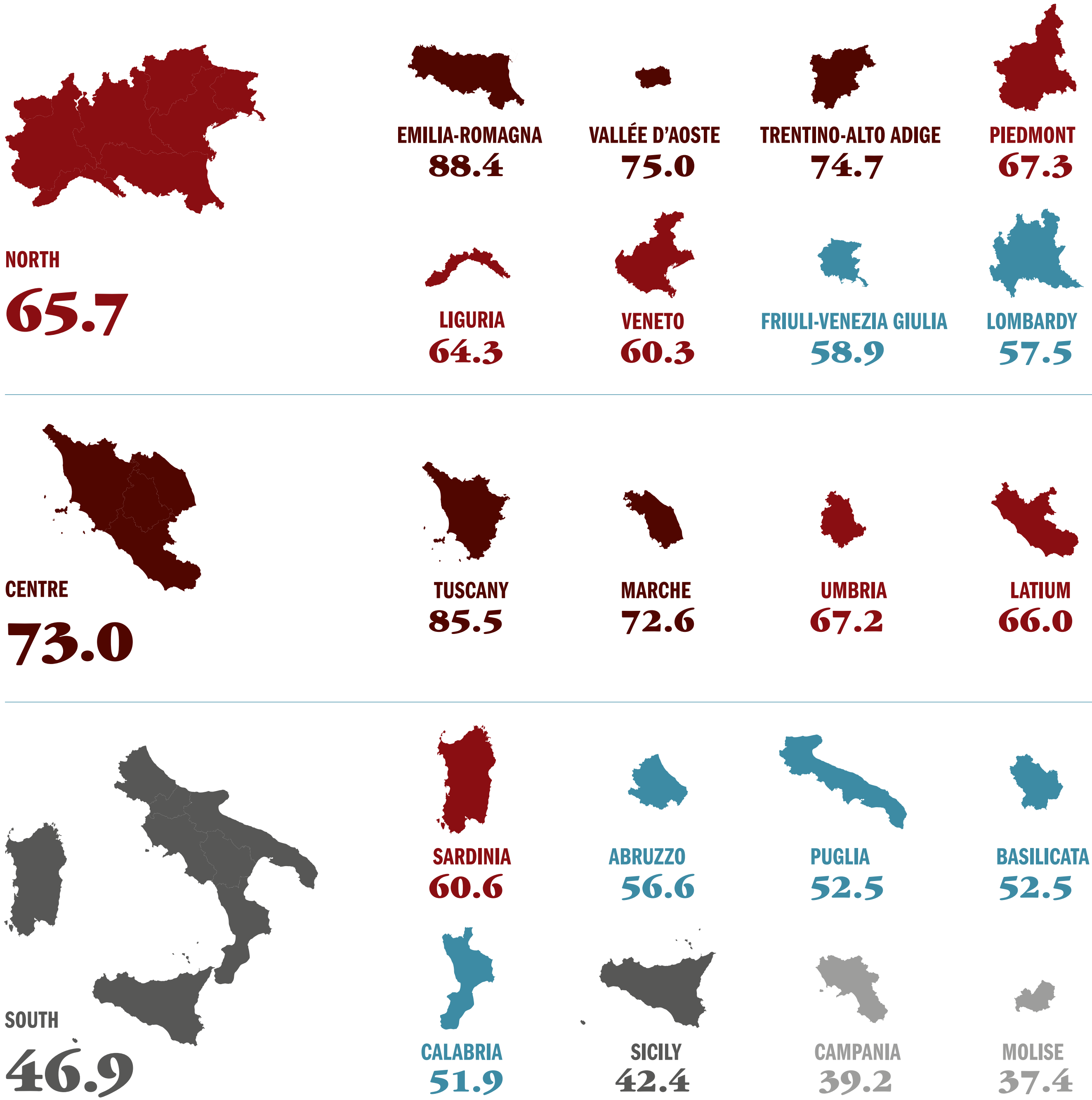
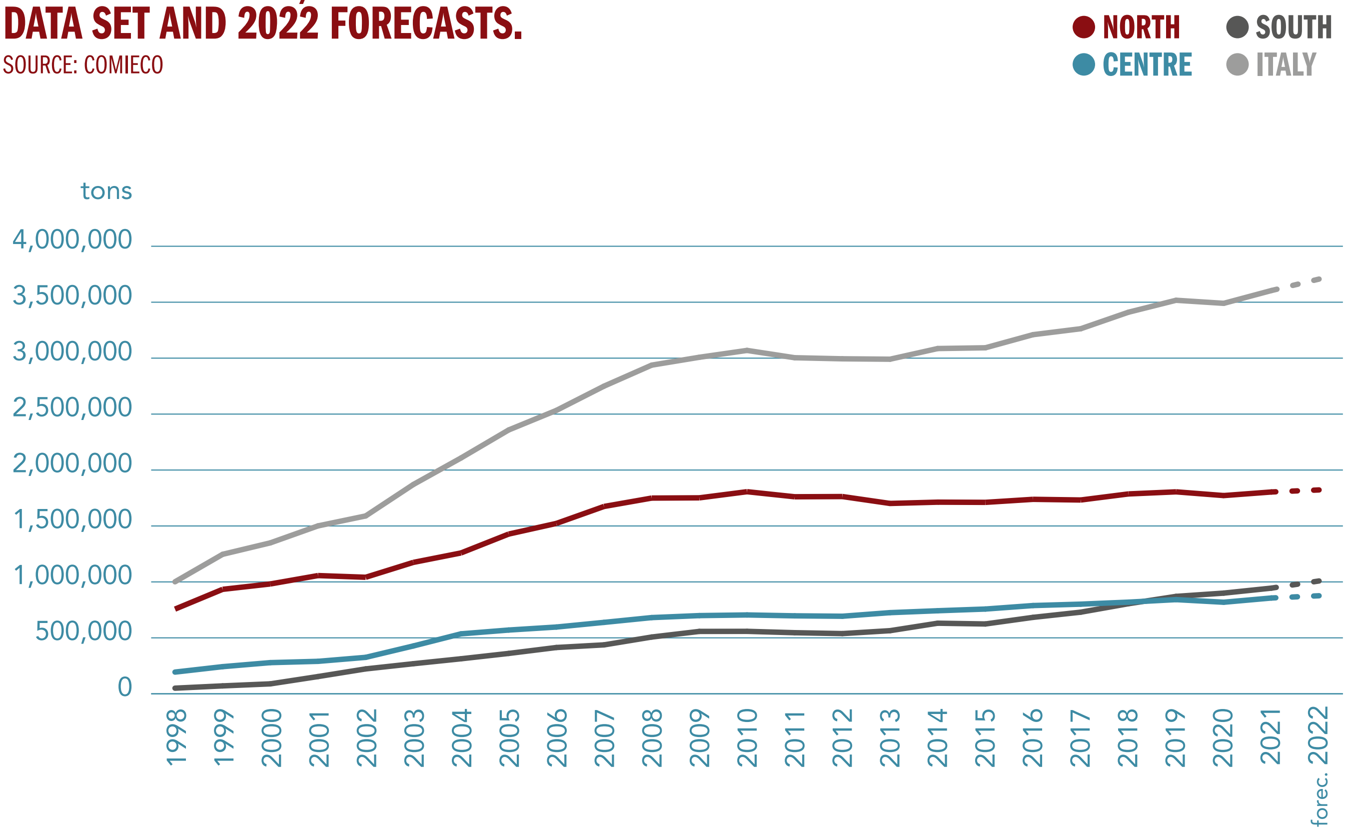

NORTH
65.7
EMILIA-ROMAGNA
88.4
VALLÉE D'AOSTE
75.0
TRENTINO-ALTO ADIGE
74.7
PIEDMONT
67.3
LIGURIA
64.3
VENETO
60.3
FRIULI-VENEZIA GIULIA
58.9
LOMBARDY
57.5
CENTRE
73.0
TUSCANY
85.5
MARCHE
72.6
UMBRIA
67.2
LATIUM
66.0
SOUTH
46.9
SARDINIA
60.6
ABRUZZO
56.6
PUGLIA
52.5
BASILICATA
52.5
CALABRIA
51.9
SICILY
42.4
CAMPANIA
39.2
MOLISE
37.4

FIG. 2
MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION. 1998/2021 HISTORICAL DATA SET AND 2022 FORECASTS.

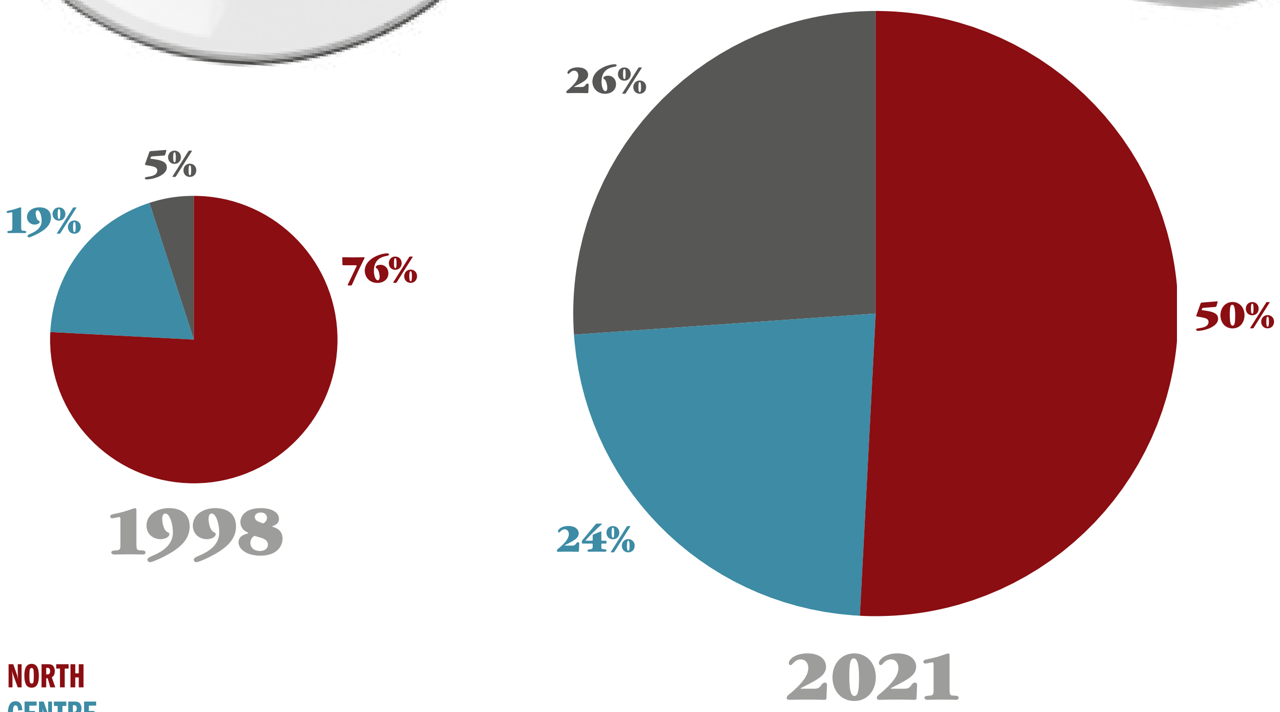
SOURCE: COMIECO



	1998	2021	2022 forecast	Δ 2021-2022 forecast
	t	t	t	t
North	756,813	1,803,711	1,822,057	18,347
Centre	193,958	858,452	876,212	17,759
South	50,222	940,739	1,008,461	67,722
Italy	**1,000,993**	**3,602,902**	**3,706,730**	**103,828**

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

SOURCE: COMIECO



- NORTH
- CENTRE
- SOUTH

Note: the ratio of the pie charts' dimensions is proportional to the absolute value of collection.

TAB. 2
THE RATIO OF SEPARATE PAPER AND BOARD COLLECTION TO TOTAL URBAN WASTE. 2021 ESTIMATES.

SOURCE: COMIECO 2021 ESTIMATES ON 2020 ISPRA DATA

The ratio of paper to urban waste collection and the amount of the waste residues – 2021 data estimates – alongside the per-capita value, allow better understanding of the actual development of the separate collection service.
In this table, the Regions and the macro-areas are shown in decreasing order with respect to their ratio of separate paper collection to total urban waste.

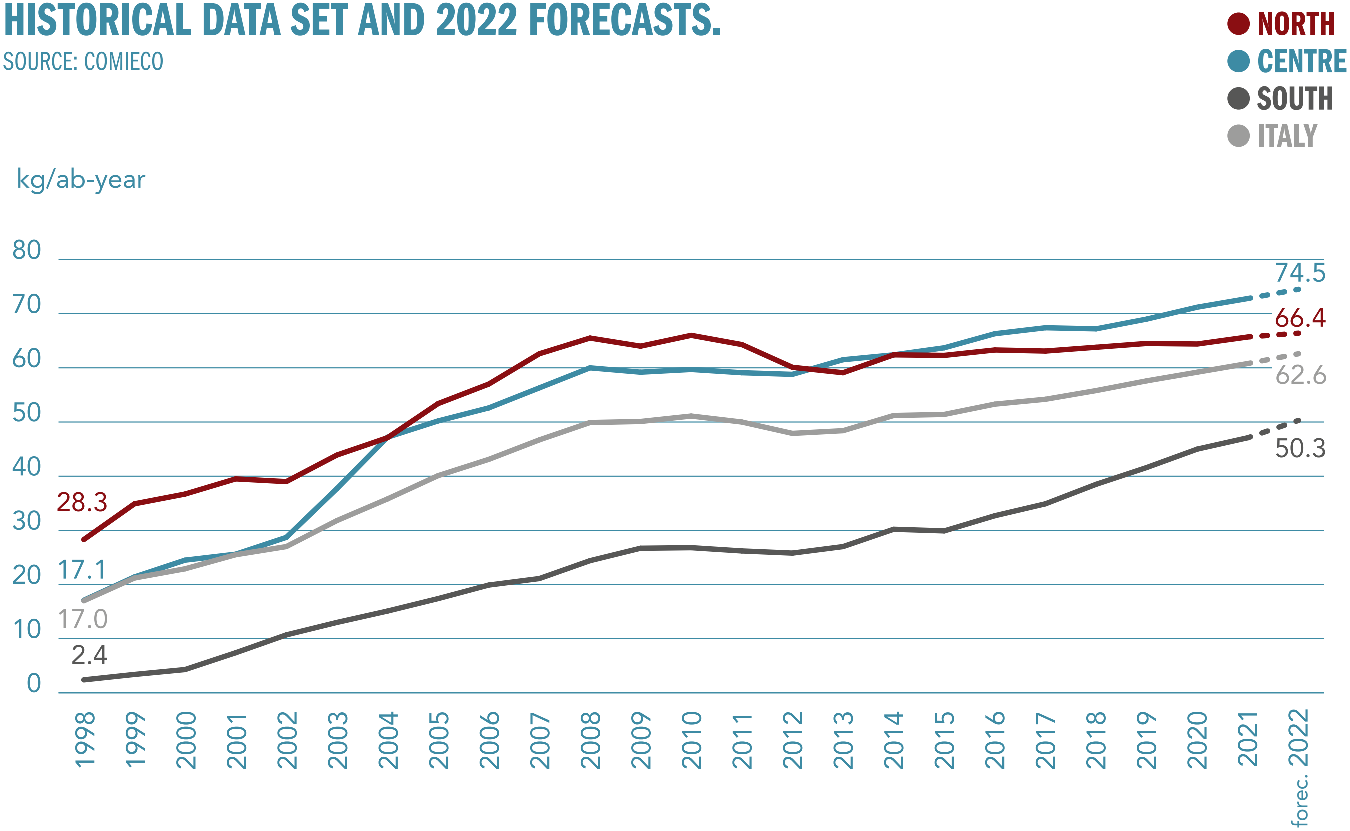
Region	Inhabitants	Total UW	Mixed UW	Total SC		SC of paper	SC of paper to tot UW
	n	kg/ab	kg/ab	kg/ab	%	kg/ab	%
North	27,449,117	509.7	143.6	366.1	71.8	65.7	12.9
Centre	11,755,548	526.5	203.9	322.5	61.3	73.0	13.9
South	20,052,901	446.6	195.4	251.2	56.2	46.9	10.5
Italy	**59,257,566**	**491.7**	**173.1**	**318.6**	**64.8**	**60.8**	**12.4**

- <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 tot UW
	n	kg/ab	kg/ab	kg/ab	%	kg/ab	%
Trentino-Alto Adige	1,078,460	494.8	132.0	362.9	73.3	74.7	15.1
Basilicata	547,579	347.9	152.6	195.2	56.1	52.5	15.1
Tuscany	3,668,333	580.2	215.2	365.1	62.9	85.5	14.7
Marche	1,501,406	517.4	145.0	372.4	72.0	72.6	14.0
Emilia-Romagna	4,445,549	649.1	162.4	486.7	75.0	88.4	13.6
Calabria	1,877,728	385.7	173.5	212.1	55.0	51.9	13.5
Piedmont	4,273,210	500.2	171.1	329.0	65.8	67.3	13.5
Vallée d’Aoste	123,895	557.4	193.0	364.4	65.4	75.0	13.5
Latium	5,720,796	496.1	217.3	278.8	56.2	66.0	13.3
Sardinia	1,598,225	455.5	113.4	342.0	75.1	60.6	13.3
Umbria	865,013	514.8	170.2	344.6	66.9	67.2	13.0
Veneto	4,852,453	468.0	116.2	351.9	75.2	60.3	12.9
Liguria	1,509,805	520.8	225.9	294.9	56.6	64.3	12.3
Abruzzo	1,285,256	461.4	163.5	297.9	64.6	56.6	12.3
Friuli-Venezia Giula	1,198,753	484.0	147.9	336.0	69.4	58.9	12.2
Lombardy	9,966,992	474.3	124.5	349.9	73.8	57.5	12.1
Puglia	3,926,931	473.5	202.9	270.6	57.1	52.5	11.1
Molise	296,547	361.5	141.5	220.0	60.9	37.4	10.4
Sicily	4,840,876	442.1	225.8	216.3	48.9	42.4	9.6
Campania	5,679,759	460.1	208.8	251.3	54.6	39.2	8.5

