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Consorzio Nazionale Recupero e Riciclo
degli Imballaggi a base Cellulosica

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Report

Collection, Recycling, and Recovery of paper and board in 2017

July 2018

23rd Report
Collection, Recycling, and Recovery of Paper and Board in 2017

July 2018

Consorzio Nazionale Recupero e Riciclo degli Imballaggi a base Cellulosica

MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION 2017 RESULTS IN THE THREE MACRO-AREAS

Domestic municipal collection

NORTH

1,736,719 t

	Δ 2016/2017	Δ 1998/2017
	-0.1%	**+129%**

63.3 kg/ab-year

Emilia Romagna
86.8 kg/ab-year

CENTRE

801,162 t

	Δ 2016/2017	Δ 1998/2017
	+1.6%	**+313%**

67.4 kg/ab-year

Tuscany
78.3 kg/ab-year

SOUTH

730,670 t

	Δ 2016/2017	Δ 1998/2017
	+6.1%	**+1,343%**

34.7 kg/ab-year

Abruzzo
59.5 kg/ab-year

Collection under the Comieco agreements

NORTH

610,114 t

35.1%
of the total for the area

67.8%
of Cities

78.5%
of inhabitants

52.0 million EUR
of allocated considerations

CENTRE

322,396 t

40.2%
of the total for the area

65.4%
of Cities

86.6%
of inhabitants

22.5 million EUR
of allocated considerations

SOUTH

548,391 t

75.7%
of the total for the area

67.1%
of Cities

84.5%
of inhabitants

35.8 million EUR
of allocated considerations

As a pipeline Consortium within the CONAI System, Comieco works to ensure paper and board recycling, actually supporting the development of separate collection across Italy. Confirming its subsidiary role with respect to the market, Comieco focuses resources and investments in areas that need more support, and lets more mature ones continue their journey independently.

MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION IN ITALY

ITALY

3,262,495 t
Municipal separate paper and board collection

Δ 2016/2017	Δ 2016/2017	Δ 1998/2017
+53mila t	+1.6%	+226%

54.2 kg/ab-year

Emilia Romagna
86.8 kg/ab-year
Best per-capita 2017

Sicilia
+16.1%
Greatest increase Δ 2016/2017

COMIECO MANAGEMENT

1,480,900 t
Managed collection

45.4%
of municipal collection

67.3%
of Cities

82.2%
of inhabitants

110.3 million EUR
Considerations allocated to the Cities

+8%
Δ 2016/2017

PAPER AND BOARD PACKAGING RECYCLING AND RECOVERY IN ITALY

comieco
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4.9 milioni di t
Apparent paper and board packaging consumption

10 t
Paper for recycling recycled every minute

79.8%
Recycling rate

87.7%
Recovery rate

+2.1%
Paper production
Δ 2016/2017

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ACRONYMS

CTA
Comieco 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
.000 tons

ab
inhabitants

kg
kilograms

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Paper
is recycled
and comes
back to life.
Guaranteed
by Comieco.

PREFACE

by
Amelio Cecchini
Chairman, Comieco

2017 THE QUALITY CHALLENGE

The release of the annual report – now at its 23rd edition – is part of the tradition of Comieco to collect data on the whole paper supply chain.
Last year, multiple issues and challenges were introduced for recycling operators, which now drive the choices of the decision-makers involved, with different roles, in managing paper and board collection, processing, and recycling.

Varying signs come from the individual macro-areas: while growth is still largely possible in the Centre and South, the North has been recording general stability for a few years now. But how should these numbers be interpreted?

Encouragingly, greater awareness of the importance of appropriate post-consumption material management is shared by all – separate collection and recycling are now part of the DNA of citizens, managers, and operators. Where separate paper and board collection is consolidated, sorting standards are high and feed the supply chain constantly with recycling-ready materials. Positive signs also come from the regions where services are available: user response is usually prompt and takes little time to consolidate, with clear positive impacts on the quality of the conferred materials.

Growth is not as fast as it could and should be, though. The country's data for 2017 points out to a 1.6% growth, a positive value, yet below the result recorded in the previous two years. This year again growth is mostly driven by the South, where the Consortium has been promoting separate collection development for a few years now by means of focused, virtually tailor-made measures, which provide for qualitative and quantitative targets and deadlines for achievement thereof. This year's data, with a focus on Trentino Alto Adige in the North and Tuscany in the Centre, shows that there is still room to grow in Regions that have been driving collection for years.

The past year showed a clear divide for the recycling pipeline. In the early months of the year, the paper for recycling market was bright, with quotations comparable to the 2010/2011 peak values. The change of the maximum allowed contaminant levels notified by China at mid-year was a sharp turning point. From September, in fact, prices started to decline, matching the minimum levels recorded in 2009 early this year.
This trend was part of an overall expansion of the paper sector, with positive signs confirming the trend for the previous three-year period.
It should be noted that significant investments are scheduled at national level on new manufacturing sites aimed at expanding the demand for paper for recycling.

Shifting our focus further downstream, the analysis of the historical data set for the paper sector is influenced by two factors that changed and are still radically changing the consumer society: on one hand the decline of graphic paper, which goes hand in hand with the gradual "replacement" that IT technologies have brought about in publishing and data storage; on the other, the production of paper and board packaging, which now enjoys two-digit growth thanks to product e-commerce.

How can seemingly contrasting dynamics, such as the expansion of collection and the possible difficult allocation of materials for recycling, be reconciled? The key can be summarized in a single word – QUALITY!
Quality of services: accurate and timely collection, effective user communication, operator training.
Quality of in-plant processing: ensure smoother paper-mill based recycling, reduce processing scraps while ensuring their disposal, these being anyway a share of urban waste unduly captured within the recycling process.

EXECUTIVE SUMMARY

Carlo Montalbetti
General Manager, Comieco

THE SOUTH CONTINUES TO DRIVE PAPER AND BOARD COLLECTION DEVELOPMENT IN ITALY

Municipal paper and board collection in Italy totalled more than 3.2 million tons in 2017, with a per-capita amount that raises the annual national average above 54 kg. This 23rd report confirms the ongoing development of separate paper and board collection already observed over the past 3 years: over 50thousand tons of paper and board were recycled in 2017, with an overall 1.6% increase vs. the previous year. Data for the three Italyn macro-areas point out to a composite growth.

The South continues its run, totalling close to 35 kg per capita with an increase by over 6 percent points vs. 2016, and accounting for over three-quarters of the domestic volume increase. Significant results were also achieved with the use of the special funds allocated by Comieco to buy paper and board collection equipment and vehicles within the framework of development projects in Cities "below average": with the Plan for the South and the ANCI Tender, the total investment of the Consortium amounted to 8.3 million EUR for the 2014-2017 four-year period. While the Centre records, in turn, a positive sign (+1.6%), data is substantially stable for the North, even if this is where virtuous Regions like Emilia Romegna and Trentino Alto Adige are growing even further, thus demonstrating that you should never stop and there is always room to improve.