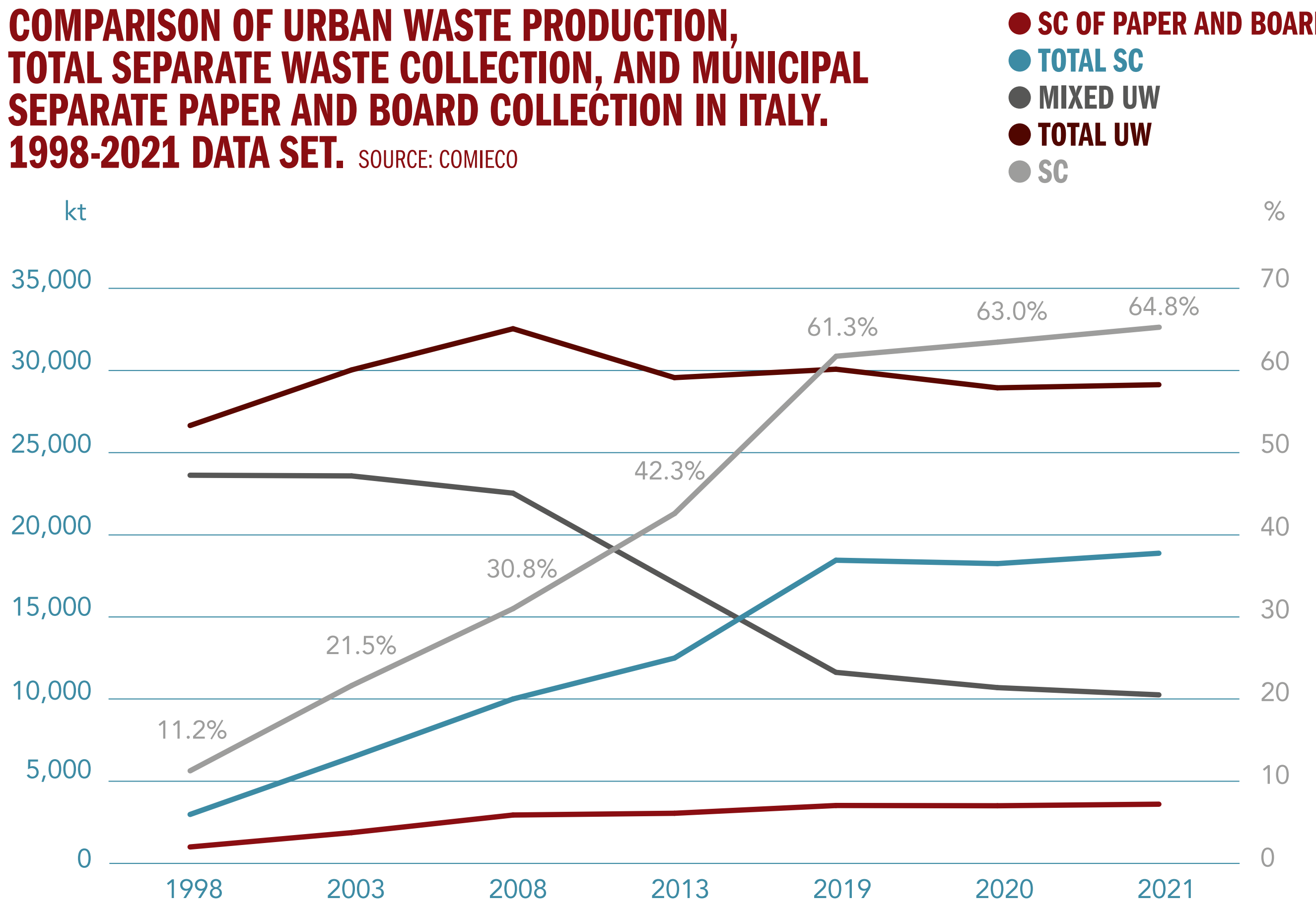
FIG. 3
PER-CAPITA MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION. 1998-2021 HISTORICAL DATA SET AND 2022 FORECASTS.

SOURCE: COMIECO



	1998	2020	2021	Δ 2020/2021	Δ 1998/2021		2022 forecast
	kg/ab-year	kg/ab-year	kg/ab-year	kg/ab-year	kg/ab-year	%	kg/ab-year
North	28.3	64.4	65.7	1.3	37.4	132.2	66.4
Centre	17.1	69.9	73.0	3.1	55.9	327.0	74.5
South	2.4	45.0	46.9	1.9	44.5	1,854.7	50.3
Italy	**17.0**	**58.9**	**60.8**	**1.9**	**43.8**	**257.7**	**62.6**

FIG. 4
COMPARISON OF URBAN WASTE PRODUCTION, TOTAL SEPARATE WASTE COLLECTION, AND MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION IN ITALY. 1998-2021 DATA SET. SOURCE: COMIECO



Reliance is made on the South and the metropolitan areas to hit the target of 800 thousand tons of paper and board that are still potentially to be captured with municipal collection, but all the regions still have untapped potentials to a varying extent.

BIG CITIES: EXPANDING URBAN FORESTS

Metropolitan areas, and regional or provincial capitals in particular, are focus points that deserve some ad-hoc consideration.
As in the past few editions of the Annual Report, this monitoring considers six Italian cities (from the North to the South: Turin, Milan, Florence, Rome, Naples, and Palermo) that account, together, for almost 12% of the inhabitants and approximately 14% of the urban waste generated in Italy.

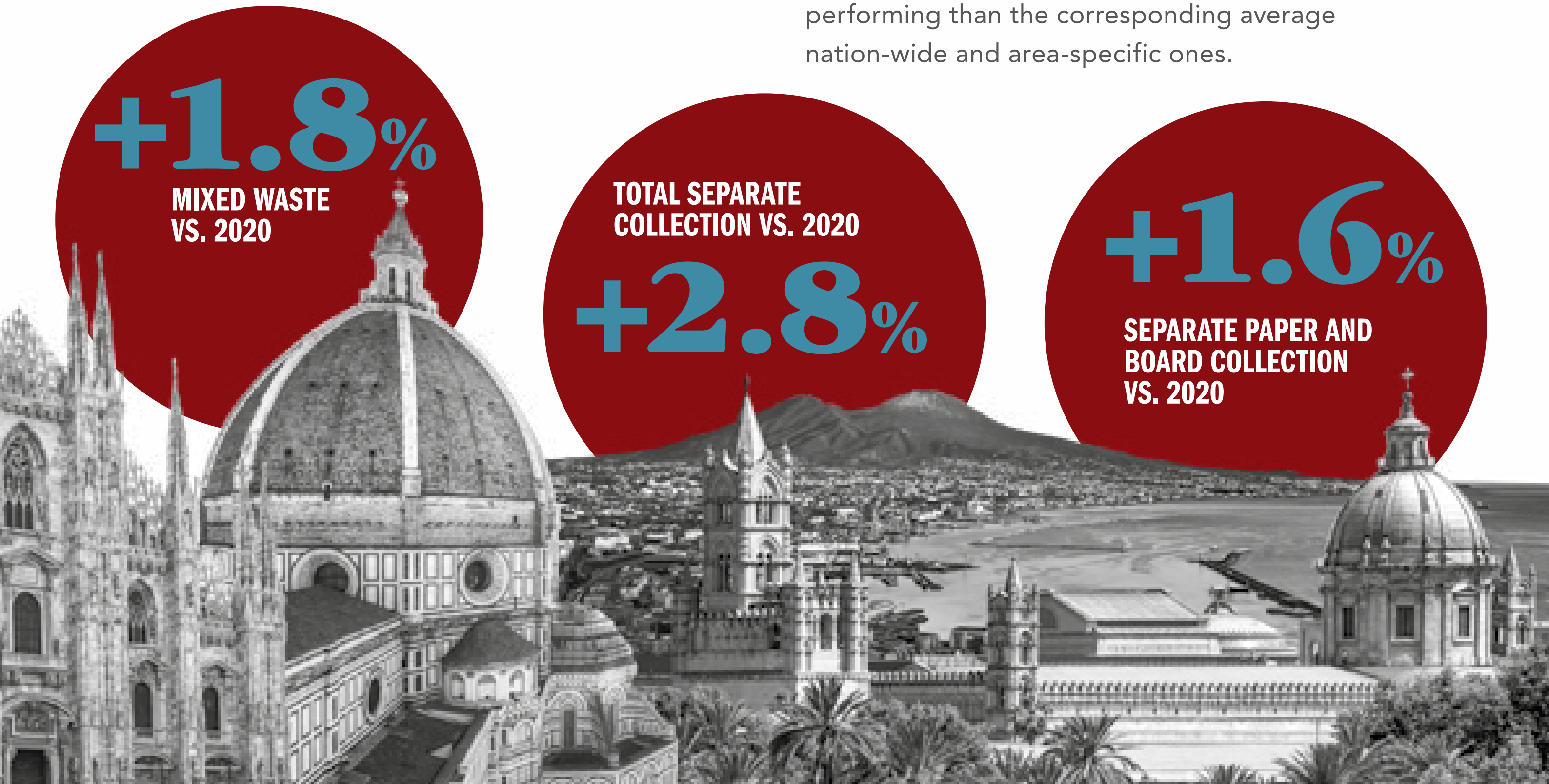
These cities are characterized by a physiological complexity due to the population density, to the types and diversity of users, and to the urban texture. All these factors contribute to a more complicated organization and management of urban sanitation services. If these six cities are considered as a single urban entity, several interesting observations can be made.

"This urban conglomerate of 6.8 million inhabitants generated approximately 3.7 million tons of urban waste in 2021, including 1.7 million (46%) collected separately".

The generated waste has resumed its growth everywhere, with the sole exception of Palermo. After a year 2020 with lockdown measures and, particularly, the stop to tourist-related activities, which yielded the minimum historical data, 2021 sees a trend reversal and a return to indicators that are consistent with the historical data.

Overall waste generation is growing (+2.3%), but mixed waste to a lesser extent (+1.8%) than overall separate collections (+2.8%).

Total per-capital waste generation is 17% 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.



On the other hand, Palermo is seriously lagging behind, which makes it one of the main targets for the expected development. It is, in fact, a synthesis of the “south” and of “urban areas”, the key words for growth over the next few years.

> *“As to paper and board collection in the six cities, volumes surpassed 475thousand tons in 2021, i.e. approximately 13% of the national figure”.*

The average per-capita volume is 62 kg/ab, 3% above the national figure, but big cities – first and foremost Rome – hide a collection potential estimated at least at 20% vs. the present value. However, the average is calculated on non-homogeneous situations, as if the “macro-city” were divided into six boroughs with widely different service and performance standards. Milan (+2.9%) and Turin (+6.6%) see an improvement of their 2020 good levels with an increase of separate collections, including of paper and board.

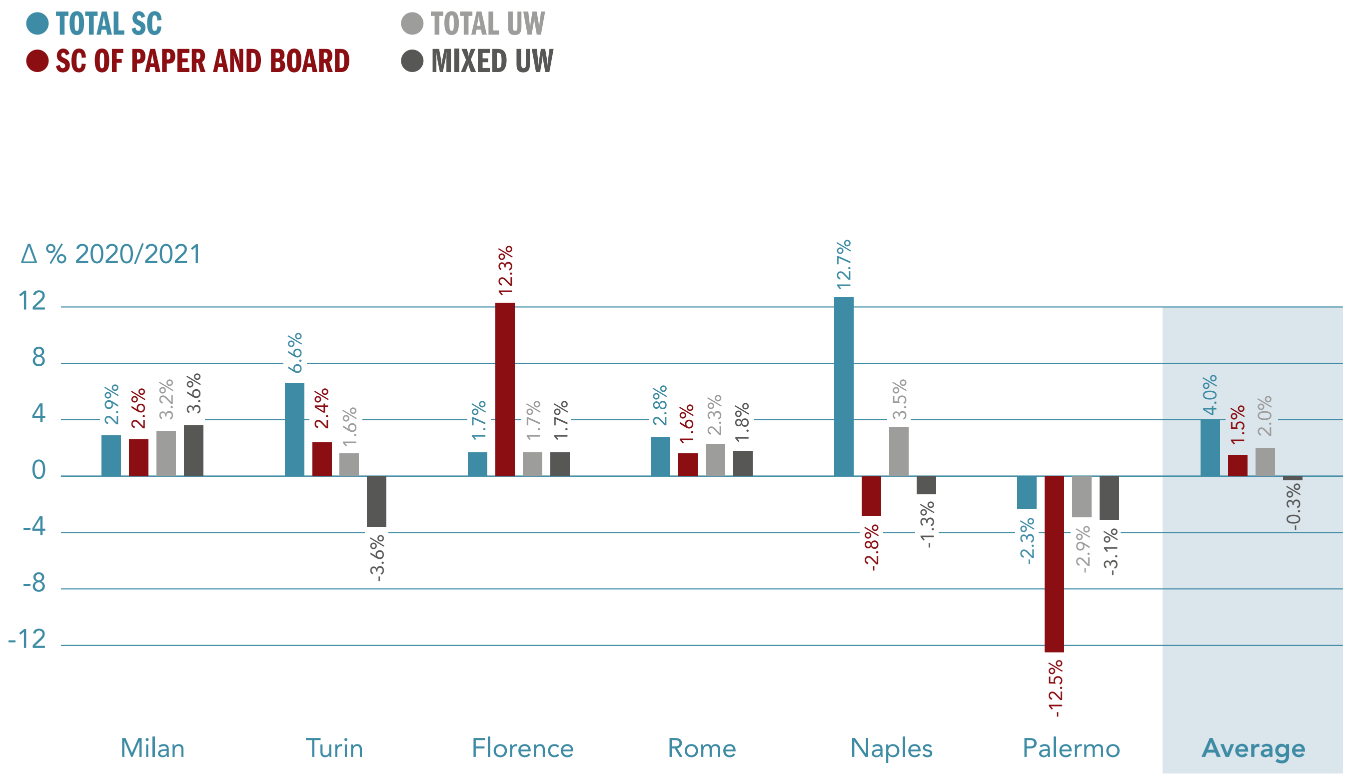
FIG. 5 WASTE COLLECTION IN THE SAMPLE CITIES TURIN, MILAN, FLORENCE, ROME, NAPLES, AND PALERMO. YEAR 2021 AND 2020-2021 VARIATIONS.

SOURCE: COMIECO

National dynamics are amplified in big cities. Waste generation increases (+2.3%, a significant figure if compared against -8.2% last year). Separate collections are improving everywhere (+2.8%), except in Palermo (-2.3%).

Florence is also improving, particularly in paper and board collection (+12.3); however this figure should be seen as a return to “normality”, considering the recovery of tourist flows and the transformation of the collection system, which the operator and the Municipal administration are implementing with a positive feedback from users.

Napoli shows an unexpected 12.7% increase of separate collections, despite a decline of paper and board collection (-2.8%). Palermo declines even further (-2.3%), with paper and board collection recording a 12.5% decrease.

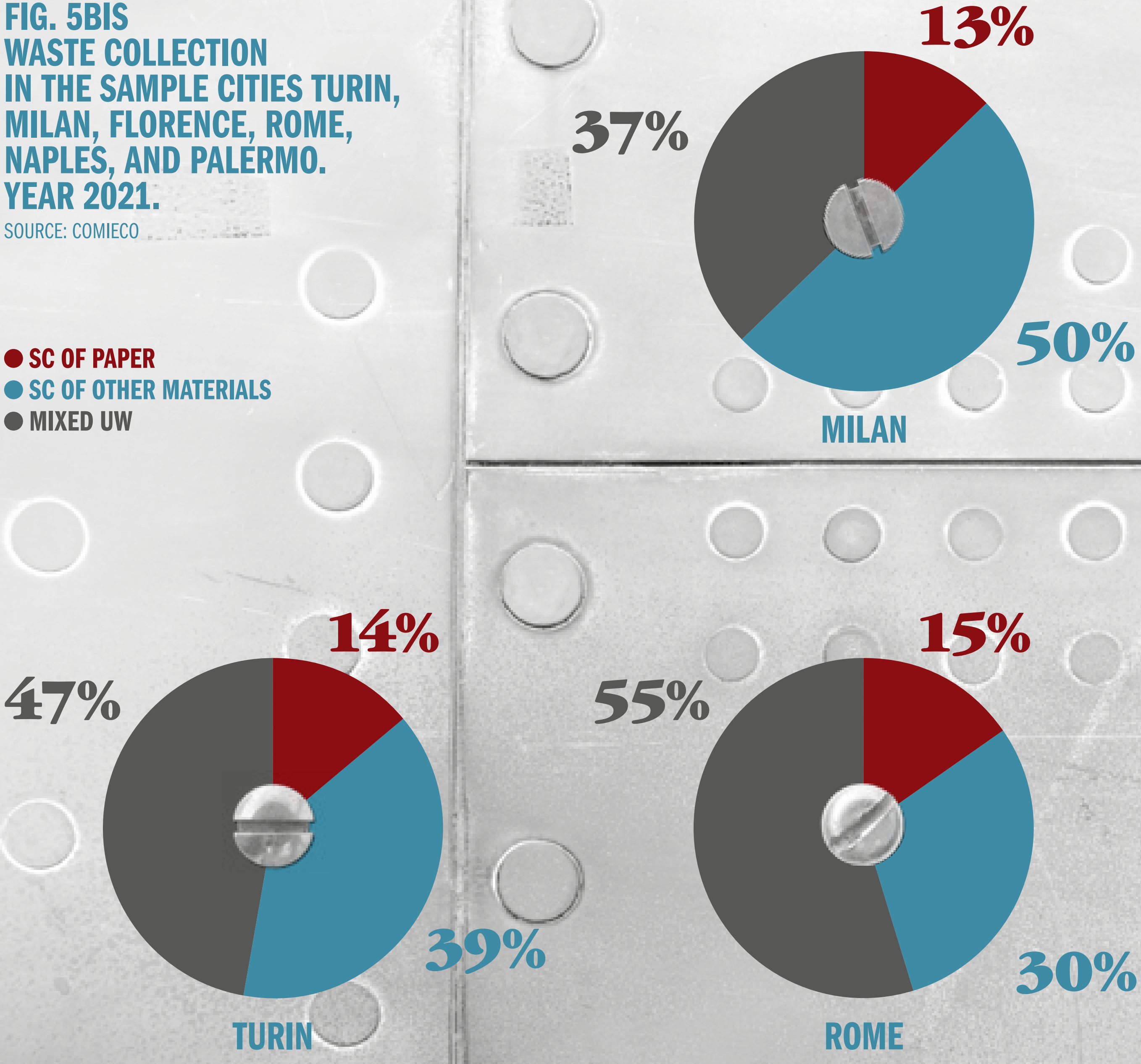


2021		Milan	Turin	Florence	Rome	Naples	Palermo	Total
Total SC	t	390,077	219,826	118,227	732,175	188,481	65,197	**1,713,983**
SC of paper and board	t	80,003	60,247	29,744	246,125	43,330	16,065	**475,514**
Total UW	t	625,004	412,117	220,940	1,606,811	501,912	347,507	**3,714,291**
Mixed UW	t	234,927	192,291	102,713	874,636	313,431	282,310	**2,000,308**
SC/mixed UW	**%**	**62.41**	**53.34**	**53.51**	**45.57**	**37.55**	**18.76**	**46.15**

FIG. 5BIS
WASTE COLLECTION IN THE SAMPLE CITIES TURIN, MILAN, FLORENCE, ROME, NAPLES, AND PALERMO. YEAR 2021.