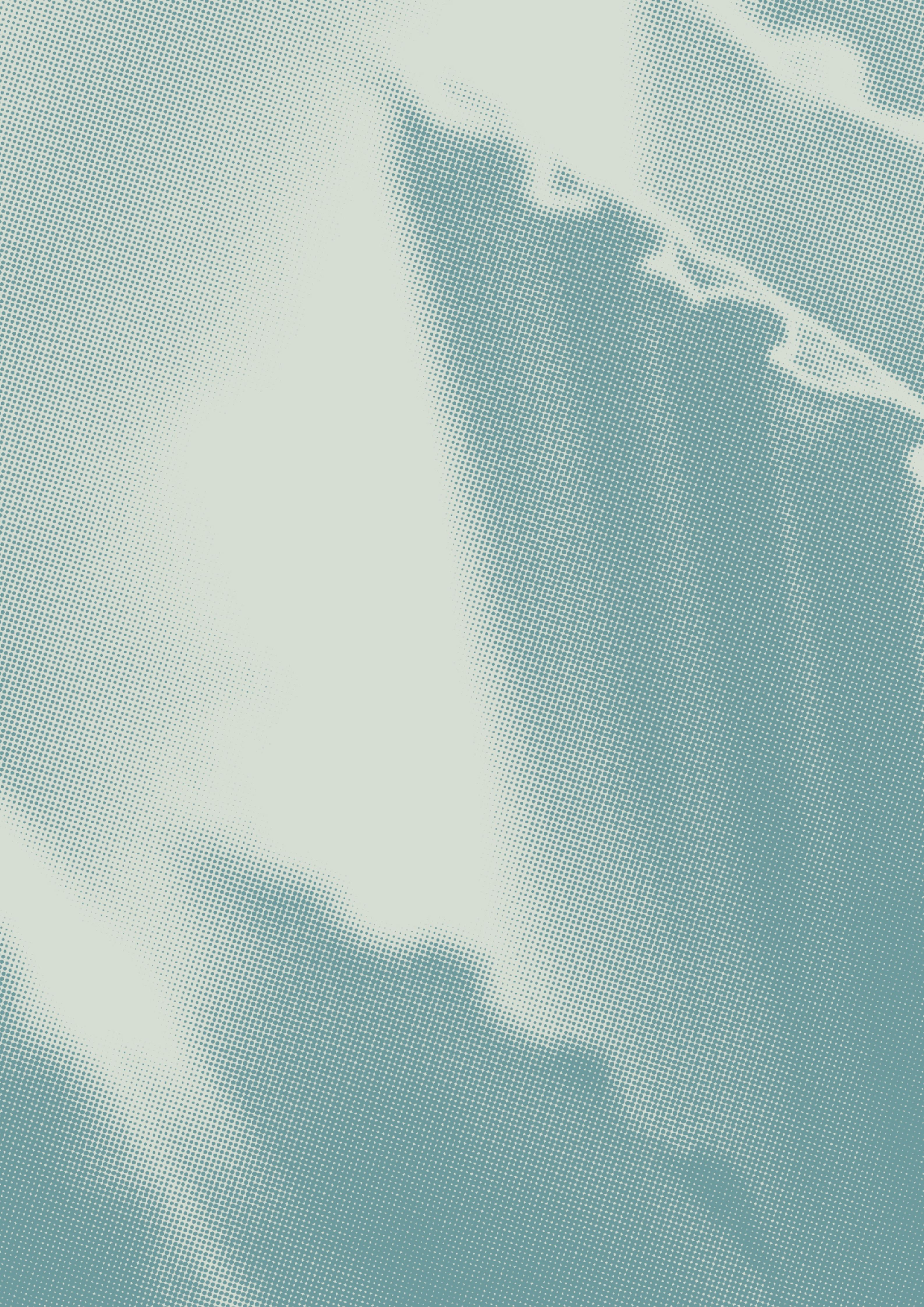
The role of the Consortium has changed since its establishment. In 2017, with 845 active agreements, the amount of paper and board managed by Comieco accounted for approximately 45% of total municipal separate collection, with an average 35/40% incidence in the North and Centre and 75% in the South. Therefore Comieco is still a key party to ensure recycling and the development of collection services, particularly in the South, where Cities have troubles at "networking" and optimizing investments and know-how, and where the potential is still very high: according to estimates, at least 600thousand tons of paper and board are still available for collection before they end up in a landfill.

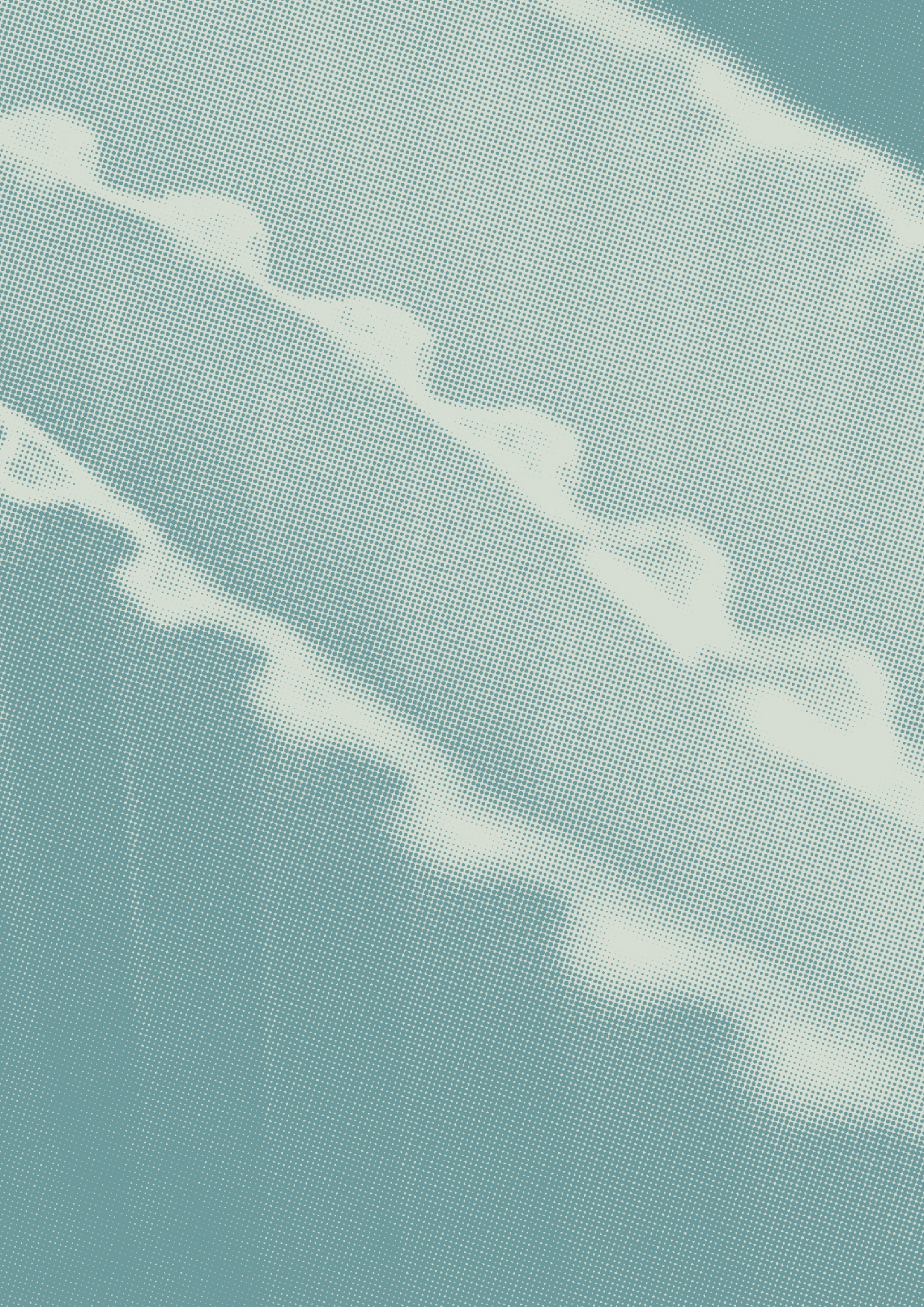
Since its inception in the late 1990s, paper and board recycling has improved significantly in Italy, which can now be considered to its full right as one of the best organized European countries: in 20 years, paper and board collection volumes increased more than threefold – from 1 to over 3 million tons per year. Almost 49 million tons are recycled, which means a 45 million ton reduction of CO_2 emissions and 400 local landfills less.

As a pipeline Consortium within the CONAI System, since the enforcement of the "Ronchi Decree" (Legislative Decree No. 22/97) Comieco has been working to ensure paper and board recycling, actually supporting the development of separate collection across Italy with over 1.5 billion EUR allocated to the Cities involved in the agreements (110 million EUR in 2017 alone) and 29.4 million tons of managed paper and board. This is a subsidiary role that Comieco is still playing today, letting mature areas (the North and Centre) continue their journey independently and rather concentrating its efforts – and investments – in areas that need more support.