SOURCE: COMIECO

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



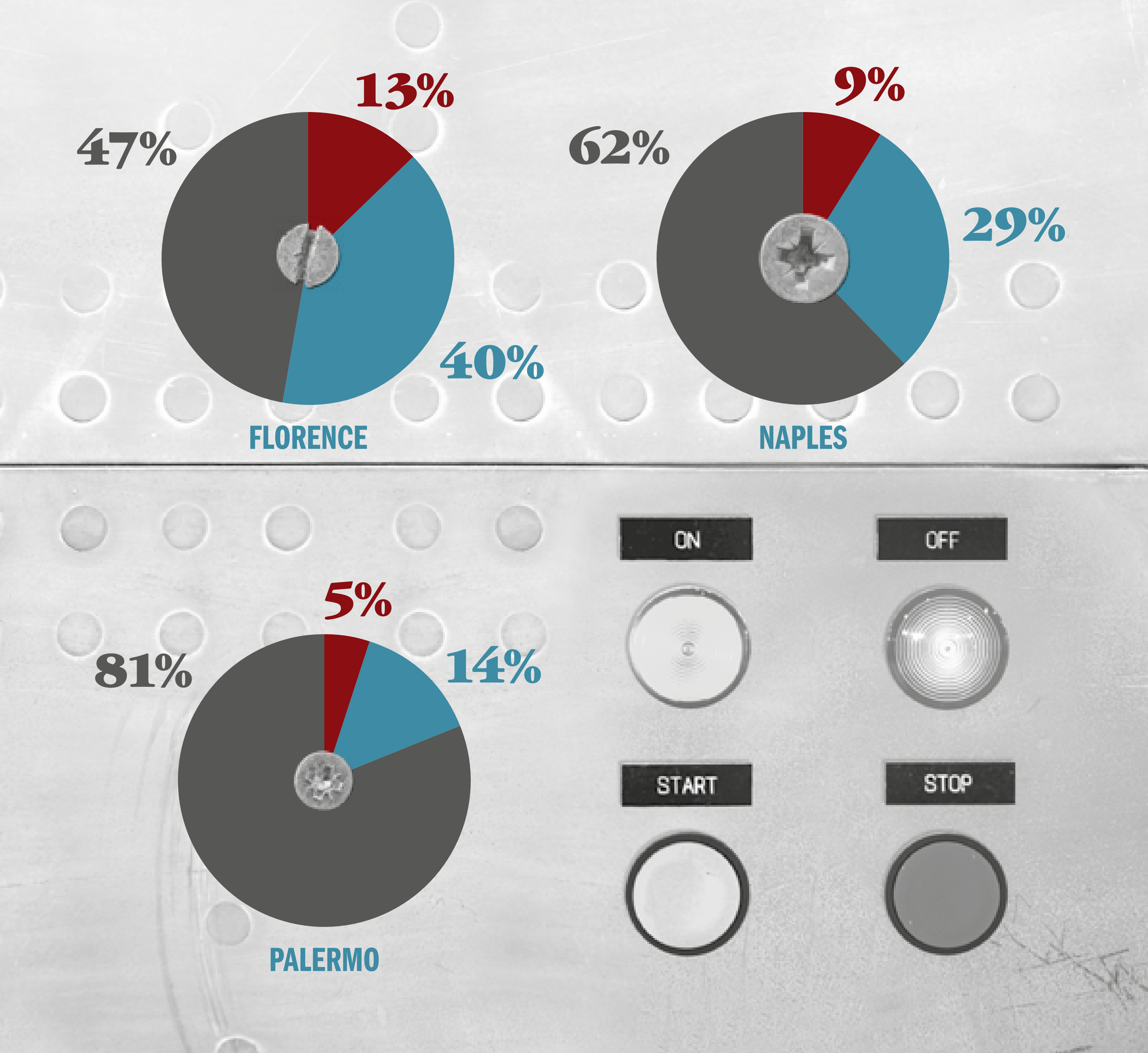
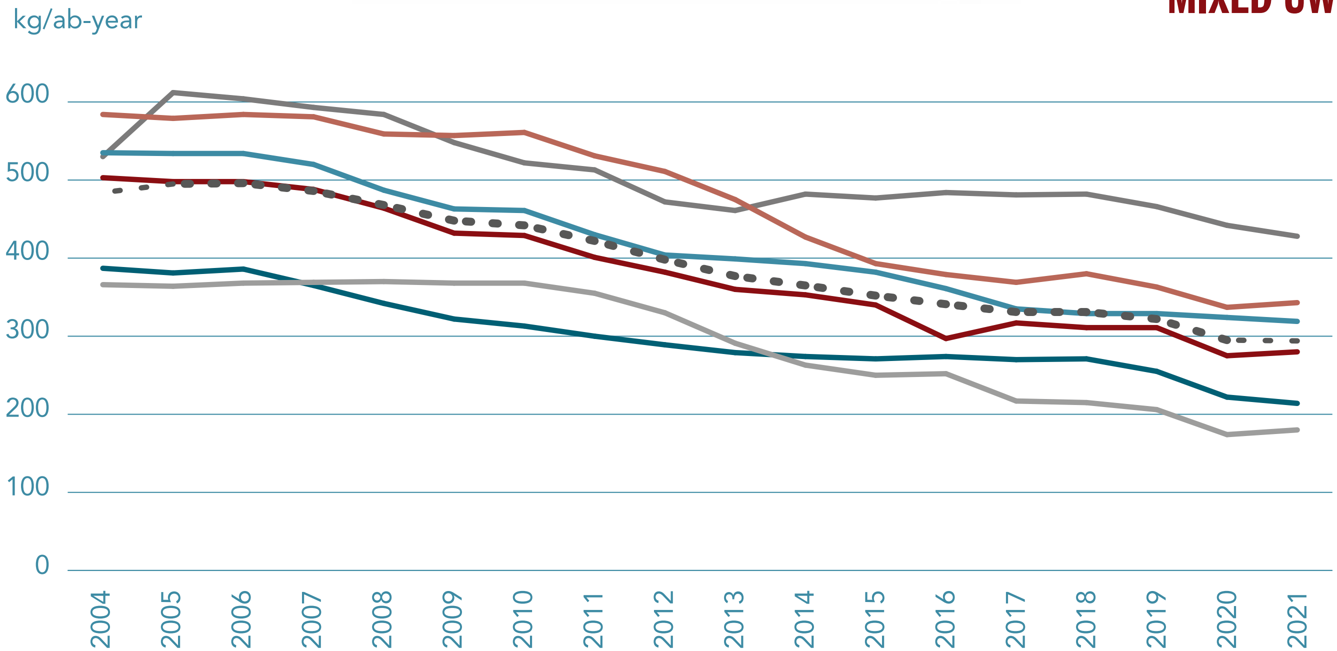

13%
47%
40%
FLORENCE
9%
62%
29%
NAPLES
5%
81%
14%
PALERMO
ON
OFF
START
STOP

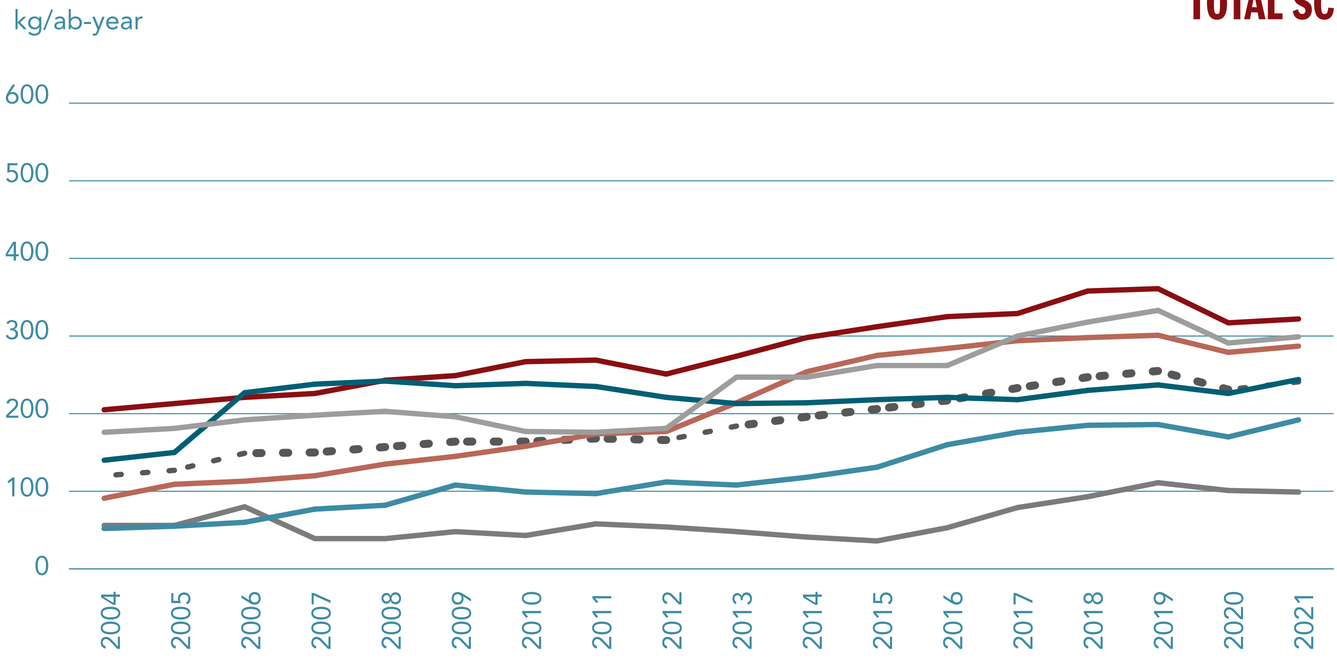
FIG. 6
WASTE COLLECTION IN THE SAMPLE CITIES TURIN, MILAN, FLORENCE, ROME, NAPLES, AND PALERMO. 2004-2021 PER-CAPITA DATA.

SOURCE: COMIECO

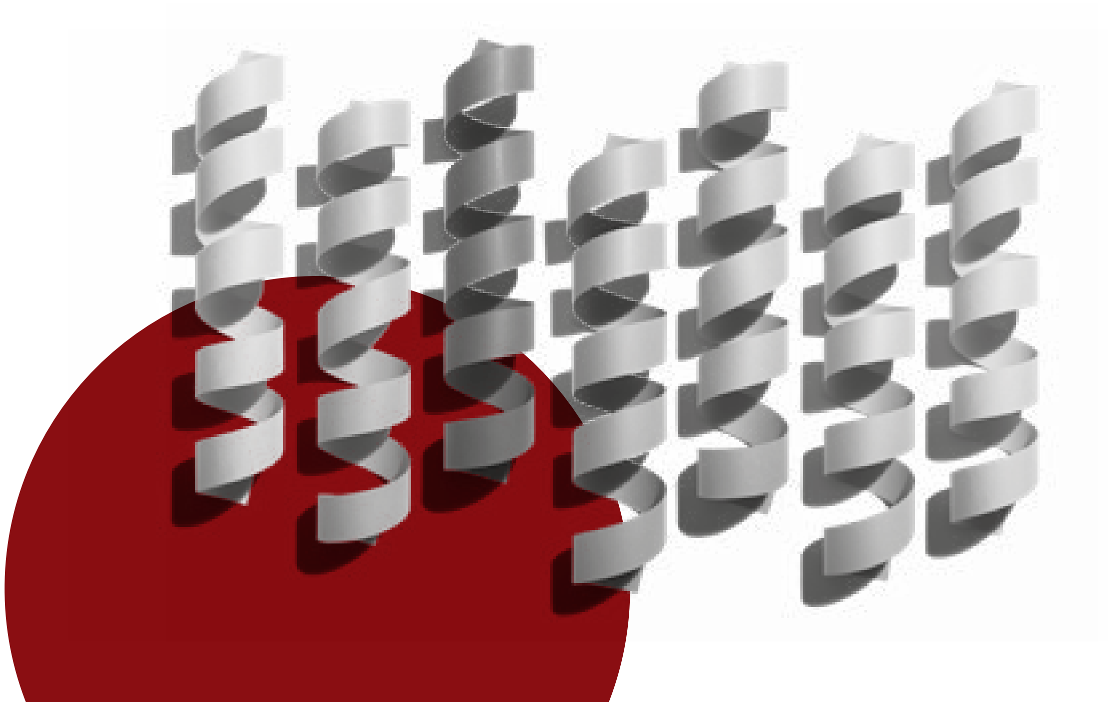
MIXED UW

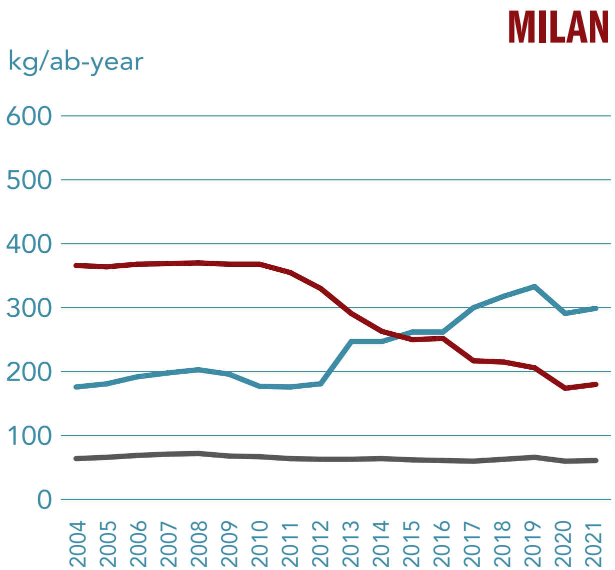


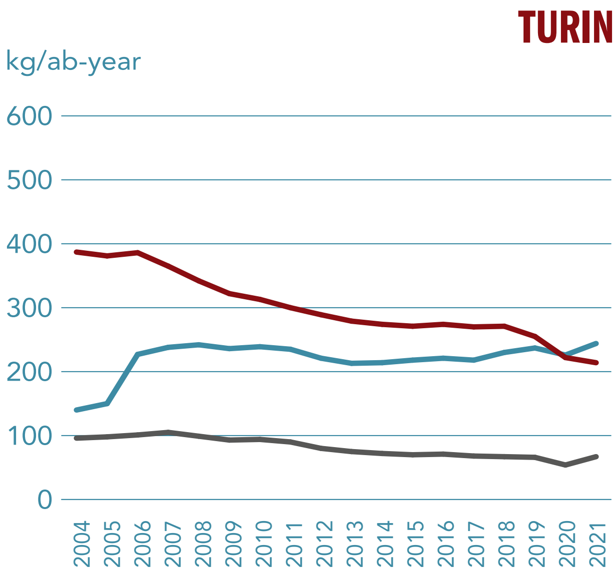
TOTAL SC

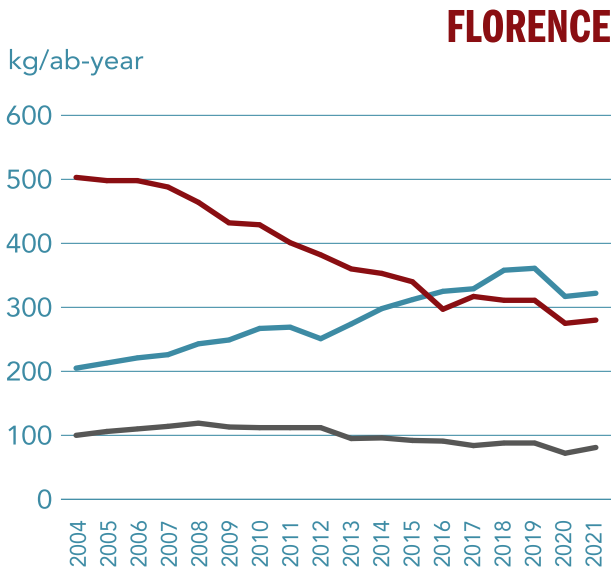


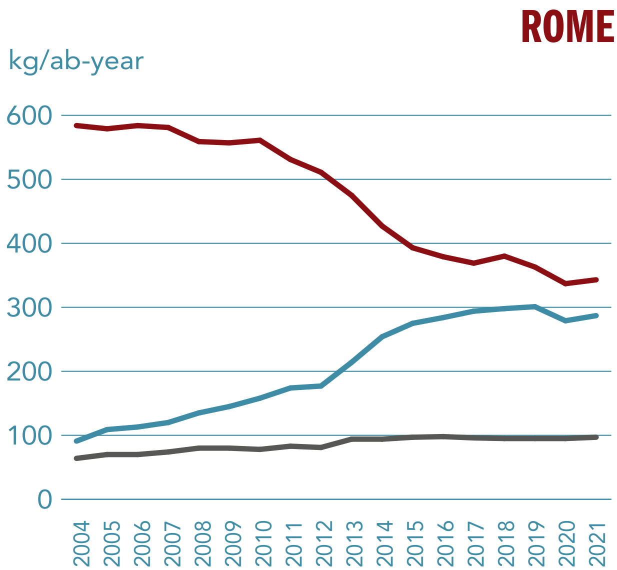
MILAN
TURIN
FLORENCE
ROME
NAPLES
PALERMO
AVERAGE




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

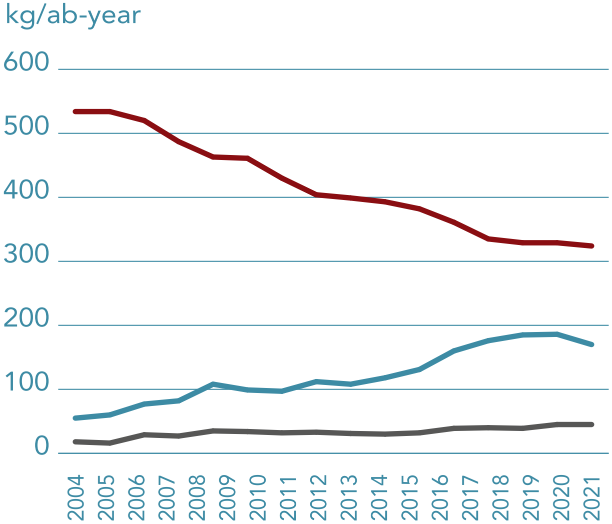

TURIN
kg/ab-year
600
500
400
300
200
100
0
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021