But this is not enough! Quantity should go hand in hand with Quality, a key factor also in the last Framework Agreement. The average content of contaminants has declined with respect to 2016, but again not homogeneously in the different macro -areas. While collection at business level is generally effective, "household collection", the true target and challenge, is improving in the North, but not in the Centre and South. With respect to city size, it should be noted that, except for some virtuous cases, it is mostly in big cities that service efficiency, a fluid social texture, and urban-planning complexity have a

significant impact on the content of contaminants in municipal paper and board collection.
Briefly, paper collection has been expanding since 2014 at an average rate of two percent points per year, driven by the South, but there is still something more we can do, and do it better. This trend should be supported and accelerated with the short-term target of surpassing the symbolic 3.5 million ton threshold. An additional 200thousand tons is an attainable result.
Shifting our focus further downstream, the analysis of the historical data set for the paper sector, after almost twenty years of "matching" trend, now points out to a separation between packaging consumption and graphic paper consumption. From 1990 to 2007, "packaging" and "graphic paper" consumption developed in parallel, but in the following ten years (2008/2017) graphic paper consumption fell from the 2007 peak value (4.8 million tons) to less than 3 million tons in 2017 – below the baseline value (1990). Over the same period of time packaging consumption continued to increase, despite the fluctuations due to the economic downturn, and totalled more than 6 million tons in 2017. The graphic paper/packaging ratio in 2017 is 47.6%.
This data can be interpreted in the light of two factors that have changed and are still radically changing the consumer society. The decrease of graphic paper consumption was definitely impacted by the gradual "replacement" that IT technologies brought about in the publishing and data storage sector. Just consider that graphic paper production in the past ten years suffered a significant decline that resulted into a fifty-percent decrease of the average monthly circulation of newspapers. The increase of packaging paper consumption, on the other hand, is actually promoted by technology: considering the development of e-commerce, i.e. the part of trade that calls for logistics and packaging (over 100 million boxes a year) across the Italyn territory in 2017, the overall estimated value is 12.2 billion EUR, with an estimated 15 million EUR monthly volume of deliveries in Italy.
The effects of both the above factors are measured downstream, based on the changing collection mix. The rate of packaging is increasing and calls for specific measures. In Milan, where the estimated daily e-commerce deliveries exceed 23,000 units, the conditions were established to launch a pilot project for "on call" municipal collection: AMSA, in cooperation with Comieco, launched a new cardboard-only collection service that grew by almost 10% in one year to more than 17thousand tons.





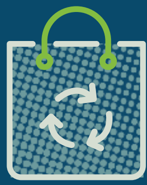
SEPARATE PAPER AND BOARD COLLECTION IN ITALY – THE STATE OF THE ART

2017: STEADY GROWTH, ALBEIT SLOW

Separate paper and board collection, like all human activities, can be constantly improved, as shown by the 2017 trend: with almost 3.3 million tons of paper and board collected separately and recycled, thus avoiding disposal, a 1.6% increase was recorded, i.e. over 50thousand tons more compared to 2016. It is as if the entire province of Treviso, a model of waste management efficiency, had doubled its waste paper and board collection. The South accounts for over three-quarters of the increase (+6.1%); the rest is attributable to the Centre (+1.6), while the North records substantially unchanged results, probably due to the market of paper for recovery – particularly cardboard – which drew flows of materials away from the activity of municipal administrations.

Each citizen made additional efforts to increase per-capita collection by almost one kilogram – from 53.3 kg in 2016 to 54.2 kg last year.
While this indicator is a key reference figure, it should be considered alongside other values to ensure clear understanding of, and to describe current trends and changes.

Cellulose-based materials represent the second most important fraction of urban waste, following organic waste; their separate collection is one of the pillars of an integrated waste management system designed to achieve legal targets.
This is to say that collection data should be compared against overall waste production levels and total separate collection to obtain a more reliable overview of the sorting efficacy, as well as guidance on the areas that need consideration. The ratio of collected paper and board to total urban waste at domestic level totals again between 10.5% and 11.0% in 2017. This figure points out to a growth potential that is still significant. Regional details show that behaviours in the different areas basically depend on the penetration of the separate waste collection culture across the Italyn population, on the socio-economic environment and, last but not least, on the quality and organizational efficiency of municipal collection services. Differences among the individual geographic regions of the country have always been closely analyzed and have been the object of focused financial investments in the past few years, which produce significant results.



54.2 kg
Average per-capita collection

3.3 million t
Municipal paper and board collection volume

+53 thousand t
vs 2016

Table 1

MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION BY REGIONS. YEARS 2016-2017.

Source: Comieco

In 2017 the macro-areas continue to follow the trend of the past 3 years. The South stands out with an increase by more than 6 percent points vs. 2016, thus accounting for over three-quarters of the additional domestic volumes.

REGION	SC OF PAPER 2016	SC OF PAPER 2017	Δ 2016/17	Δ 2016/17
	t	t	t	%
Piedmont	265,360	260,056	-5,304	-2.0
Vallée d'Aoste	9,649	9,534	-115	-1.2
Lombardy	559,461	561,742	2,281	0.4
Trentino Alto Adige	81,197	83,399	2,202	2.7
Veneto	290,040	286,786	-3,254	-1.1
Friuli Venezia Giulia	69,646	69,827	182	0.3
Liguria	83,533	84,467	933	1.1
Emilia Romegna	379,162	380,909	1,747	0.5
NORTH	**1,738,048**	**1,736,719**	**-1,328**	**-0.1**
Tuscany	287,040	295,557	8,517	3.0
Umbria	56,796	56,740	-56	-0.1
Marche	100,571	100,336	-235	-0.2
Latium	344,256	348,529	4,273	1.2
CENTRE	**788,662**	**801,162**	**12,500**	**1.6**
Abruzzo	74,570	79,440	4,870	6.5
Molise	7,244	7,711	467	6.4
Campania	181,731	182,809	1,078	0.6
Puglia	161,093	170,338	9,245	5.7
Basilicata	20,417	21,723	1,306	6.4
Calabria	63,435	68,000	4,565	7.2
Sicily	95,654	111,051	15,397	16.1
Sardinia	79,002	83,542	4,540	5.7
SOUTH	**683,147**	**724,614**	**41,468**	**6.1**
ITALY	**3,209,856**	**3,262,495**	**52,639**	**1.6**

Note: 2016 data adjusted for Campania, Friuli Venezia Giulia, Puglia, Tuscany, and Veneto.

Figure 1

PER-CAPITA MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION BY REGIONS AND BY AREAS IN 2017.

Source: Comieco

- <30 kg/ab year
- 30-45 kg/ab year
- 45-60 kg/ab year
- 60-75 kg/ab year
- >75 kg/ab year

Average per-capita collection in Italy reached 54.2 kg/ab in 2017. The South is close to the 35 kg annual threshold. The performance of the past few years is confirmed for the North and Centre. Emilia Romegna, Tuscany, and Abruzzo are still the leaders in their respective areas.

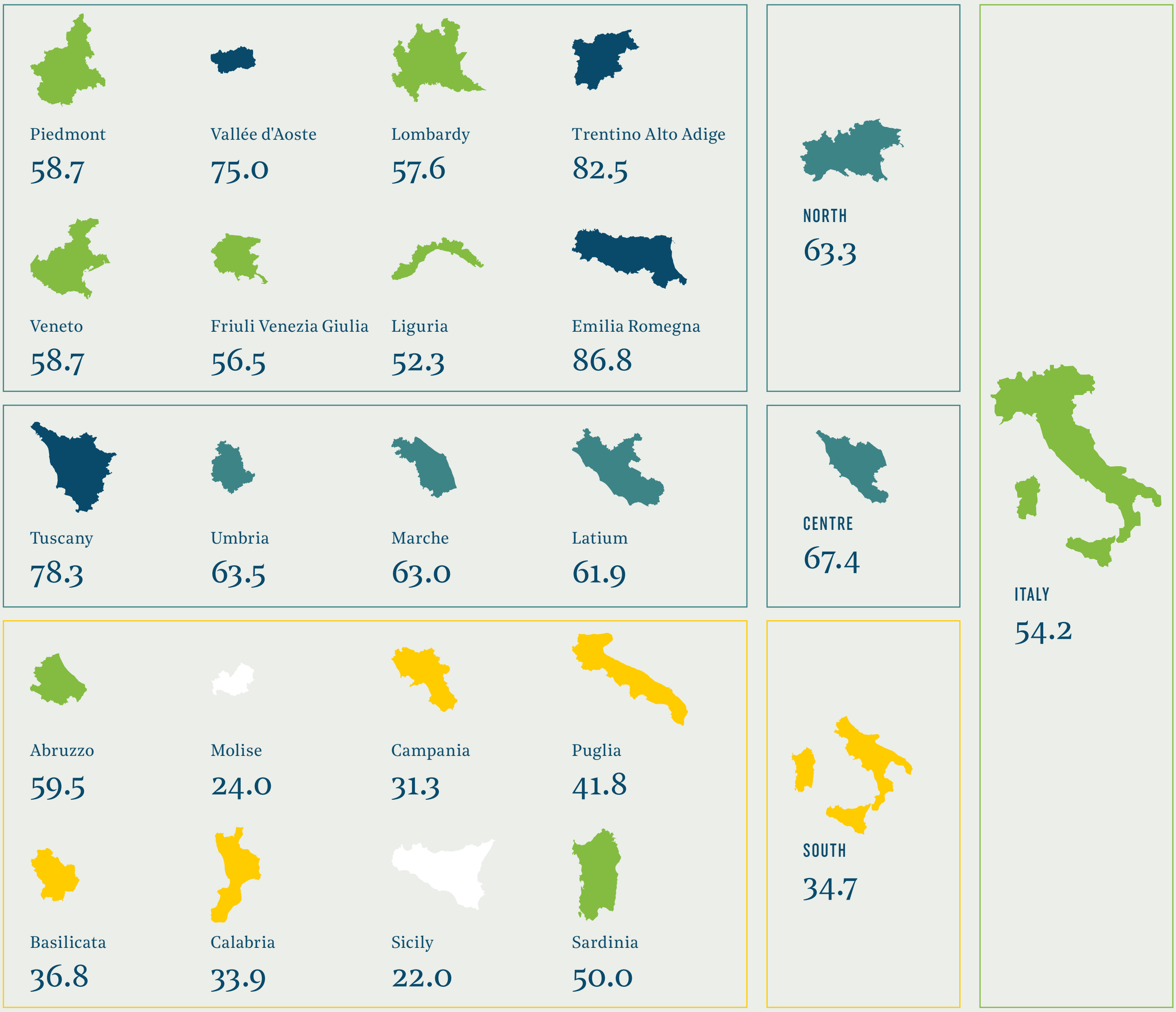
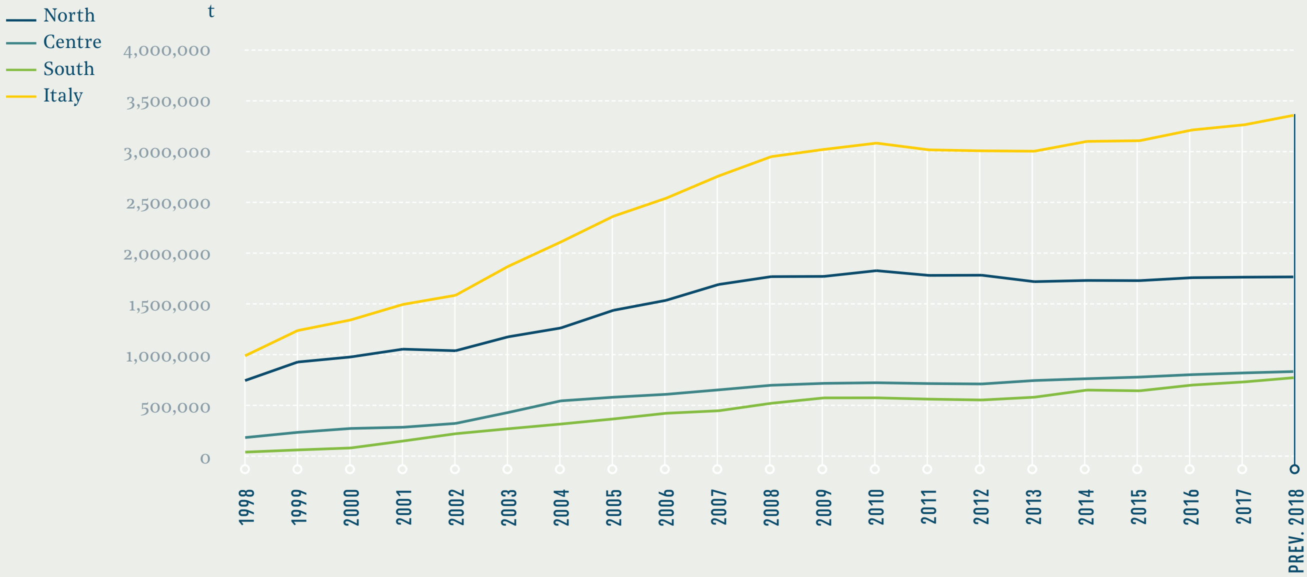


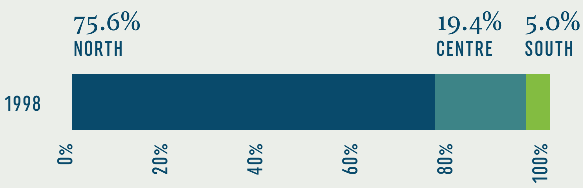
Figure 2

MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION. 1998/2017 TREND AND FORECASTS FOR 2018.

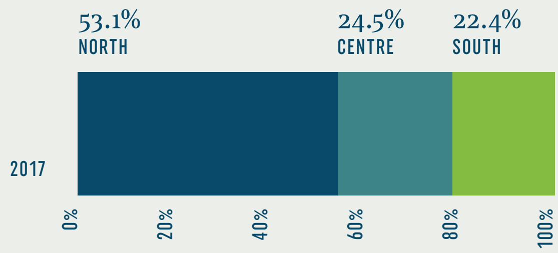
Source: Comieco



	1998	2017	2018 PREVISIONE	Δ 2017-2018	Δ 1998-2017
	t	t	t	t	%
North	756,813	1,736,719	1,748,166	11,447	129
Centre	193,958	801,162	824,356	23,194	313
South	50,222	724,614	774,565	49,951	1,343
ITALY	1,000,993	3,262,495	3,347,087	84,591	226



Note: areas are proportional to the collection data



RAISING THE BAR – A LOCAL CHALLENGE

A more detailed analysis of the situation highlights more diversified data. Positive and negative results in the North are mutually offset and the balance is -0.1%, which should not be deemed negative. These are mostly amounts of cellulose-based waste, cardboard in particular, that were excluded from municipal collection due to strong market conditions in the first part of the year and to industrial demand. Excluding the net data for Piedmont and Veneto, where this phenomenon is more obvious, the rest of the North records an average 1% growth. Trentino Alto Adige deserves special mentioning: while boasting the second best national per-capita figure (82.5 kg/ab), it continues to grow. This trend can be interpreted in the light of a deeply rooted focus on appropriate waste management, which allows to implement "closely focused" policies and measures in a region that is also characterized by a strong tourist inclination.

The trend in the Centre is encouraging (+1.6%). The best performance, both in terms of total and of per-capital volume, is recorded in Tuscany and the same considerations made for Trentino Alto Adige also apply here. Weaker signs come from other Regions. Umbria and Marche are substantially stable, whereas Latium records minimal growth (+1.2%). Pending a change of approach in Rome – where development margins are significant – several medium-sized cities in this Region, including Rieti and Tivoli, are proving quite dynamic; here, measures are being introduced for collection services, also leveraging on the support provided by the Equipment Tender, discussed further on in this Report.

Lastly, the South shows a positive performance, with a global 6.1% growth. All Southern regions record positive results: the figure for Sicily – 16.1% – stands out in particular, totalling +30% vs. 2015 if summed up to last year's. Sicily is the object of the strongest recent and current measures and may soon provide a significant contribution to overall growth. A somewhat contrasting trend is observed in Campania, where growth, albeit positive, is slower than in other regions (less than 1%). However, considering the efficiency of the private sector in this region, the same market dynamics observed in northern Italy may reasonably be deemed to be in place here.