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

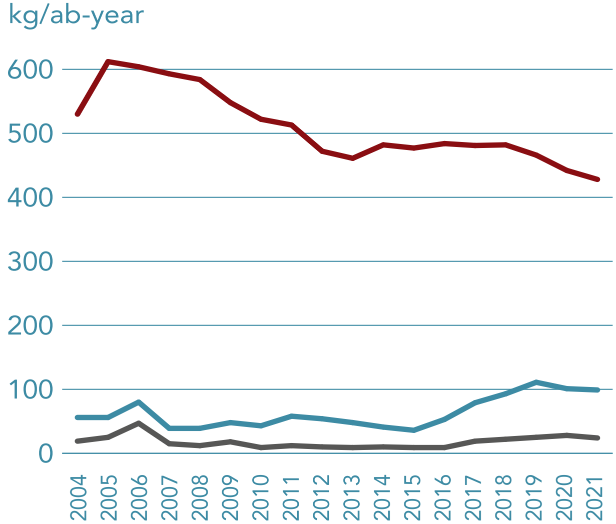

ROME
kg/ab-year
600
500
400
300
200
100
0
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021

● MIXED UW
● TOTAL SC
● SC OF PAPER

NAPLES



PALERMO



88.8%

CITIES UNDER THE AGREEMENTS

94.8%

ITALIAN CITIZENS COVERED BY THE AGREEMENTS

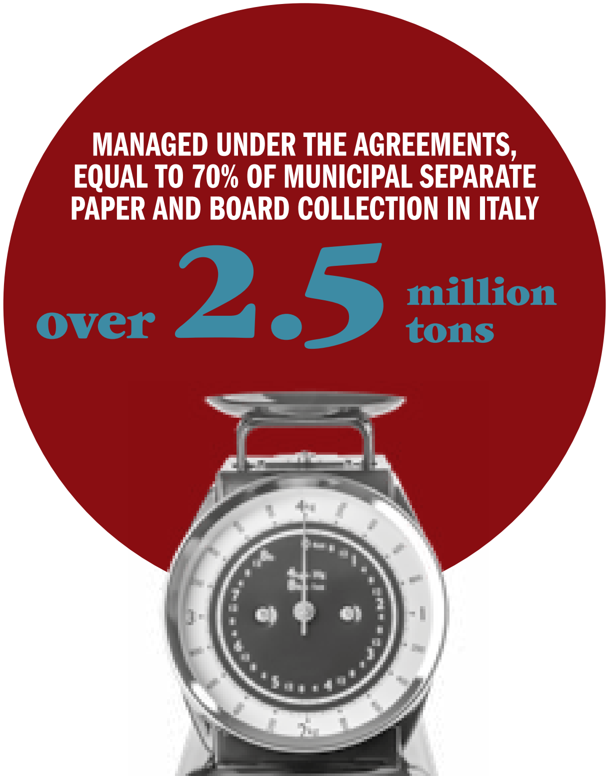
THE CITIES UNDER THE AGREEMENTS: FIGURES AND RESULTS IN 2021

COLLECTION

Almost one-thousand agreements were signed by Comieco with the Cities and the operators to take charge of and recycle paper and board collected separately. While the Centre and the North have 90 and 170 active agreements in place, respectively, the South has 723. Sadly this figure confirms the fragmented management of the agreements, which can hardly be addressed.

A less fragmented management can result into better coordination among the administrations in an organization by super-municipal areas, as well as into scale economies, more efficiency, and cost reduction, both for collection and for subsequent recycling activities. In figures, the average is one agreement every 3 Cities in the South, one every 10 in the Centre, and one every 23 in the North.

In 2021 the Consortium provided for the recycling of 2.52 million tons of paper and board, i.e. 69.8% of national municipal collection. The managed amounts increased by almost 84thousand tons compared to 2020 (+3.4%). More precisely, the Consortium managed 1.57 million tons of packaging with an increase by over 115thousand tons vs. 2020, whereas the similar product fractions (graphic paper) in the collection mix decreased by 32thousand tons to just more than 950thousand tons (+28%) in 2021. The 2021 figure is the highest, in absolute volumes, since the launch of the agreement-based system 20 years ago.



From 2019 to the first half of 2021, Comieco was more often treated as a guarantor for recycling. Over this period, uncertainties on the domestic and international market resulted into the Cities and the operators entrusting significant shares of their collections to the Consortium.

This phenomenon was reversed last year. With the revival of demand from the paper pipeline and the sustained growth of paper for recycling prices, the more advanced cities reduced the volumes of non-packaging paper under the agreements and diversified recycling channels as they had been doing until 2018. This trend started in the second half of 2021. Compared to the first half of 2021, the amount of 1.01 + 1.02 declined by over 80thousand tons, whereas the packaging share was up again (+60thousand tons).

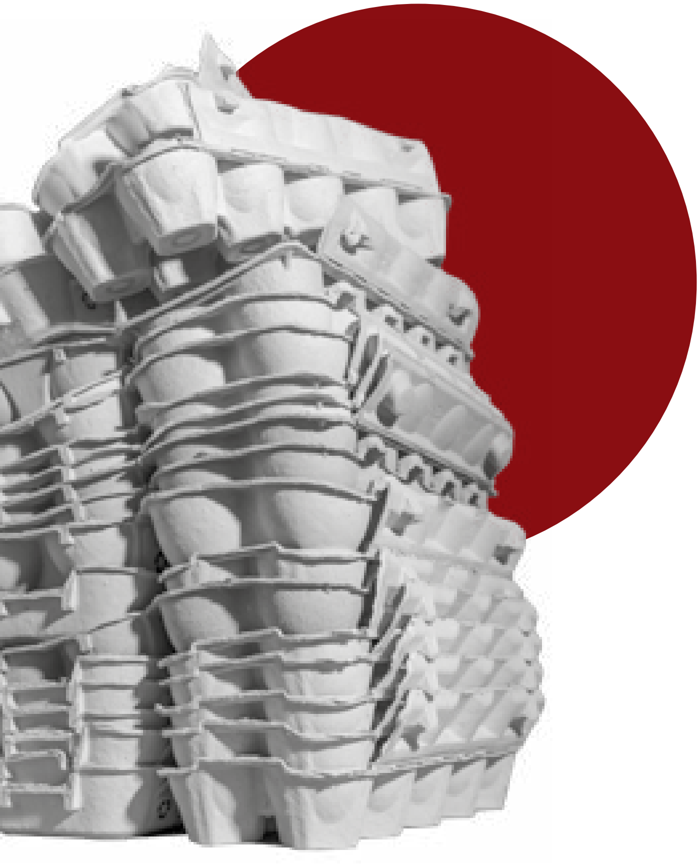
While the North of the Country is the leader of this change, this trend is less or not at all observed in the Centre and in the South. According to estimates, the amounts managed by Comieco will fall by over 500thousand tons in 2022, particularly in the North and in "household" 1.01 + 1.02 collection. With the introduction of the so-called "six-month window" in the latest ANCI-CONAI agreement, the system ensures that the Cities have more freedom to decide, despite Comieco guaranteeing a planning of the amounts entrusted thereto via a notice-based system.

TAB. 3 LOCAL COVERAGE BY REGIONS AS AT DECEMBER 31, 2021.

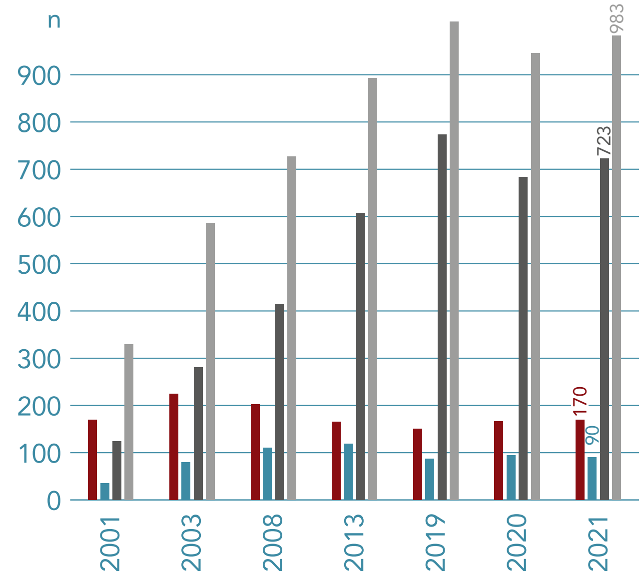
SOURCE: COMIECO

Area	Agreements	Average No. of inhabitants per agreement	Average amount managed under the agreements
	n	n	t
North	170	152,040	7,397
Centre	90	125,854	5,849
South	723	26,282	1,012
Italy	**983**	**57,147**	**2,559**

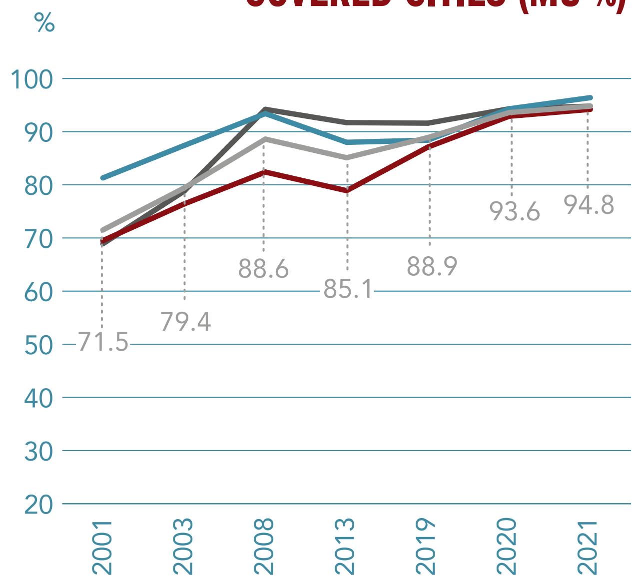
Region	Agreements	Cities under the agreements		Inhabitants under the agreements		Amounts managed under the agreements	
	n	n	%	n	%	t	% Vs. total SC of paper
Piedmont	26	1,176	99.6	4,262,383	99.7	200,254	69.6
Vallée d'Aoste	1	74	100.0	123,895	100.0	9,145	98.4
Lombardy	67	1,148	76.2	8,704,239	87.3	405,563	70.8
Trentino-Alto Adige	21	272	96.5	1,055,590	97.9	71,068	88.2
Veneto	25	514	91.3	4,622,682	95.3	220,022	75.2
Friuli-Venezia Giulia	6	213	99.1	1,190,671	99.3	39,547	56.0
Liguria	14	224	95.7	1,455,311	96.4	68,304	70.4
Emilia-Romagna	10	320	97.6	4,432,044	99.7	243,561	62.0
North	**170**	**3,941**	**89.9**	**25,846,815**	**94.2**	**1,257,464**	**69.7**
Tuscany	16	268	98.2	3,650,253	99.5	190,882	60.8
Umbria	9	90	97.8	853,030	98.6	45,975	79.1
Marche	14	208	91.6	1,457,617	97.1	90,648	83.2
Latium	51	296	78.3	5,365,940	93.8	198,933	52.7
Centre	**90**	**862**	**88.9**	**11,326,840**	**96.4**	**526,438**	**61.3**
Abruzzo	29	279	91.5	1,255,648	97.7	67,119	92.3
Molise	11	133	97.8	294,308	99.2	8,700	78.4
Campania	111	465	84.5	5,369,680	94.5	182,031	81.8
Puglia	172	243	94.6	3,804,442	96.9	156,685	76.0
Basilicata	24	106	80.9	497,642	90.9	18,277	63.6
Calabria	64	357	88.4	1,793,582	95.5	59,245	60.8
Sicily	265	352	90.3	4,727,644	97.7	166,941	81.3
Sardinia	47	282	74.8	1,258,612	78.8	72,975	75.4
South	**723**	**2,217**	**86.9**	**19,001,558**	**94.8**	**731,973**	**77.8**
Italy	**983**	**7,020**	**88.8**	**56,175,213**	**94.8**	**2,515,875**	**69.8**



SIGNED AGREEMENTS (MU N)



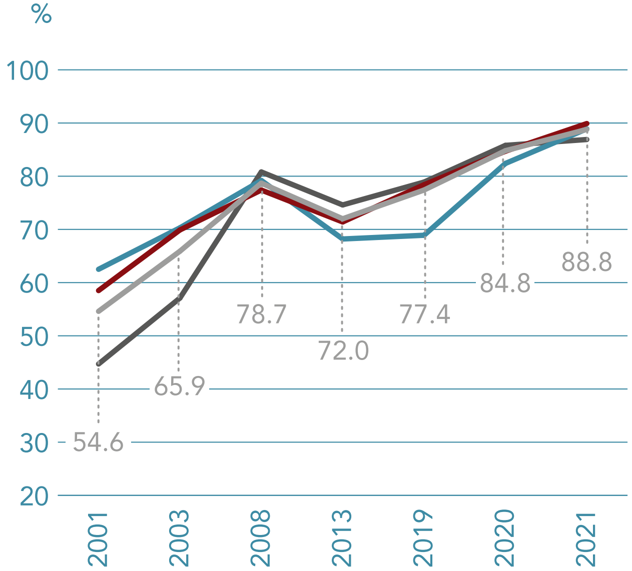
COVERED CITIES (MU %)



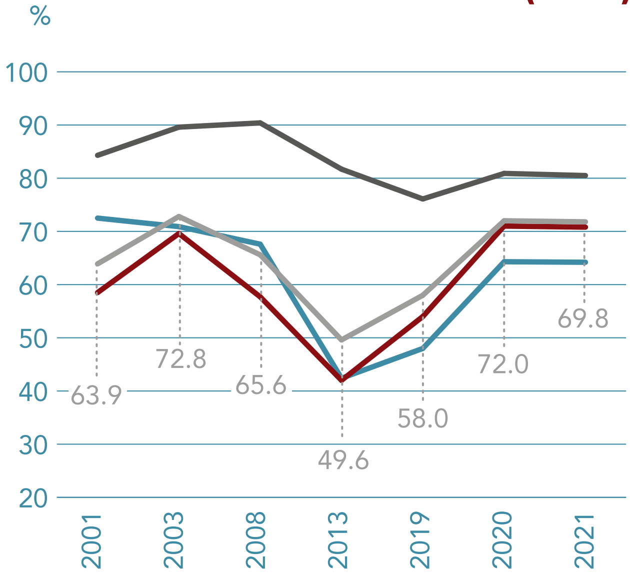
NORTH
CENTRE
SOUTH
ITALY

FIG. 7
STATUS OF THE AGREEMENTS UPON EXPIRATION OF EACH FRAMEWORK AGREEMENT AND COVERAGE RATE OF THE AGREEMENTS. 2001/2021 HISTORICAL DATA SET.
SOURCE: COMIECO

COVERED INHABITANTS (MU %)



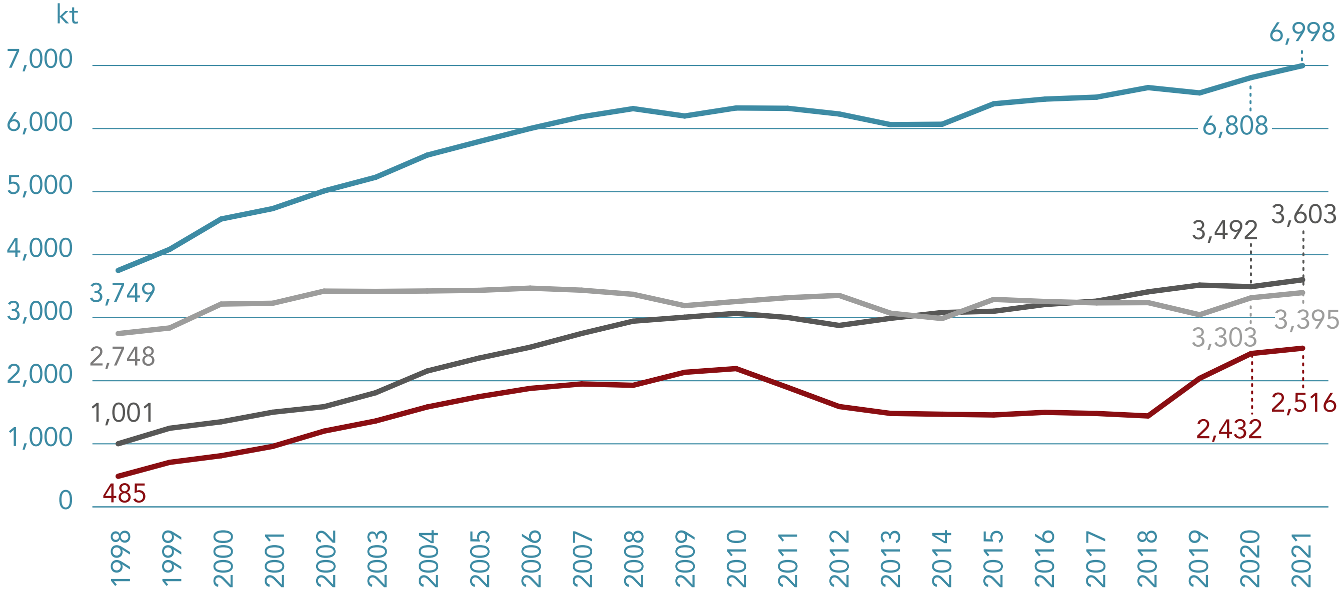
AMOUNTS MANAGED BY COMIECO VS. TOTAL MUNICIPAL SC OF PAPER (MU %)



The high fragmentation of agreements, observed in the South, still hampers synergic development. Comieco plays a key role by mitigating market fluctuations – consistently with the principle of subsidiarity – and managing additional volumes up to close to 70% of the total in 2021.