While applauding these growth rates, it should be noted that the present collection level in southern Regions is still just above half compared to the rest of the country. In terms of volumes, the South is close to the 800thousand tons of the Centre, however with an almost twice as large population. It is therefore justified to concentrate most efforts on southern Regions with the purpose of capturing a potential 600thousand tons a year of cellulose-based materials that still end up in landfills in this area. In terms of per-capita collection, the 35 kg/ab reference threshold for access to the funds allocated by the equipment tender is almost close-by. However this performance is still poor if compared against the almost 65 kg/ab collected in the Centre and North.

Both in the North and in the Centre, the best performing Regions have improved even further, thus confirming that a positive attitude stimulates each player within its scope (supply chain, administration, operators, citizens), with good results for all.

In a per-capita collection ranking, the most virtuous regions include Emilia Romegna with 86.8 kg per-capita, followed by Trentino Alto Adige (82.5) and Tuscany (78.3). Per-capita collection in these three Regions amounts to 80 kg on average, 50% above the national per-capita result. Sicily and Molise still rank at the bottom end, with 22 kg and 24 kg respectively.

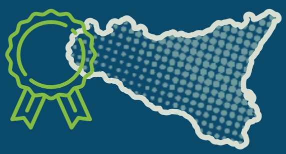
A different key for interpretation comes from the ratio of total waste production/total separate collection to paper-only collection. This parameter implies minor changes to the ranking, and sees the citizens of Trentino Alto Adige at the top with 16% paper sorting from urban waste (like Veneto, this region disposes of less than 150 kg/ab of urban waste in landfills). A number of regions harshly compete for the second place in ranking in terms of paper sorting from total urban waste. Emilia Romegna, Vallée d'Aoste, Piedmont, Marche, and Abruzzo are all close to 13%. These last two Regions deserve special mentioning: as representatives of, respectively, the Centre and South, they demonstrate that effective collection is an asset for all.

Lastly, a note on overall separate collections. ISPRA 2016 data certified that the 50% threshold was surpassed (52.5%). Such growth continued up to almost 55% in 2017. Pending the recent implementation of the new EU directives, according to estimatesabout 4 million tons more of waste should be collected separately to hit the 65% target provided for by the Ronchi Decree of 1997. Paper and bo ard play a key role in this process, with a share that is worth almost one-fourth of these volumes.

The Region with the best per-capital result

Emilia Romegna

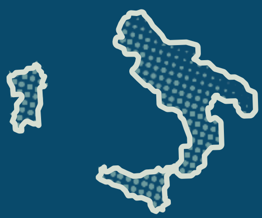
86.8 kg



The Region with the highest increase

Sicily

+16.1%



The South is catching up

+6.1%

Table 2

THE RATIO OF SEPARATE PAPER AND BOARD COLLECTION TO TOTAL URBAN WASTE.
Source: ISPRA 2016 data processed by Comieco

Data on paper sorting from urban waste and the amount of residual waste, combined with per-capita figures, ensure better understanding of the actual development of separate waste collection services. In this table, Regions and macro-areas are arranged in decreasing order based on the separate paper collection rate vs. total urban waste.

REGION	INHABITANTS	TOTAL UW	MIXED UW	TOTAL SC	TOTAL SC	SC OF PAPER	SC OF PAPER VS. TOTAL UW
	n	kg/ab	kg/ab	kg/ab	%	kg/ab	%
Trentino Alto Adige	1,062,860	480.3	141.8	338.5	70.5	77.4	16.1
Emilia-Romegna	4,448,841	652.9	256.9	396.0	60.7	85.2	13.0
Marche	1,538,055	527.2	213.1	314.0	59.6	68.6	13.0
Vallée d'Aoste	126,883	572.8	254.3	318.5	55.6	73.1	12.8
Piedmont	4,392,526	470.3	204.0	266.3	56.6	59.7	12.7
Abruzzo	1,322,247	455.3	210.5	244.8	53.8	57.7	12.7
Tuscany	3,742,437	616.4	301.5	314.9	51.1	76.7	12.4
Friuli Venezia Giulia	1,217,872	477.9	157.1	320.8	67.1	58.7	12.3
Veneto	4,907,529	486.8	131.9	354.9	72.9	59.1	12.1
Umbria	888,908	529.4	224.5	304.9	57.6	64.1	12.1
Lombardy	10,019,166	477.3	152.2	325.1	68.1	55.9	11.7
Latium	5,898,124	513.0	295.6	217.3	42.4	58.3	11.4
Sardinia	1,653,135	443.7	176.8	266.9	60.2	48.2	10.9
Basilicata	570,365	354.1	215.1	138.9	39.2	36.4	10.3
Liguria	1,565,307	540.1	303.9	236.2	43.7	53.4	9.9
Calabria	1,965,128	403.8	269.7	134.1	33.2	35.1	8.7
Puglia	4,063,888	471.1	309.5	161.5	34.3	39.6	8.4
Campania	5,839,084	450.0	218.0	232.1	51.6	31.1	6.9
Molise	310,449	388.0	279.5	108.5	28.0	19.6	5.1
Sicily	5,056,641	466.1	394.2	71.9	15.4	18.4	3.9
NORTH	27,740,984	510.2	182.4	327.7	64.2	62.6	12.3
CENTRE	12,067,524	548.0	281.7	266.4	48.6	65.8	12.0
SOUTH	20,780,937	450.0	280.8	169.2	37.6	33.1	7.4
ITALY	60,589,445	497.1	235.9	261.1	52.5	53.1	10.7

Figure 3

URBAN WASTE PRODUCTION, TOTAL SEPARATE COLLECTION, AND MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION IN ITALY. 1998-2017 HISTORICAL DATA SET.

Source: Comieco

Total SC kt
Mixed UW kt
SC %
SC of paper and board kt

Overall estimated urban waste production is stable, separate collections subtract approximately 700thousand tons from mixed waste; the rate is close to 55%.

PER-CAPITA SEPARATE PAPER AND BOARD COLLECTION DATA BY MACRO-AREAS

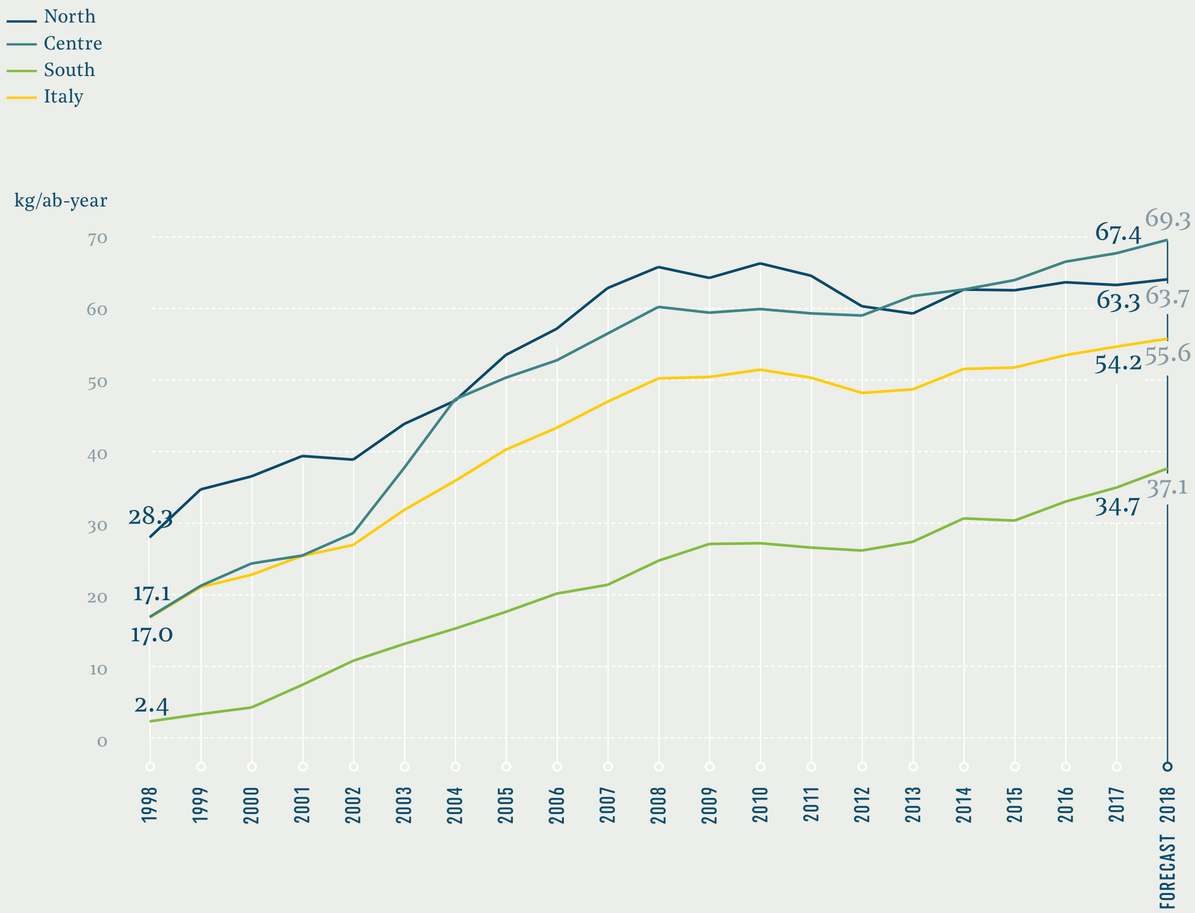
	1998	2016	2017	Δ 2016/2017	Δ 1998/2017	Δ 1998/2017
	kg/ab-year	kg/ab-year	kg/ab-year	kg/ab-year	kg/ab-year	%
North	28.3	63.3	63.3	0.0	35.0	123.6
Centre	17.1	66.3	67.4	1.1	50.3	294.0
South	2.4	32.7	34.7	2.0	32.3	1,346.3
ITALY	17.0	53.3	54.2	0.9	37.2	218.7