FIG. 8
RATIO OF PAPER AND BOARD COLLECTION MANAGED UNDER THE AGREEMENTS VS. APPARENT COLLECTION. 1998-2021 HISTORICAL DATA SET AND 2020-2021 COMPARISON.

SOURCE: COMIECO



	1998	2003	2008	2013	2019	2020	2021	Δ 1998/2021		Δ 2020/2021	
	kt	kt	kt	kt	kt	kt	kt	kt	%	kt	%
Apparent collection*	3,749	5,227	6,316	6,062	6,564	6,808	6,998	3,249	86.7	190	2.8
Household collection	1,001	1,810	2,945	2,991	3,517	3,492	3,601	2,602	259.9	111	3.2
Municipal SC of paper and board	485	1,362	1,928	1,482	2,038	2,432	2,516	2,031	418.7	84	3.4
Municipal SC of paper and board under the agreements	2,748	3,417	3,371	3,071	3,047	3,316	3,395	647	23.5	79	2.4

	1998	2003	2008	2013	2019	2020	2021
	%	%	%	%	%	%	%
Municipal SC of paper and board under the agreements vs. apparent collection	12.9	26.1	30.5	24.4	31.1	35.7	35.9
Municipal SC of paper and board under the agreements vs. municipal collection	48.5	75.2	65.5	49.6	58.0	69.7	69.8

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

ALLOCATIONS TO THE PARTIES UNDER THE AGREEMENTS

218.2
million EUR
ALLOCATED TO THE CITIES IN 2021

Over 218 million EUR: this is the global amount of the considerations paid by Comieco in 2021 for the management of just more than 2.5 million tons of paper and board from municipal collection operated under the agreements.

“The total is the sum of 170.4 million EUR for packaging and 47.8 million EUR for graphic paper”.

The investment increased significantly (+67.4 million EUR vs. 2020), only minimally as an effect of the new volumes the Consortium was invited to take charge of, and mostly as a consequence of the adjustment of considerations for packaging introduced effective from May 1, 2020 with the enforcement of the fifth cycle of the ANCI-CONAI agreement, applied throughout the year.

The review of considerations for packaging and for the incineration of FMS resulted into an average value for 1.01 + 1.02 managed collection growing from 43 to over 77 EUR/t (+78%). The change for 1.04 + 1.05 was from 98 to over 104 EUR/t (+6.4%).

+67.4
million EUR
VS. 2020

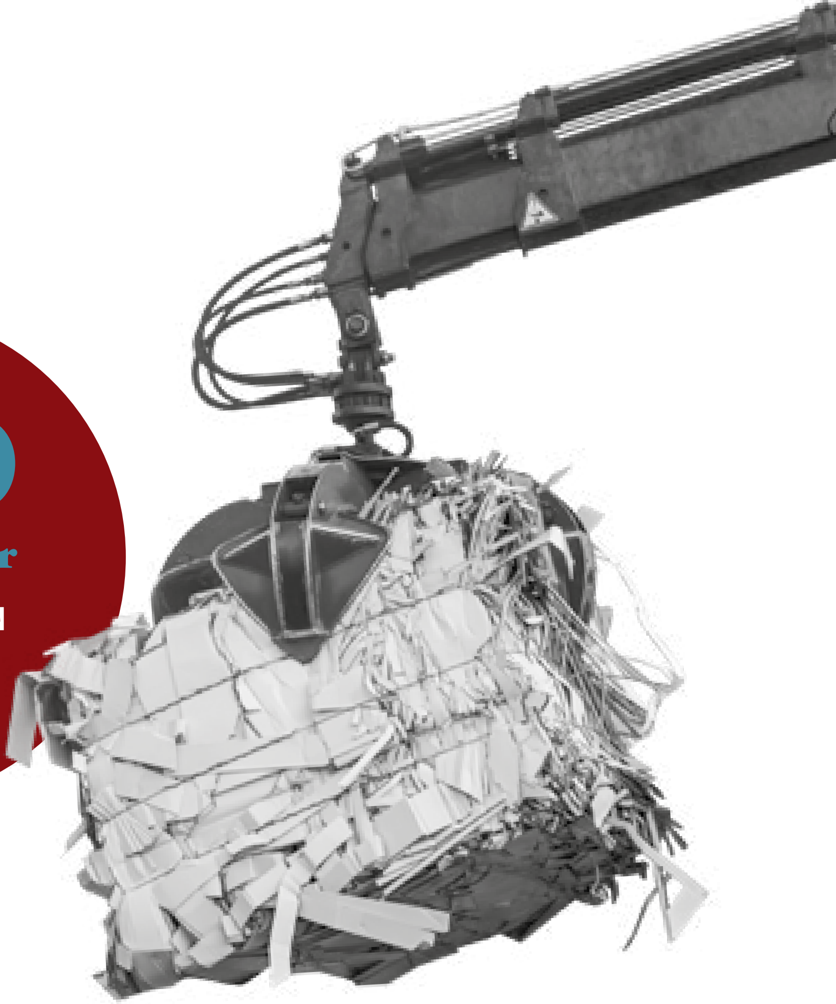
The average calculated value per inhabitant covered by the agreements also grew significantly (+50%) from 2.6 EUR in 2020 to 3.9 EUR in 2021.

This is substantially attributable to three factors:

1. an increase of the per-capita yield (particularly in the South);
2. an increase of the amount of materials subject to post-sorting management under the so-called OUT agreements, which ensure compliance with first quality bracket parameters and, thus, the highest consideration;
3. a higher remuneration of similar product fractions, whose price is tied to market trends.

Local resource allocation also involves other instruments. In particular, in addition to considerations for collection – in the so-called "OUT" agreements – Comieco invests resources in the processing and improvement of paper for recycling.

2.14
billion EUR
FROM 1998 TO 2021



3.90

EUR/ab-year

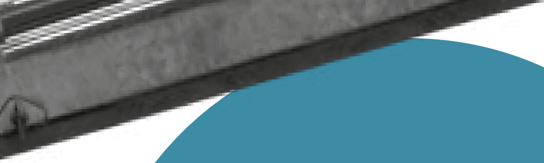
AVERAGE ALLOCATION PER INHABITANT

These resources are intended for plants operating on account of the parties covered by the agreements.

"These amounts totalled just less than 48 million EUR in 2021".

The sum of all the volumes of municipal paper and board collection from 1998 to 2021 – with an increase from 1 to over 3.6 million tons per year – totals more than 60 million tons; just less than 60% (35.7 million) was managed by Comieco.

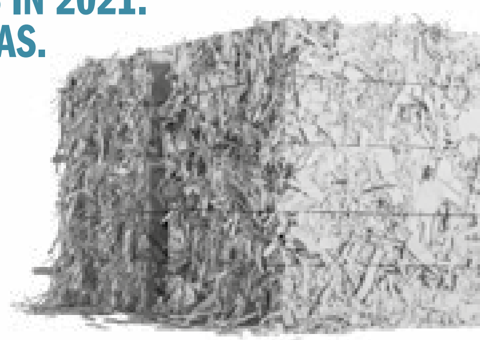
In 24 years of operation (1998-2021) of the ANCI-CONAI agreement, the Consortium allocated considerations to the Italian cities for almost 2 billion EUR globally to support paper and board collection, plus 200 million EUR for processed FMS, and almost 220 million EUR for plant-based sorting activities.



The amounts managed by the Consortium are constantly increasing also in 2021 (+3.4%). The considerations paid to the Cities under the agreements are above 218 million EUR. The average value per inhabitant increases by 50%.

TAB. 4
MANAGED AMOUNTS AND RESOURCES ALLOCATED TO THE PARTIES UNDER THE AGREEMENTS IN 2021. DETAILED BY AREAS.

SOURCE: COMIECO

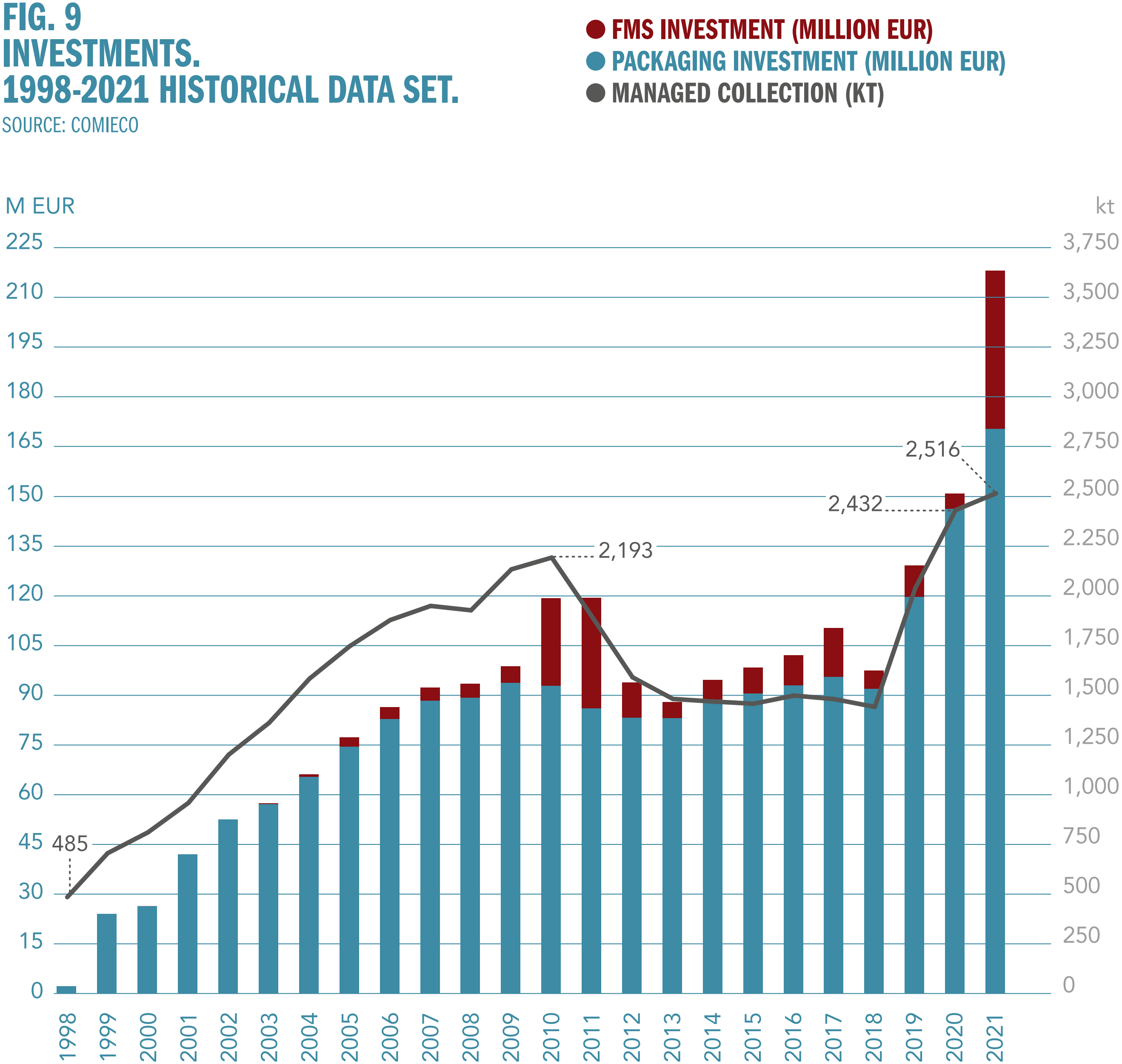


Area	Inhabitants under the agreements	Amounts					
		Managed packaging	FMS	Total	Managed packaging	FMS	Total
	n	t	t	t	kg/ab	kg/ab	kg/ab
North	25,846,815	778,696	478,767	1,257,464	30.1	18.5	48.7
Centre	11,326,840	323,422	203,016	526,438	28.6	17.9	46.5
South	19,001,558	463,448	268,526	731,973	24.4	14.1	38.5
Italy	**56,175,213**	**1,565,566**	**950,309**	**2,515,875**	**27.9**	**16.9**	**44.8**

Area	Inhabitants under the agreements	Considerations for collection					
		Managed packaging	FMS	Total	Managed packaging	FMS	Total
	n	EUR	EUR	EUR	EUR/ab	EUR/ab	EUR/ab
North	25,846,815	86,315,961	23,993,787	110,309,748	3.3	0.9	4.3
Centre	11,326,840	35,125,457	10,363,564	45,489,021	3.1	0.9	4.0
South	19,001,558	48,971,664	13,430,503	62,402,167	2.6	0.7	3.3
Italy	**56,175,213**	**170,413,083**	**47,787,854**	**218,200,936**	**3.0**	**0.9**	**3.9**

FIG. 9
INVESTMENTS.
1998-2021 HISTORICAL DATA SET.

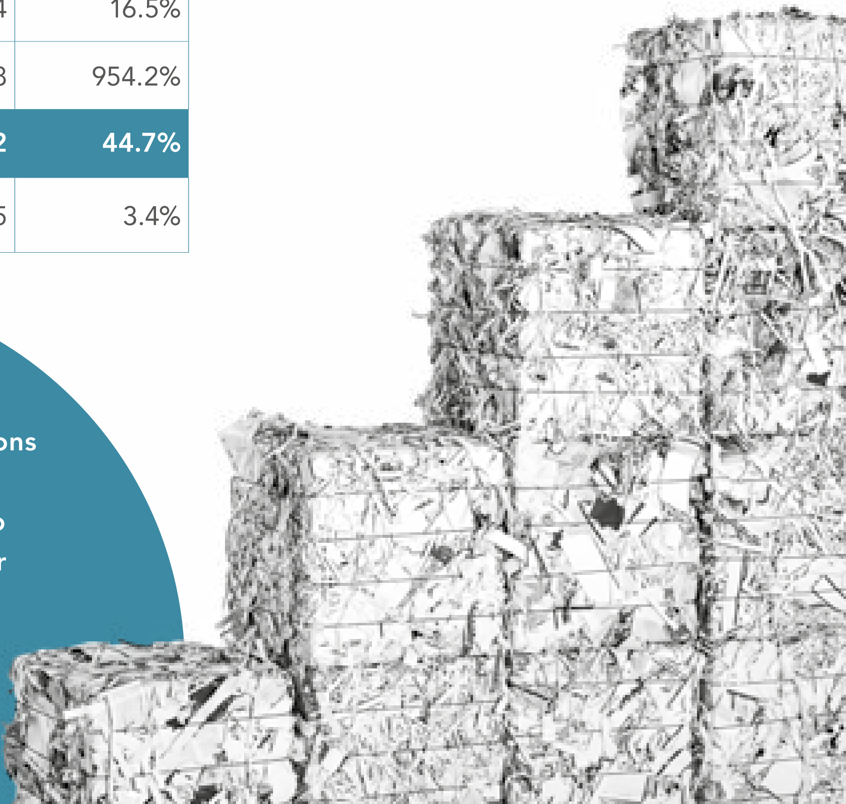
SOURCE: COMIECO



		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 2020-2021	Total
Packaging	Million EUR	204.2	400.3	439.0	579.6	316.7	**1,939.7**
FMS	Million EUR	0.4	15.3	80.2	52.6	52.3	**200.8**
Total	**Million EUR**	**204.6**	**415.6**	**519.2**	**632.2**	**369.0**	**2,140.6**
Managed collection	t	5,523,979	9,088,263	9,295,707	9,386,935	4,948,066	**38,242,950**

		2020	2021	Δ 2020-2021
Packaging	Million EUR	146.3	170.4	16.5%
FMS	Million EUR	4.5	47.8	954.2%
Total	**Million EUR**	**150.8**	**218.2**	**44.7%**
Managed collection	t	2,432,191	2,515,875	3.4%

Comieco managed 38.2 million tons of paper and board derived from municipal collection from 1988 to 2021, and paid considerations for almost 2.4 billion EUR.



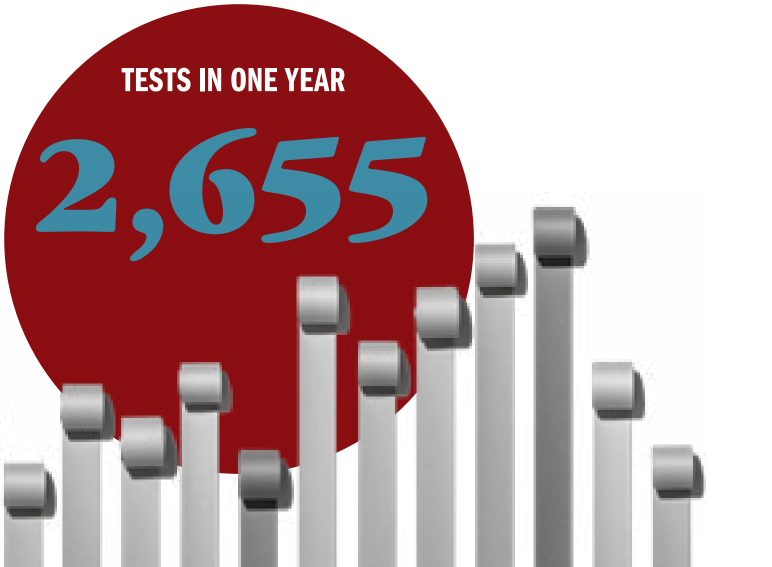
QUALITY – MORE TESTS FOR A MORE RELIABLE PIPELINE

The tests performed during 2021 outline once again a different picture for the North, the Centre, and the South in both flows: 1.01 + 1.02 from households and 1.04 + 1.05, which includes packaging collected from business users.

The number of collected samples continued to grow: with 2,655 tests performed in 2021, the increase was more than 120% in the last three years (2019/2021), thus demonstrating the importance of quality in the organizational and industrial paper and board recycling system in the country.

A preamble is due on the method. Over 60% of the material under the agreements is by now managed under the so-called "OUT" agreements, where the party to the agreement identifies the service supplier for collection sorting and processing in view of entrusting End of Waste material to Comieco. This allows to maximize revenues while ensuring first-bracket management. A minor, yet non-negligible share of volumes is rather managed based on the amounts conferred to the plant immediately after collection, i.e. via "IN" contracts. In most cases this is done in the regions that ensure high quality and the highest considerations a priori.

In order to retain information on the quality of collection, the Consortium, according to the provisions of the Quality Annex, monitors conferments based on "OUT" agreements with "exploration" tests. This data is also useful to identify the cities that need operational and information support to improve collection at the source, particularly in the household collection channel.



1.98% AVERAGE CONTAMINANTS IN 1.01 + 1.02

0.79% AVERAGE CONTAMINANTS IN 1.04 + 1.05

As to 1.01 + 1.02, if the national average is considered, 2021 consolidates the positive trend that started back in 2019: after a few years of average contaminants above 3% upon unloading at the plant, the amount of contaminants is now within the parameters set for the first quality bracket for the third year in a row, and decreased to under 2%.

For more objective consideration, the national data should be extracted also for the 2021 performance, and the behaviour of the three macro-areas should be observed: the Centre (1.61% of contaminants) approaches the performance of the North for the first time and drives the national improvement by offsetting the decline in the North and in the South.

The value for the North remains the national reference average (1,50% in 1.01 + 1.02), albeit with a moderate decline, and the South (3.73%) remains above the first quality bracket threshold mentioned in the Technical Paper Annex. Despite a moderate decline, the top quality of 1.04 + 1.05 board collection is confirmed: the average national figure (0.79% of contaminants) and the specific ones for the three macro-areas are well within the first-bracket limits (1.5%), with materials that are ready for recycling upon collection – except for logistic issues.

If the quality of household 1.01 + 1.02 collection (always measured upon reaching the plant before processing) is analyzed by separate agreement flows, it clearly turns out from the distribution of the tests performed by quality brackets that, in the agreements where collection is transferred to Comieco at the post-processing stage, collection is still far from top quality. At national level, only 47% of tests point out to top quality, and almost three-quarters of tests in the South detect contaminants that take them beyond the first bracket.

These come from the household collection of paper and packaging that contain plastics and organic waste and that, if improved at the source, would allow the parties under the agreements to avoid pre-cleaning and disposal costs.

As in previous years, in 2021 Comieco, supported by specialized companies, carried out 199 audits of sorting plants (100), paper mills (69), and packaging manufacturers (30), aimed at ensuring compliance with contract requirements and at taking stock of the material in transit originating from the parties to the agreements and intended for paper mills.

Audits at the paper mills and packaging manufacturers were aimed at ensuring the appropriateness of the statements released to Comieco on the use of paper for recycling and on final production (Ba.Da.Com statements).

The criticalities observed during the audits were formally addressed by the Consortium via the implementation of specific corrective actions.

The goal of the entire pipeline, from the citizens to the recycling operators, is increasingly to improve in the early steps, ensuring value generation at all levels of the recycling process.

This data is thus confirmed as important information to allocate resources to development, organize field checks and communication activities in view of addressing issues at the origin of the flows that supply the recycling pipeline, and maximizing raw material recovery.

TAB. 5
QUALITY OF THE COLLECTED MATERIALS (AVERAGE RATE OF CONTAMINANTS). 2020-2021 COMPARISON BY MACRO-AREAS.

SOURCE: COMIECO

	Year 2020		Year 2021		Δ 2020/2021	
	Tests	Contaminants	Tests	Contaminants	Tests	Contaminants
	n	%	n	%	n	%
1.01 + 1.02	First quality bracket threshold: 3.0%					
North	719	1.37	1.189	1.50	470	0.13
Centre	441	3.23	470	1.61	29	-1.62
South	339	3.22	418	3.73	79	0.51
Italy	**1,499**	**2.29**	**2.077**	**1.98**	**578**	**-0.31**
1.04 + 1.05	First quality bracket threshold: 1.5%					
North	157	0.51	130	0.59	-27	0.08
Centre	148	0.81	175	0.89	27	0.08
South	235	0.68	273	0.85	38	0.17
Italy	**540**	**0.66**	**578**	**0.79**	**38**	**0.13**

1,01 + 1.02: the positive trend that started in 2019 is consolidated in 2021, and the average contaminant rate (1.98%) falls within the limits set for the first quality bracket (3%) for the third year in a row. 1.04 + 1.05: business collection follows a stable trend.

TAB. 5 BIS
DISTRIBUTION OF TESTS PERFORMED ON COLLECTION AT THE SOURCE PER QUALITY BRACKETS.

SOURCE: COMIECO

IN flows		bracket 1	bracket 2	bracket 3	bracket 4
North	%	91.45	4.27	1.71	2.56
Centre	%	89.25	8.60	2.15	0.00
South	%	64.67	14.67	11.33	9.33
Italy	**%**	**82.60**	**8.39**	**4.82**	**4.19**

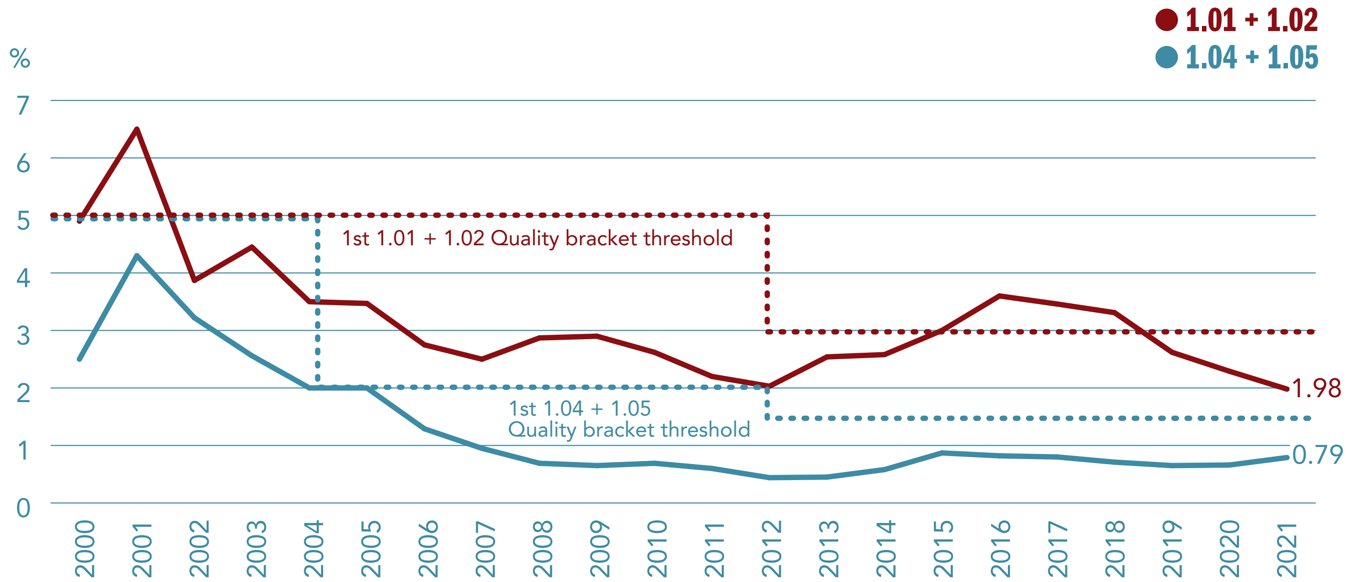
OUT flows		bracket 1	bracket 2	bracket 3	bracket 4
North	%	83.33	11.11	5.56	0.00
Centre	%	57.14	35.71	7.14	0.00
South	%	26.32	28.95	31.58	13.16
Italy	**%**	**47.14**	**25.71**	**20.00**	**7.14**

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

FIG. 10
QUALITY OF THE COLLECTED MATERIALS (AVERAGE TREND OF CONTAMINANTS). 2000-2021 PERIOD.

SOURCE: COMIECO

The tests challenge confirms the improvement observed in past few years with respect to the rate of contaminants in 1.01 + 1.02. 2,655 tests were performed in 2021.



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 2020-2021	Total 1998-2021
1.01 + 1.02	n	1,006	3,456	4,040	4,286	3,576	16,364
1.04 + 1.05	n	594	3,591	4,204	2,931	1,118	12,438

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 under the agreements. From July 2014 these results only refer to tests on incoming materials in the so-called "IN agreements" valid for acknowledgement of the collection consideration.

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 361 waste management plants that collected the material and performed preliminary sorting and pressing for recycling at the mill.

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 (16.3 km on average). Logistic optimization, which is key to improve recycling, needs to reconcile the possibility to confer the materials 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:

- sixty percent of the amount managed by Comieco (over 1.5 million tons) is entrusted to 58 paper mills on a pro-quota basis;
- the other 40% (approximately 1 million tons) is awarded – by regular auctions – to eligible parties. In 2021, 32 different parties were awarded at least one lot.

361
WASTE MANAGEMENT PLANTS

PAPER MILLS IN ITALY RECYCLING THE PAPER MANAGED BY COMIECO
58

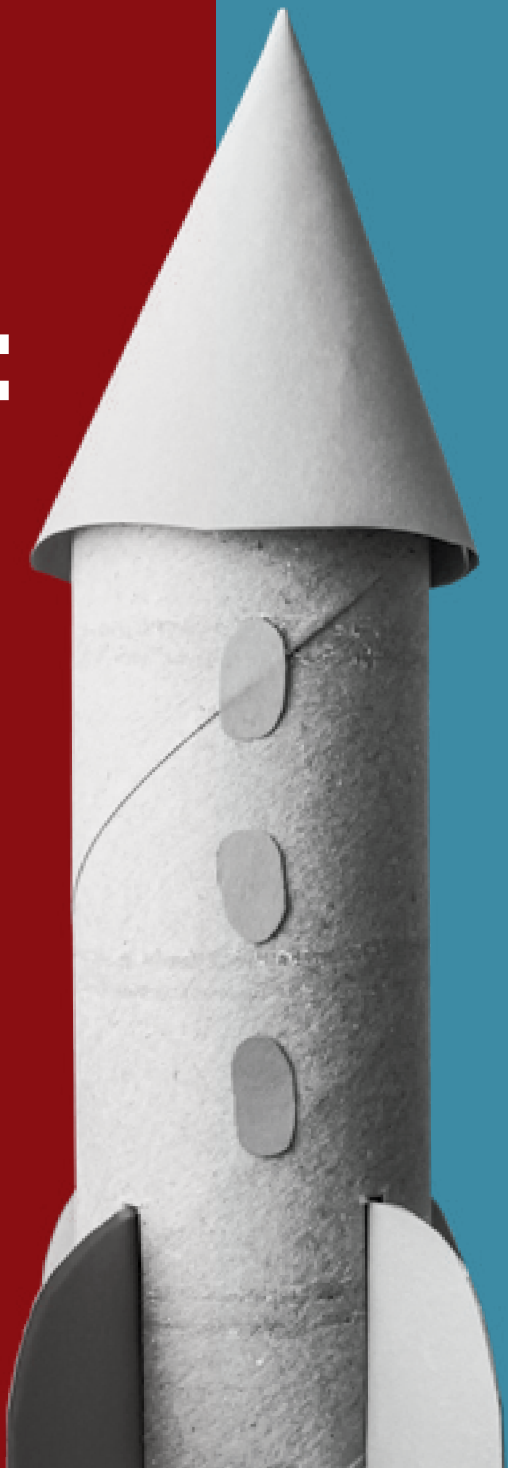
Area	Waste management plants	Average conferment distance	Waste management systems under the agreements with >20thousand t/year of incoming materials	Paper mills
	n	km	n	n
North*	146	16.2	20	33
Centre	67	16.7	9	18
South	148	16.3	6	7
Total	**361**	**16.3**	**35**	**58**

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

FIG. 11
THE RECYCLING PLANTS NETWORK. YEAR 2021.
SOURCE: COMIECO

● PAPER MILLS
● SORTING PLANTS

THE ITALIAN PAPER INDUSTRY: A RESILIENT SUPPLY CHAIN



91.4%

PAPER AND BOARD PACKAGING RECOVERY

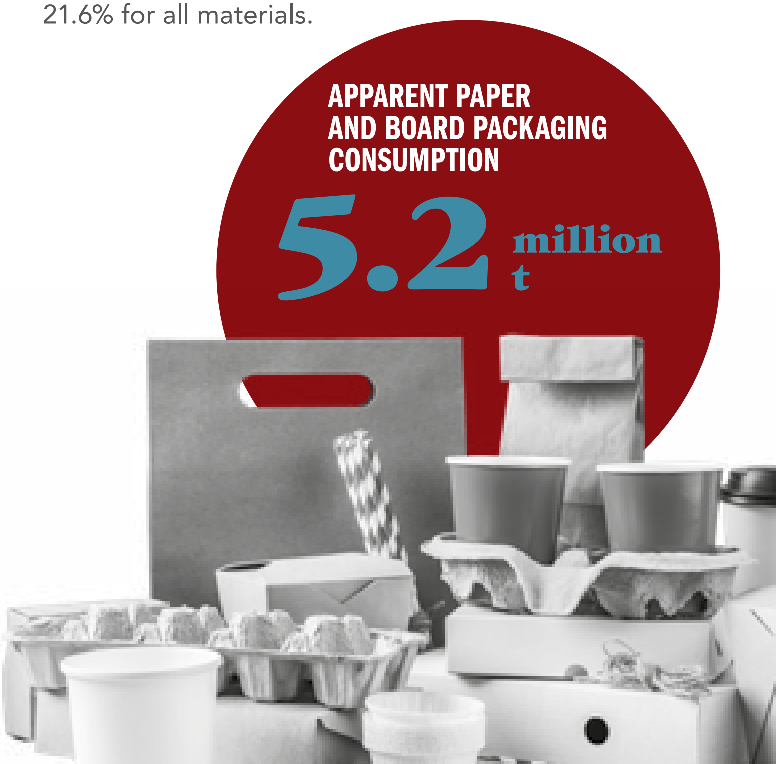
85.1%

PAPER AND BOARD PACKAGING RECYCLING

"Resilience: the ability to recover the original look after warping; the ability to react to traumas, challenges, etc".

This is how the dictionary punctually describes the attitude of the Italian paper pipeline, a sector that bears good news despite the global shock that disrupted the scenario of the past few years and months:

- paper and board packaging management in 2021 confirms and consolidates the achievement and surpassing of the recycling (85.1%) and recovery (91.4%) targets set by the European Community 10 years ahead of time;
- strong recovery of paper production in 2021: 9.6 million tons, +1.2% vs. 2020. Last year production declined by 4.4% (from 8.9 million tons in 2019 to 8.5 million tons in 2020);
- packaging paper production in 2021 grew more than the sector's average (+14.7%) to more than 5.5 million tons;
- the domestic consumption of paper for recycling increased from 5,060 million tons in 2019 to 5,454 million tons in 2020 and to a further growth in 2021 to above 6 million tons (+16%) for the first time;
- recovered paper accounts for 62% of the total fibres used by the Italian paper mills: in this respect, Italy ranks second in Europe, after Germany, and first if the percent increase is considered;
- the secondary raw material usage rate of the paper industry, i.e. the ratio of recovered to total raw materials used, is 52.6% vs. a national average of 21.6% for all materials.



These unique achievements are the result of the Country's team work (of those involved in collection and of those involved in the processing of secondary raw materials), particularly in the light of past and present challenges.

- First of all in August 2017 China introduced restrictions to waste imports and enforced a 0.5% contaminant limit when the European EN 643 norm for the paper sector provided for a 1.5% threshold for most paper for recycling types. Hence the need to identify new export markets and a 4.6% decline of exports from 2018 to 2019, with a combined decline of the quotations of paper for recycling due to the available surplus.
- Then came the infamous pandemic waves from 2020 onwards. More or less stringent measures in most Countries resulted into the shutdown and the stop to business activities, but the paper sector was considered as essential and remained in operation. During the pandemic, e-commerce grew significantly: +45% between 2019 and 2020 and +18% between 2020 and 2021 worth 30.5 billion EUR (as at 2021). After a significant decline, paper for recycling quotations were revamped in mid-2021 and surpassed 100 EUR/ton.
- Then we come to recent events, i.e. the Russian-Ukrainian conflict with still severe impacts on the market: the prices of gas, energy, and raw materials are soaring, thus exacerbating the issues connected with poor source diversification.