The South and metropolitan areas are the main targets, but all regions still have untapped potentials to a varying extent.

Figure 4

MUNICIPAL SEPARATE PAPER AND BOARD COLLECTION. 1998/2017 VOLUME TREND AND 2018 FORECASTS

Source: Comieco



BIG CITIES – COMPLEX SYSTEMS

Metropolitan areas and, particularly, major cities, are special observation points that deserve specific analysis. This monitoring – carried out for several editions of the Annual Report – has been focused on the seven biggest Italian cities (from the North to the South: Turin, Milan, Florence, Rome, Bari, Naples, and Palermo), which account, together, for just less than 12% of inhabitants and almost 14% of the urban waste produced in Italy.

These cities are characterized by physiological complexity derived from a multitude of inhabitants, different types of users, urban textures – factors that result into reduced efficiency of the organization and operation of urban health services. This is confirmed by the separate collection rates that only in two cases – Milan and Florence – are above 50%, vs. a national average close to 55%.

Data for 2017 shows that urban waste production has generally remained unchanged (-0.2%). At the same time, separate collections have increased (+3.7%) to the detriment of mixed waste (-2.9%). This means that over 60thousand tons of waste have changed their destination, from disposal to recycling. The main input to this shift comes from Rome, Naples, and Palermo, where some changes are under way, albeit with great effort, also including dedicated projects.
Turin and Florence deserve special consideration. While all the analyzed items are declining in these two cities, the most significant change concerns the mixed waste share, with subsequent benefit for the separate collection rate.

The analysis of the aggregate data of these seven sample cities (that, together, make up a virtual area that could be referred to as metropolitan region) provides other interesting insights, particularly if analyzed as an historical data set. In 14 years, the average separate collection rate in these seven cities, together, has grown from 18% in 2004 to 42% in 2017 – almost one million tons of waste that were disposed of in 2004 are now recycled – and, at the same time, waste production has declined by almost 5%. This phenomenon was driven by paper and board. While cellulose-based materials accounted for over 50% of separate collection in 2004, they still play an outstanding role today with almost 29%. Over 120thousand tons of paper and board a year are still found in our “urban forests”, high potential reserves that still need to be recovered.

+3.7%

Total separate collection is increasing

-0.2%

Total waste is almost unchanged

-2.9%

Mixed waste is decreasing

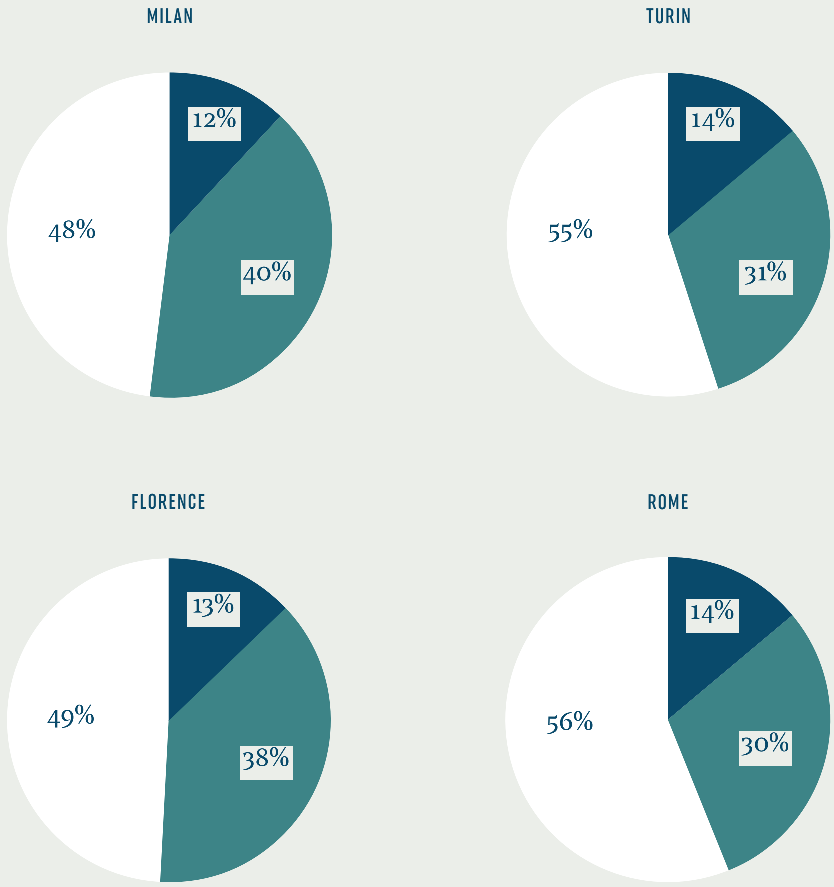
Figure 5

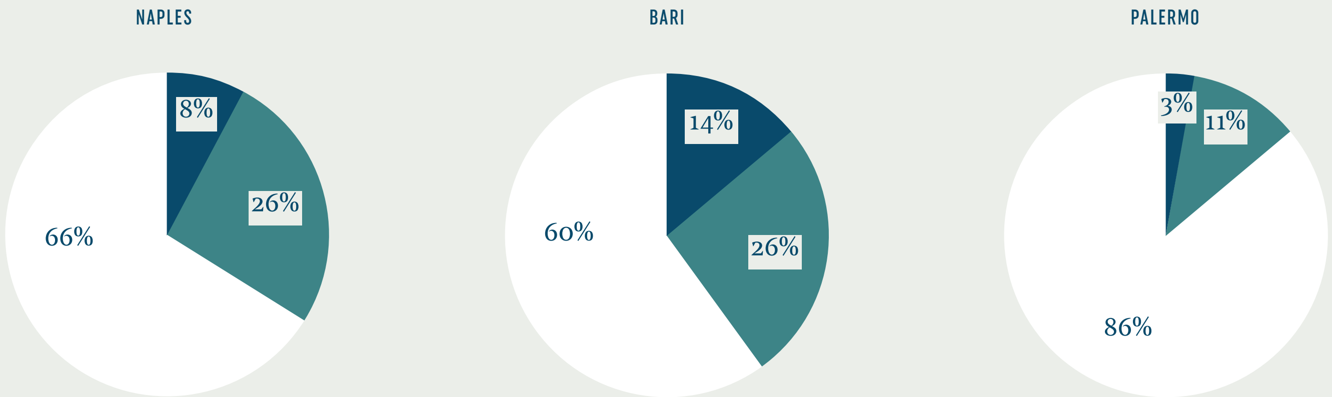
WASTE COLLECTION IN THE SAMPLE CITIES OF TURIN, MILAN, FLORENCE, ROME, NAPLES, BARI, AND PALERMO. YEAR 2017 AND 2016-2017 VARIATIONS.