More specifically, the positive results show that growth also concerns types of paper other than packaging that, with 4.1 million tons, reverses the negative trend of the past three years and returns to a 9.6% growth.

The enhanced domestic recycling capacity and the increase of the demand for paper and board packaging cut the remaining share of recovered paper transferred abroad for recycling by almost half (-41% vs. 2020), with a net export balance of 948thousand tons in 2021: a green economy that gains circularity also in terms of distances.

"Out of 5.2 million tons of apparent packaging consumption (+11.1% vs. 2020), approximately 4.5 were recycled, and 334thousand tons were recovered as energy".

Another important factor is the value of recovered paper. After more than two years of minimal quotations (from 2018 to the first half of 2020), the domestic and foreign demand for raw materials resulted into a sudden sharp increase of prices, which started in the last few months of 2020 and continued in the first part of this year.

The values recorded by the Chamber of Commerce of Milan are the highest in history, even above the peaks of more than 10 years ago (mid-2011). But what and how many benefits derive from these activities? There are direct and indirect benefits that may be translated into economic values using specific indicators. The activity of Comieco alone – 1.56 million tons of packaging managed in 2021 – results into 225 million EUR of benefits, calculated on the value of the generated raw materials and the CO_2 emissions avoided through the recycling processes.

The above numbers should not overshadow the positive impact of non-disposal, of the generated jobs and, more generally, of the value of territorial protection.

TAB. 6 PAPER AND BOARD PACKAGING RECOVERY AND RECYCLING TARGETS ACHIEVED IN 2021.

SOURCE: COMIECO

Recycling and recovery rate calculation	year 2021	Δ 2020/2021
	t	%
Apparent paper and board packaging consumption	5,242,629	11.1
Waste paper and board packaging contained in paper and board for recycling of the 1.01 + 1.02 type, recycled in Italy	954,217	78.7
Waste paper and board packaging contained in paper and board for recycling of the 1.04 + 1.05 type, recycled in Italy	2,674,897	19.9
Waste packaging recycled abroad	831,346	-36.2
Total waste paper and board packaging conferred for recycling	4,460,459	9.7
Paper and board packaging recovered as energy	333,802	-3.9
Recovered paper and board packaging	4,794,261	8.6

	year 2021
Recycling %	**85.1**
Energy recovery %	**6.4**
Recovery %	**91.4**

Note: 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.

TAB. 7
DIRECT AND INDIRECT BENEFITS OF MANAGED PAPER AND BOARD PACKAGING. 2021 DATA.

SOURCE: CONAI - TOOL LCC

The benefits generated through packaging recycling management (1.56 million tons) in 2021 can be estimated at 225 million EUR. The aggregate data for 2005-2021 amounts to benefits for over 1.57 billion EUR, calculated as the value of raw materials and of the avoided emissions.

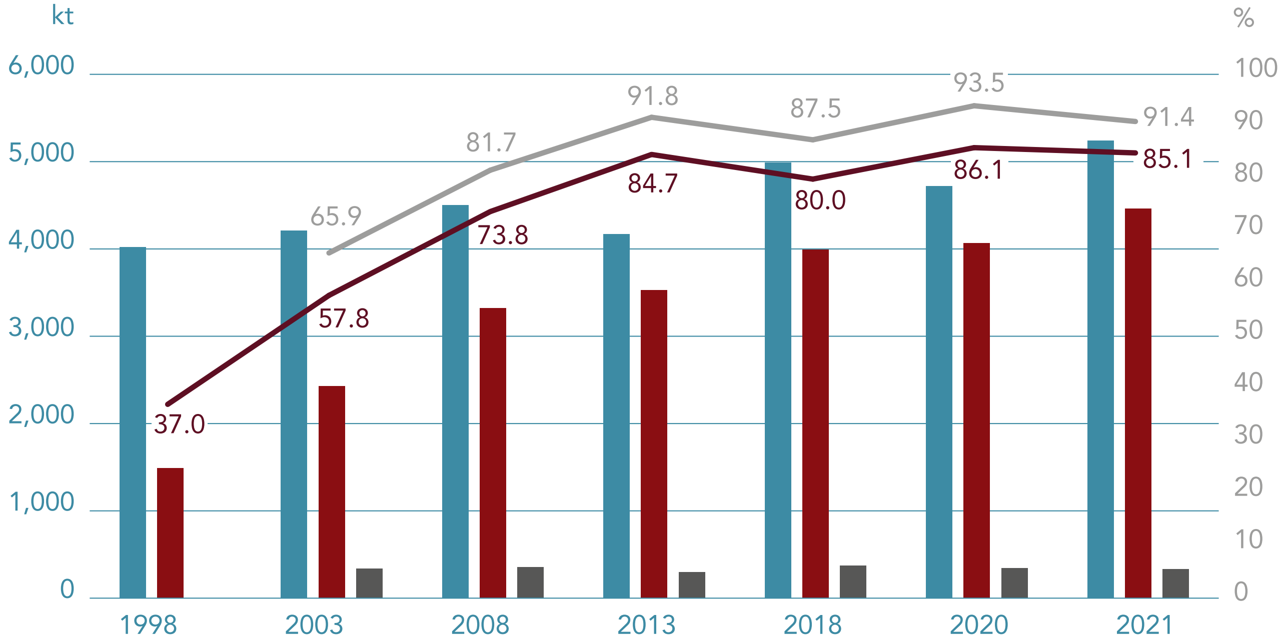
Indicators within the CONAI boundaries (managed by Comieco)			
Indicator		**2021**	**Total 2005-2021**
Amount of conferred packaging	kt	1,566	18,474
Fractions for recycling	kt	1,566	18,474
Fractions for energy recovery	kt	0	0
Fractions intended for other forms of disposal	kt	0	0

Environmental benefits			
Indicator		**2021**	**2005-2021 tot.**
Saving of raw material, paper	kt	1,314	17,814
Electric power produced from energy recovery	TJ	0	0
Thermal power produced from energy recovery	TJ	0	0
Primary energy saving through recycling	TJ	18,721	242,681
CO_2 production avoided through recycling	kt CO_2 eq	1,312	16,508
CO_2 production avoided through energy recovery	kt CO_2 eq	2	2

Economic value				
Category			**2021**	**2005-2020 tot.**
Direct benefits	Economic value of the secondary raw material obtained from recycling	million EUR	146	1,007
	Economic value of the power produced from energy recovery	million EUR	0	0
Indirect benefits	Economic value of the avoided CO_2 emissions	million EUR	79	571
Overall benefits		**million EUR**	**225**	**1,578**

FIG. 12
PAPER AND BOARD PACKAGING RECYCLING AND RECOVERY TARGETS ACHIEVED. 1998-2021 HISTORICAL DATA SET.

SOURCE: COMIECO



- APPARENT PAPER AND BOARD PACKAGING CONSUMPTION (T X 1000)
- TOTAL WASTE PAPER AND BOARD PACKAGING FOR RECYCLING (T X 1000)
- PAPER AND BOARD PACKAGING RECOVERED AS ENERGY OR WASTE-BASED FUEL (T X 1000)
- RECYCLING RATE (%)
- RECOVERY RATE (%)

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 2020 recycling and recovery data, was adjusted by CONAI.

European recycling targets achieved and to be achieved

European directive	Directive 94/62/CE	Directive 2004/12/CE	Directive 2018/852/CE	Directive 2018/852/CE
Target compliance deadline	June 30, 2001	December 31, 2008	December 31, 2025	December 31, 2030
EU paper and board packaging recycling targets	General (all materials) between 25% and 45% with a minimum 15% threshold for each material	60%	75%	85%
Paper and board packaging recycling results in Italy	50.7%	62.4% met and surpassed as early as in 2004 (4 years ahead of time)	80.4% met and surpassed as early as in 2009 (16 years ahead of time)	>85% met and surpassed in 2020 (10 years ahead of time)

TAB. 8 PAPER AND BOARD PRODUCTION IN 2021.

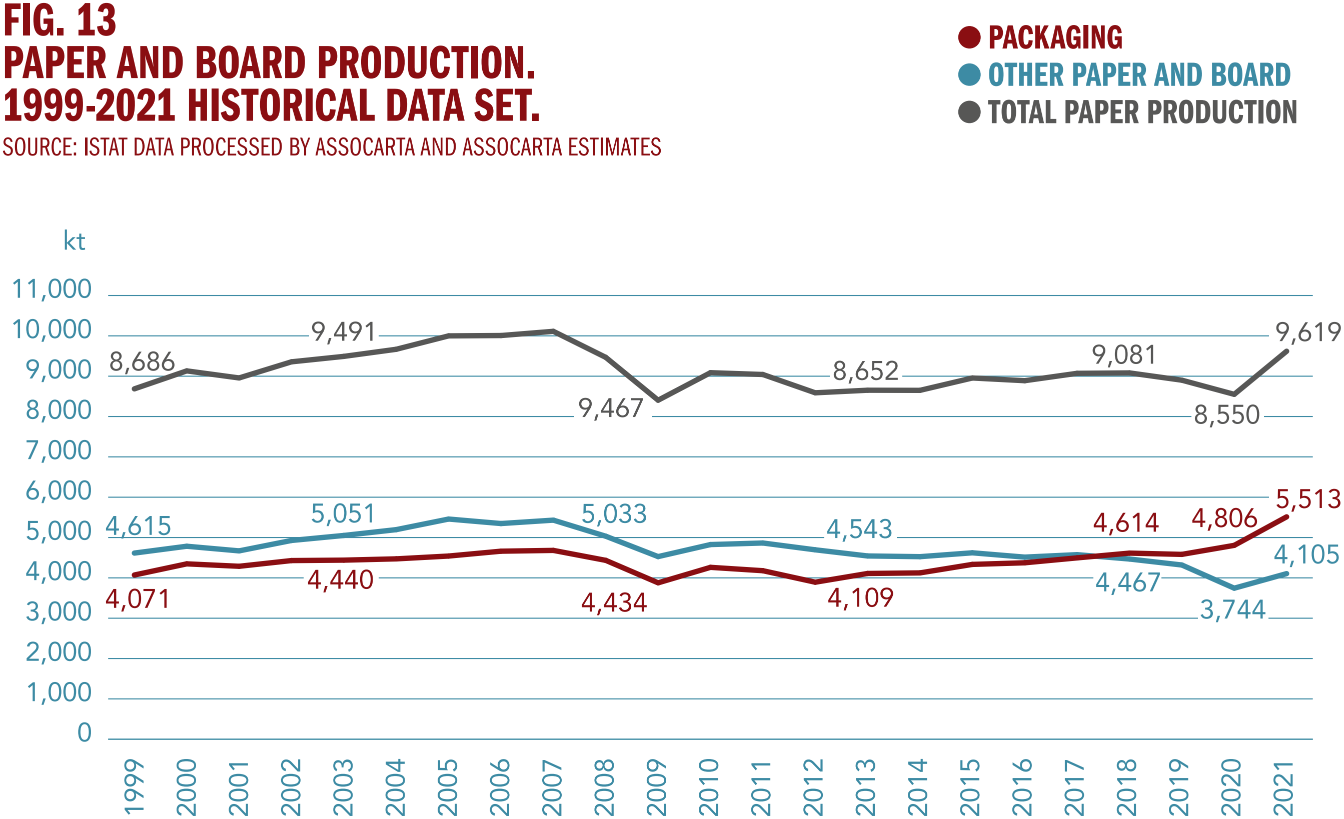
SOURCE: ISTAT DATA PROCESSED BY ASSOCARTA AND ASSOCARTA ESTIMATES

General increase for all of paper production. With over 1.4 million tons more 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, cardboard)	t	5,513,353	3,314,749	1,919,674	6,908,428
Δ 2020/2021	%	14.7	5.2	17.6	9.2
Other paper and board (Paper for graphic and hygienic-sanitary use)	t	4,105,517	1,690,814	2,210,724	3,585,607
Δ 2020/2021	%	9.6	6.4	8.5	8.7
Total paper production	**t**	**9,618,870**	**5,005,564**	**4,130,398**	**10,494,036**
Δ 2020/2021	**%**	**12.5**	**5.6**	**12.6**	**9.1**

FIG. 13
PAPER AND BOARD PRODUCTION. 1999-2021 HISTORICAL DATA SET.

SOURCE: ISTAT DATA PROCESSED BY ASSOCARTA AND ASSOCARTA ESTIMATES



		1999	2003	2008	2013	2018	2019	2020	2021	Δ 1999/2021		Δ 2020/2021	
										kt	%	kt	%
Paper and board Packaging	kt	4,071	4,440	4,434	4,109	4,614	4,582	4,806	5,513	1,442	35.4	707	14.7
Other paper and board	kt	4,615	5,051	5,033	4,543	4,467	4,319	3,744	4,105	-510	-11.0	361	9.6
Total paper production	**kt**	**8,686**	**9,491**	**9,467**	**8,652**	**9,081**	**8,901**	**8,550**	**9,619**	**933**	**10.7**	**1,069**	**12.5**

TAB. 9
CONSUMPTION, IMPORT, EXPORT OF PAPER FOR RECYCLING AND APPARENT COLLECTION*. 2020-2021 VARIATIONS.

SOURCE: ASSOCARTA DATA PROCESSED BY COMIECO

		Import (A)	Export (B)	Consumption (C)	Apparent collection* (B+C-A)
2020	t	255,237	1,851,282	5,211,639	6,807,685
2021	t	330,033	1,278,528	6,049,899	6,998,394
Δ 2020-2021	%	29.3	-30.9	16.1	2.8

FIG. 14
CONSUMPTION, IMPORT, EXPORT OF PAPER FOR RECYCLING AND APPARENT COLLECTION* - 1998-2021 PERIOD.

SOURCE: ASSOCARTA DATA PROCESSED BY COMIECO

		1998	2003	2008	2013	2019	2020	2021	1999/2021		2020/2021	
									Δ kt	Δ %	Δ kt	Δ %
Import	kt	854	589	520	338	311	255	330	-524	- 61.4	75	29.4
Export	kt	42	528	1,507	1,685	1,816	1,851	1,278	1,236	2,942.9	-573	- 31.0
Consumption	kt	4,561	5,288	5,329	4,715	5,060	5,212	6,050	1,489	32.6	838	19.6
Apparent collection	kt	3,749	5,227	6,316	6,062	6,565	6,808	6,998	3,249	86.7	190	2.8
Net export	kt	-812	-61	987	1,347	1,505	1,596	948				

**Apparent collection: Consumption - Import + Export*

A record domestic consumption of paper for recycling, which totals more than 6 million tons in 2021 (+16% vs. 2020) for the first time. The increased domestic recycling capacity of Italy and the increase of the demand for paper and board packaging have therefore cut net exports by almost half to 948thousand tons in 2021 (-41% vs. 2020).