Source: Comieco

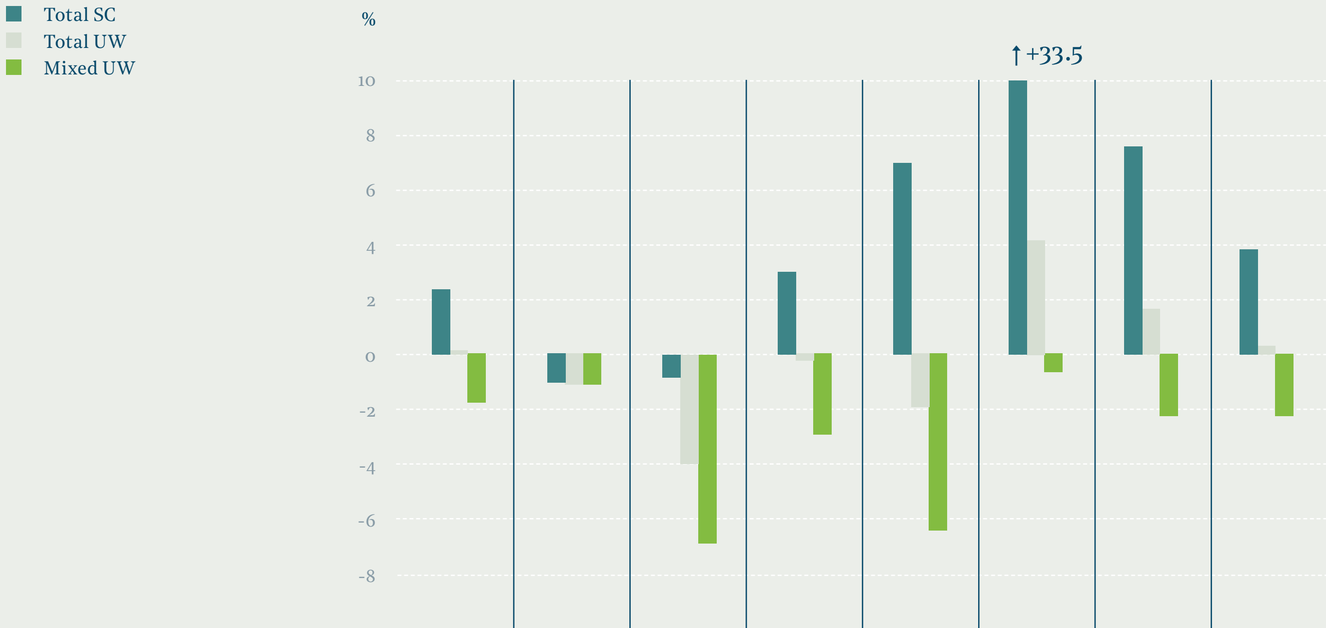
- SC of paper 2017
- SC of other fractions 2017
- Mixed UW 2017

The focus on metropolitan areas confirms the national trend. Separate collections are established, while mixed waste is decreasing. These areas deserve attention, in that this is where service organization is most difficult, but also where the highest volumes can be achieved.





2017		MILAN	TURIN	FLORENCE	ROME	NAPLES	PALERMO	BARI	TOTALE
Total SC	t	350,457	196,309	119,783	748,071	168,485	52,220	77,712	1,713,037
Total UW	t	673,793	439,500	228,081	1,687,543	501,340	369,275	196,198	4,095,731
SC/UW	%	52.0	44.7	52.5	44.3	33.6	14.1	39.6	41.8
Mixed UW	t	323,336	243,191	108,910	939,472	332,855	317,055	118,486	2,383,305



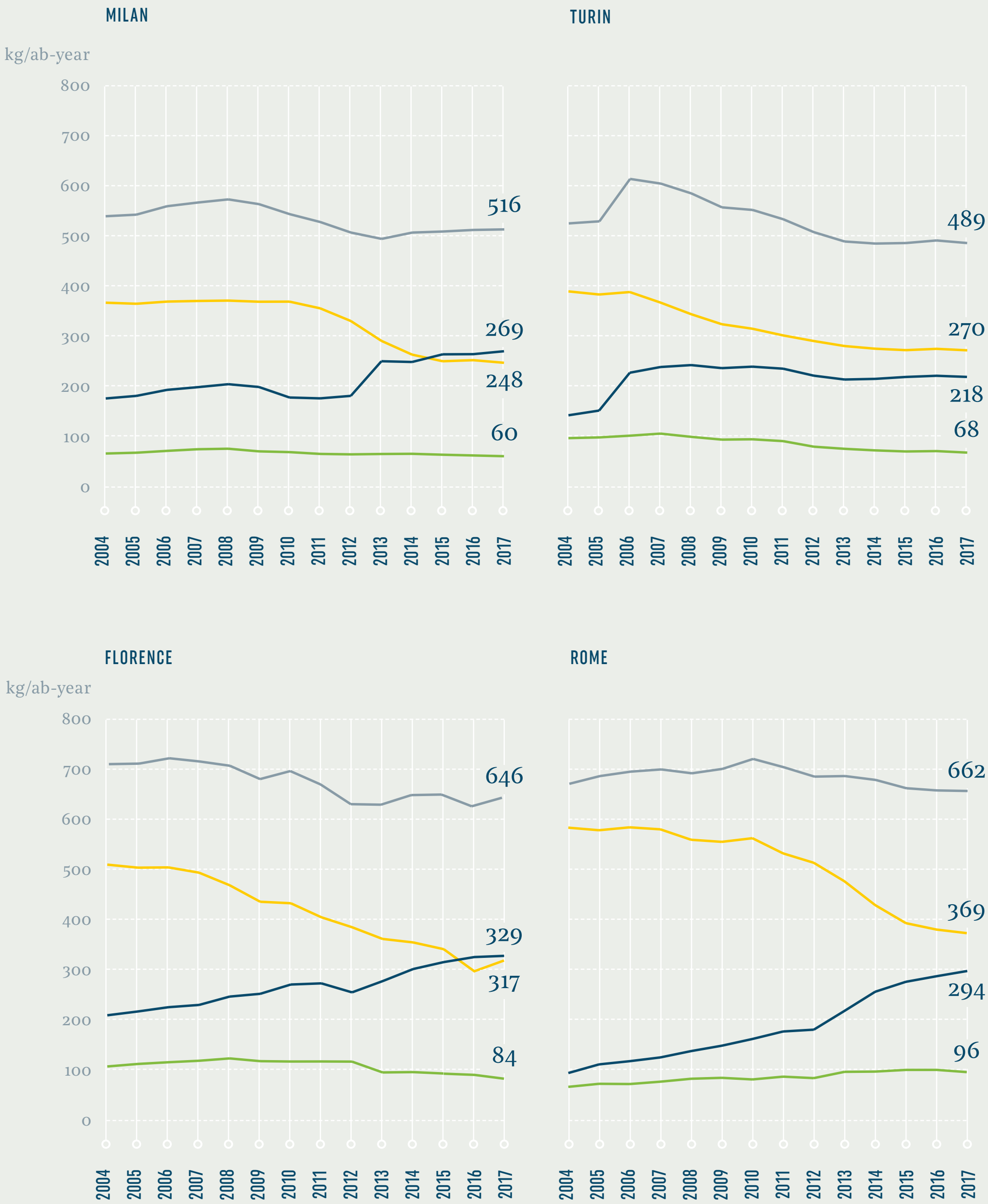
Δ 2016/2017		MILAN	TURIN	FLORENCE	ROME	NAPLES	PALERMO	BARI	MEDIA
RD totale	%	2.4	-1.1	-0.8	3.1	7.1	33.5	7.6	3.7
RU totale	%	0.4	-1.1	-4.0	-0.2	-1.9	4.2	1.7	-0.2
RU indifferenziato	%	-1.8	-1.2	-6.8	-2.9	-6.5	-0.6	-2.3	-2.9