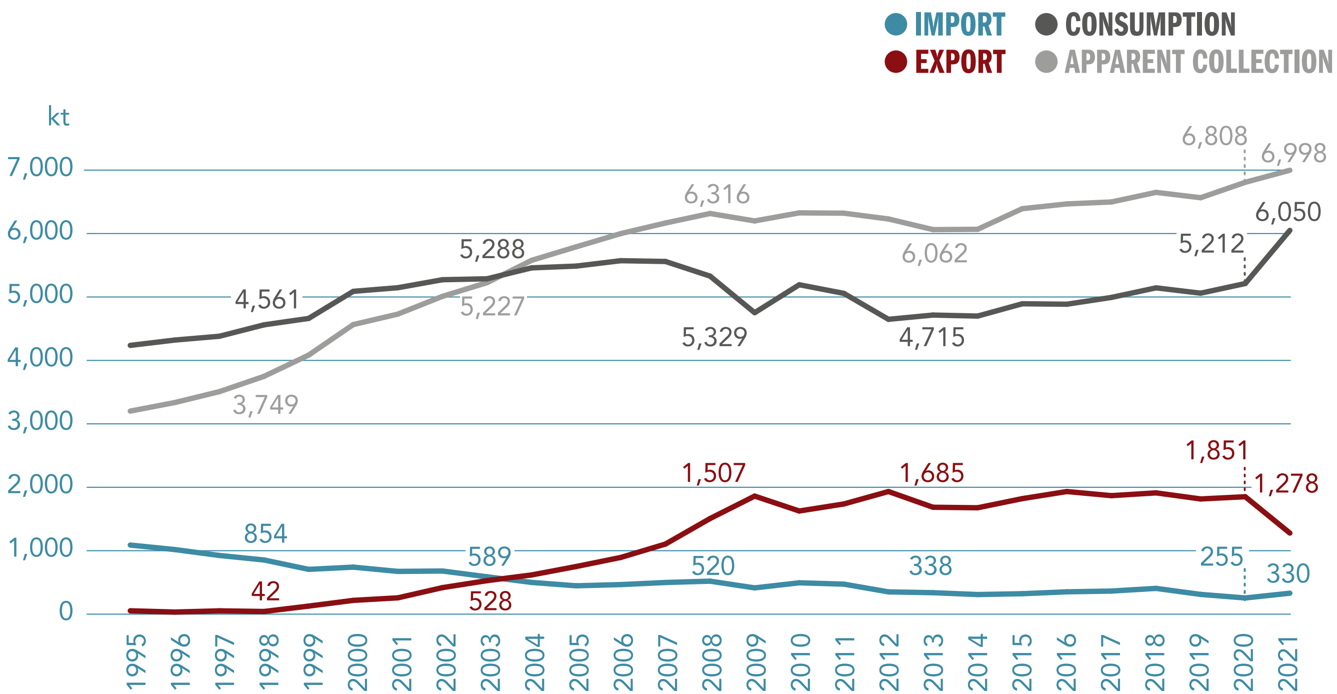
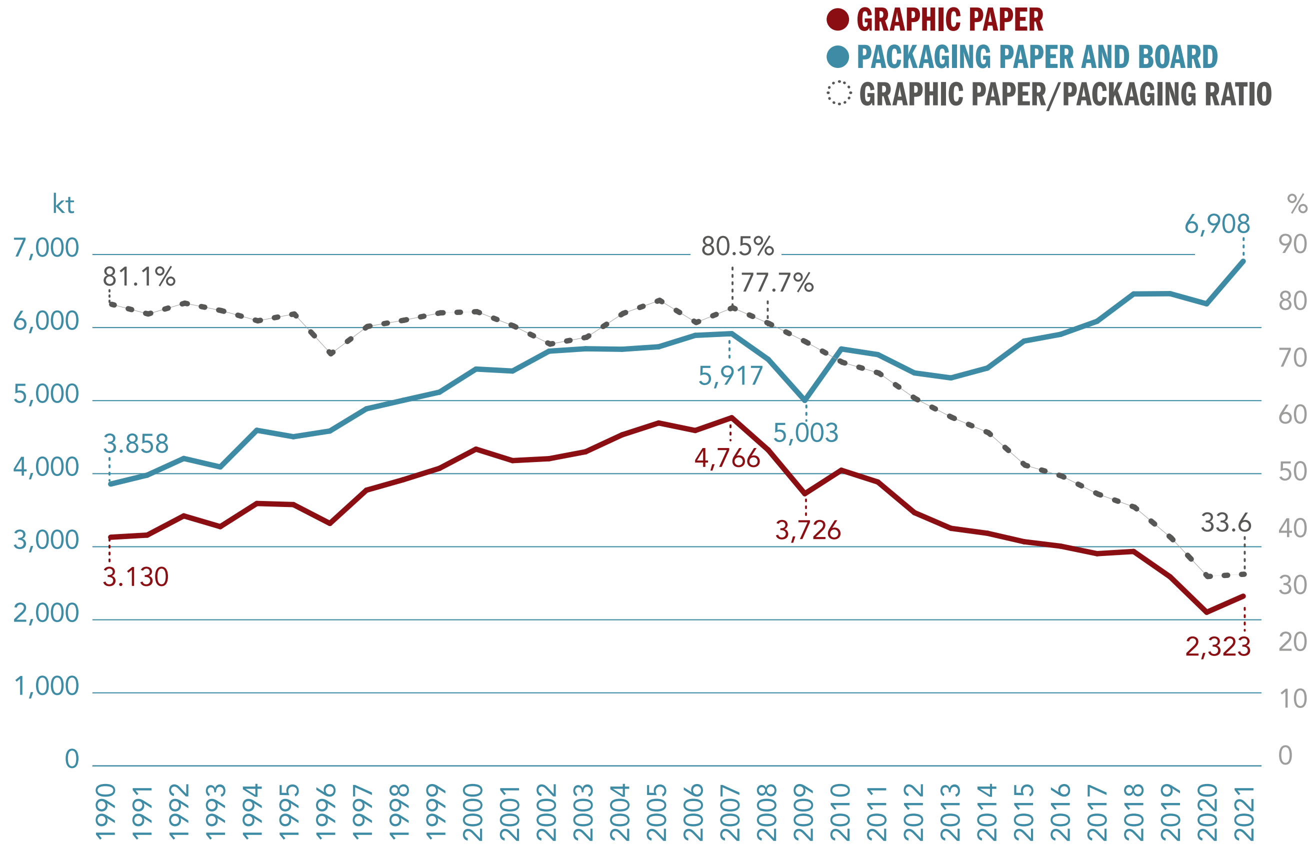


FIG. 15
RATIO OF APPARENT GRAPHIC PAPER TO PACKAGING CONSUMPTION. 1990-2021 HISTORICAL DATA SET.

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, in particular, 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.
Notwithstanding the above, 2021 is positive also for paper production other than packaging that, with 4.1 million tons, reverses the negative trend of the past three years and returns to a 9.6% growth.

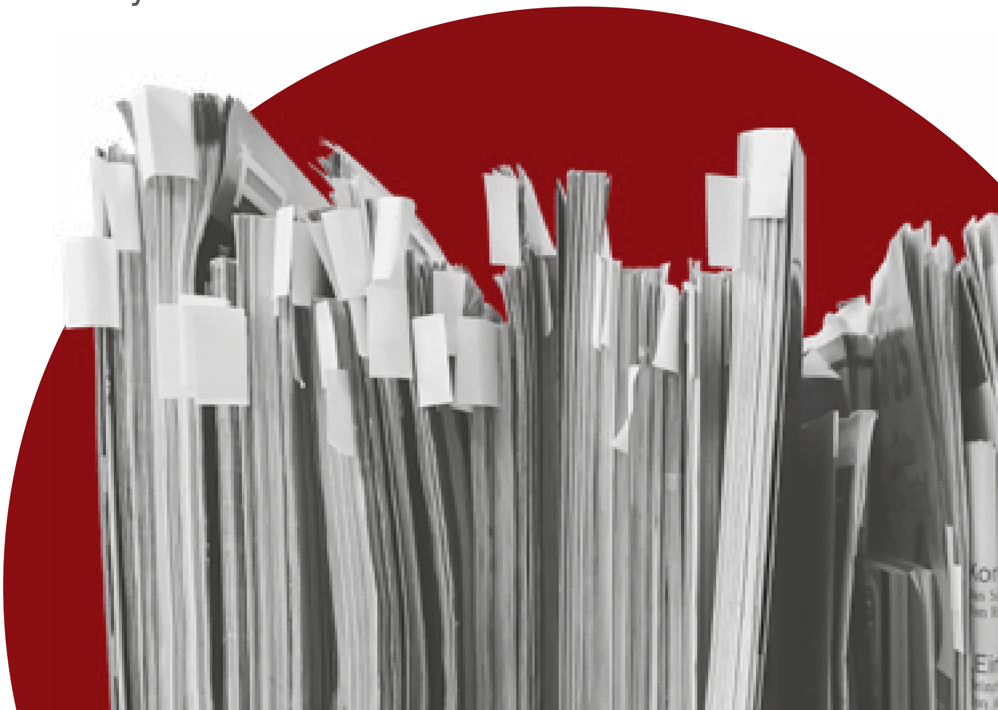
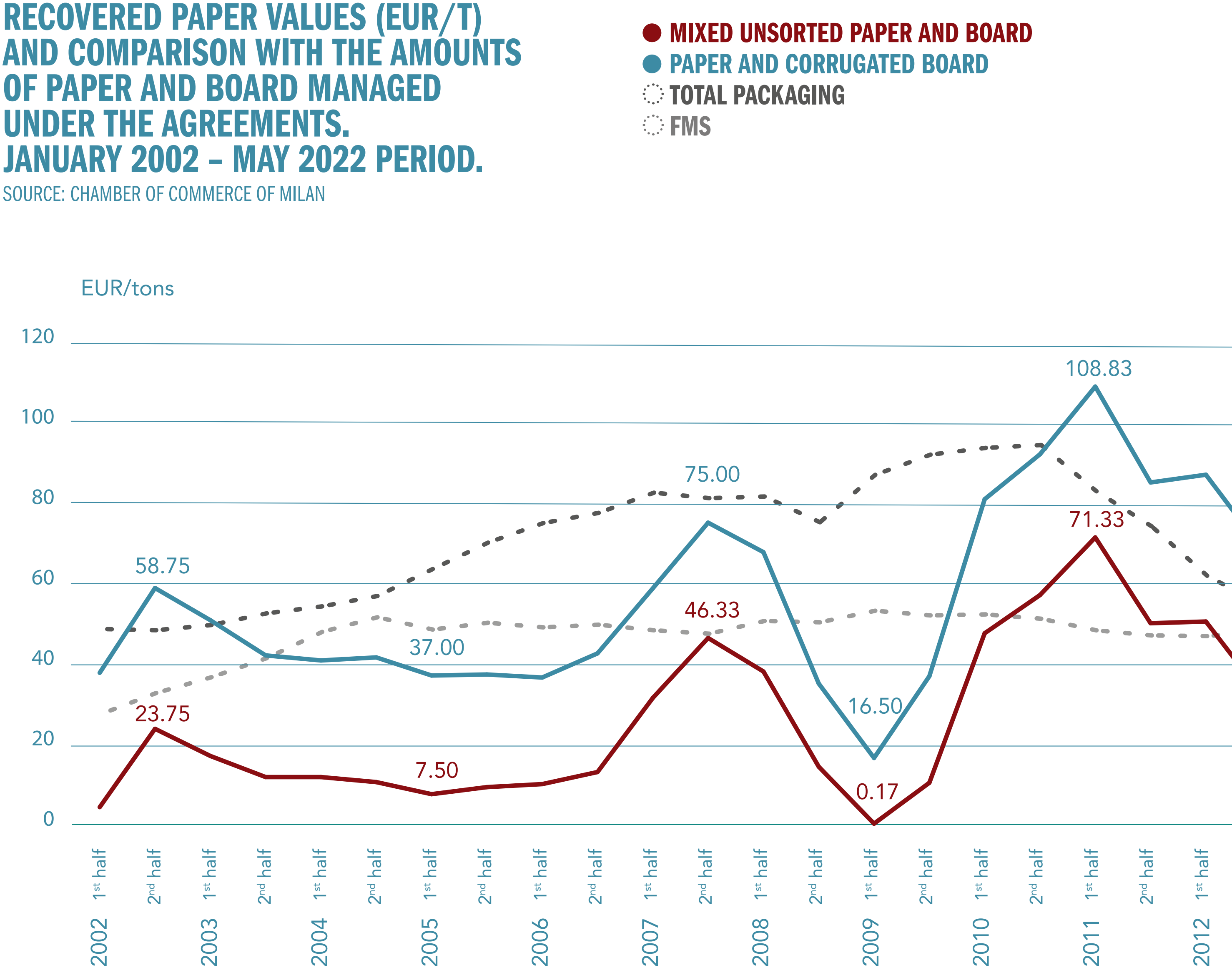
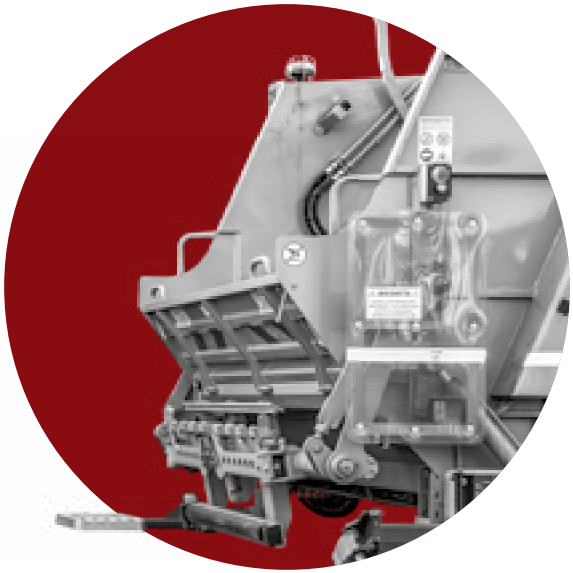
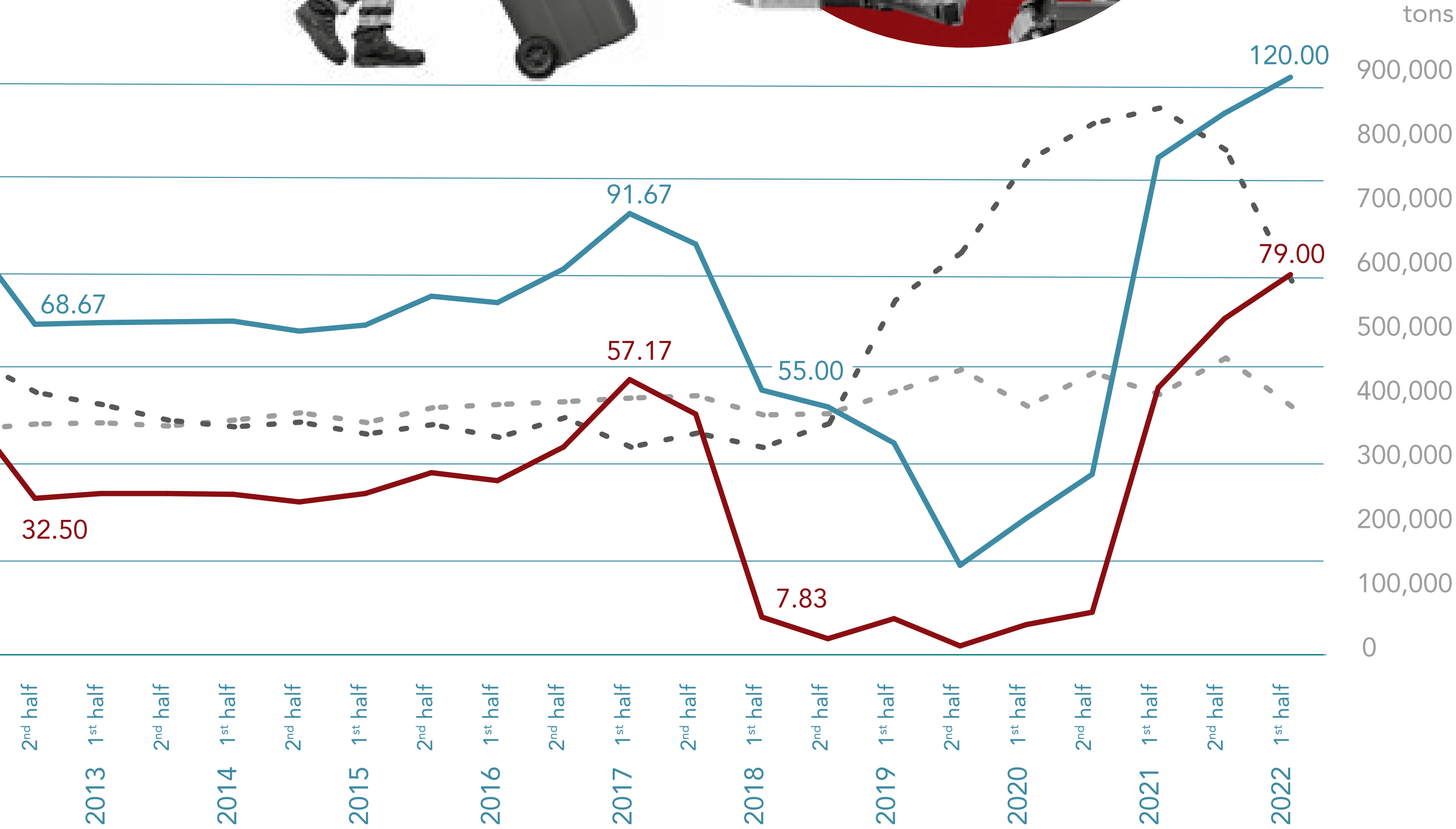


FIG. 16
SIX-MONTHLY RECORDING OF AVERAGE RECOVERED PAPER VALUES (EUR/T) AND COMPARISON WITH THE AMOUNTS OF PAPER AND BOARD MANAGED UNDER THE AGREEMENTS. JANUARY 2002 – MAY 2022 PERIOD.

SOURCE: CHAMBER OF COMMERCE OF MILAN






tons
900,000
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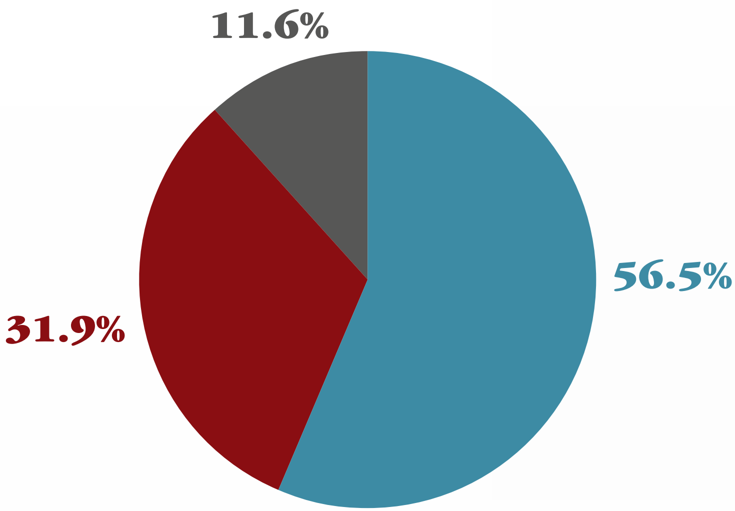
NOTE ON THE METHOD

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

Data processed by the Entities and/or organizations in charge of monitoring or managing waste flows (ISPRA, Regions, Agencies - e.g. Arpa Campania, Provinces, Work Groups, ANCI) or of managing collection (Cities, operators, plants, etc.) is mainly used to determine separate paper and board collection levels. The data thus acquired is overlapped to and compared against the data available to Comieco within the framework of its activity (management of the agreements) to ensure consistency and, if necessary, to carry out further focused reviews. Processing is usually carried out at provincial level but, in specific cases, the analysis is performed at municipal level for a more punctual assessment.

Where "official" data is not available, Comieco estimates the provincial collection level starting from historical data sets and its own data base (collection by the parties under the agreements).



SOURCES AND METHOD.

SOURCE: COMIECO

- ESTIMATED BY
- MANAGED UNDER THE AGREEMENTS
- OTHER SOURCES

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

As to 2021 evaluations, constituting the object of this Report, the share of estimated data increases: 56.5% of collection data comes from third-party sources, 31,9% 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 11.6% is based on estimated amounts.

Processing generally occurs at a time of the year when data from the regions is not complete and consolidated. Therefore, if necessary, certain collection data from the previous year (2020) is updated implementing the values disclosed by ISPRA; as a consequence, the related data (regional and national, per-capita data, etc.) is updated.

Data processed as at June 2021

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National Consortium for Recovery and Recycling of Paper and Board Packaging

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