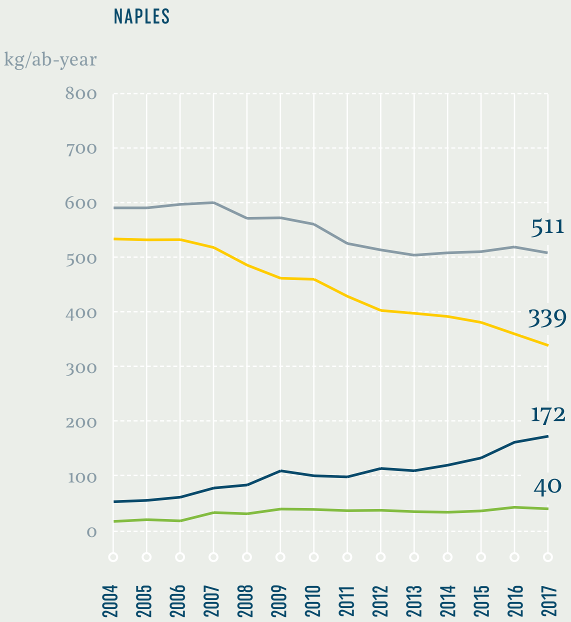
Figure 6

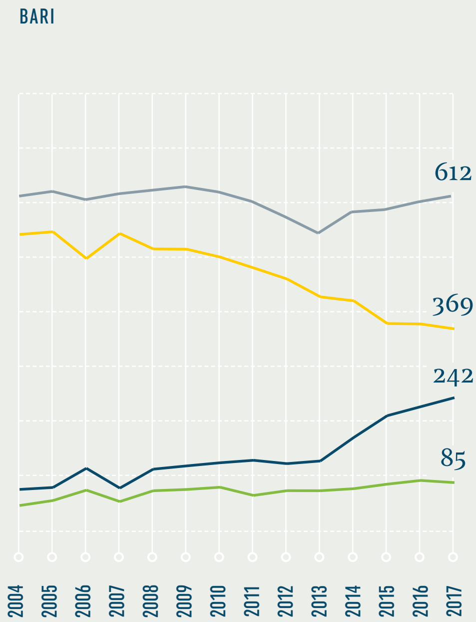
WASTE COLLECTION IN THE SAMPLE CITIES OF TURIN, MILAN, FLORENCE, ROME, NAPLES, BARI, AND PALERMO. 2004-2017 PER-CAPITA DATA.

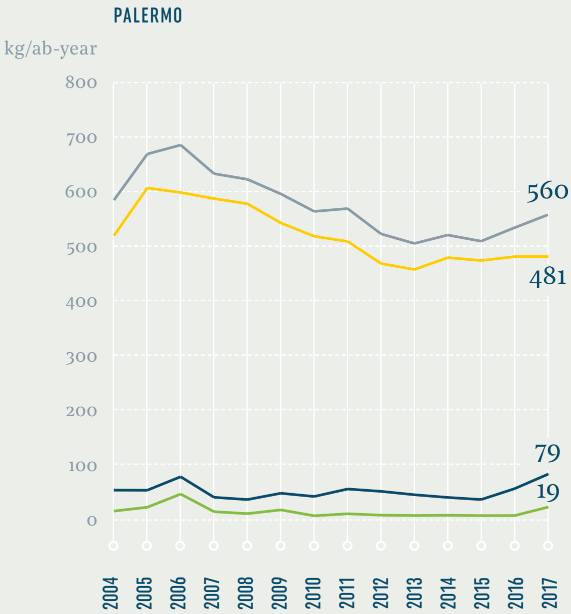
Source: Comieco

- UW
- Mixed UW
- SC
- SC of paper




NAPLES
kg/ab-year
800
700
600
500
400
300
200
100
0
511
339
172
40
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017


BARI
612
369
242
85
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017


PALERMO
kg/ab-year
800
700
600
500
400
300
200
100
0
560
481
79
19
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017

COMIECO MANAGEMENT: NUMBERS AND RESULTS FOR 2017

COLLECTION UNDER THE AGREEMENTS

Eight-hundred and forty-five agreements were in force as at 31/12/2017, entered into either directly or through proxies, representing 4,487 Italian Cities.
While the Centre and the North had 85 and 140 agreements in place respectively, the South had 620. This disproportion confirms how difficult it is to ensure homogeneous operation where the number of agreements continues to grow in parallel with collection flow fragmentation, with a subsequent local return of resources also fragmented among multiple small flows. This trend has been under way for some time and highlights poor coordination, particularly in Sicily, among local entities that do not leverage on "networking", investment optimization, and know-how, thus missing the benefits that may derive from scale economies, both upon collecting and upon processing and recycling.
An indicator like the average tons per agreement shows that, with each agreement in force in southern Italy, less than 900 t/year of paper and board are managed, i.e. one-fifth of the amounts managed in the Centre and North.
In 2017 the Consortium managed 1.48 million tons of paper and board – 45.3% of municipal collection – through agreements involving 82% of the population. This clear imbalance can be interpreted in the light of the fact that most Cities involved in the agreements only entrust part of their collection to Comieco, due to the option to define the mode, flows, and amounts to be managed under the agreements every year.
The Consortium's practical activity is carried out in two complementary ways. Where allowed by the environmental conditions – i.e. in the Centre and North – Comieco plays a market-subsidiarity role. The aggregate managed amounts account for less than 37% of municipal collection, and mostly include packaging – the core business of the Consortium's activity. Activities in the South are, instead, more widespread, the share of managed materials is larger – over 75% – and the Consortium acts as a key player to ensure recycling and support development.
The overall managed amounts declined by about 18thousand tons (-1.2%) vs. 2016, which is the arithmetic sum of a 42thousand ton decrease in the Centre and North and an over 24thousand ton increase in the South.
From a different point of view, the Consortium managed 1,043 million tons of packaging, 14thousand tons (+1.3%) more vs. 2013, whereas the amount of similar product fractions (graphic paper) declined by approximately 32thousand tons in the managed collection mix.

67.3%

Cities under the agreements

82.2%

Italian citizens covered by the agreements

1.48 million t

managed under the agreements

Table 3

LOCAL COVERAGE BY REGIONS AS AT DECEMBER 31, 2017.

Source: Comieco

	AGREEMENTS	AVERAGE INHABITANTS UNDER THE AGREEMENTS	AVERAGE AMOUNT MANAGED UNDER THE AGREEMENTS
	n	n	t
North	140	157,254	4,358
Centre	85	124,755	3,793
South	620	28,559	885
ITALY	**845**	**59,558**	**1,753**

REGION	CITIES UNDER THE AGREEMENTS		INHABITANT UNDER THE AGREEMENTS		AMOUNT MANAGED UNDER THE AGREEMENTS	AMOUNT MANAGED UNDER THE AGREEMENTS VS. SC OF PAPER
	n	%	n	%	t	%
Piedmont	1,049	86.8	4,122,057	93.1	125,650	48.3
Vallée d'Aoste	74	100.0	128,298	100.0	9,285	97.4
Lombardy	649	41.7	5,905,471	58.6	125,865	22.4
Trentino Alto Adige	272	77.9	970,777	88.2	49,434	59.3
Veneto	425	72.9	4,091,518	82.9	96,571	33.7
Friuli Venezia Giulia	212	96.4	1,212,715	98.0	33,562	48.1
Liguria	117	49.8	1,216,693	76.8	38,621	45.7
Emilia Romegna	310	86.6	4,368,076	96.3	131,126	34.4
NORTH	**3,108**	**67.8**	**22,015,605**	**78.5**	**610,114**	**35.1**
Tuscany	265	88.3	3,670,295	94.3	162,717	55.1
Umbria	52	56.5	765,016	85.5	12,194	21.5
Marche	194	80.5	1,339,833	85.3	43,308	43.2
Latium	150	39.7	4,829,032	82.0	104,177	29.9
CENTRE	**661**	**65.4**	**10,604,176**	**86.6**	**322,396**	**40.2**
Abruzzo	249	81.6	1,224,453	92.0	55,662	70.1
Molise	57	41.9	180,926	57.7	4,194	54.4
Campania	386	69.8	5,206,018	88.2	143,769	78.6
Puglia	227	88.0	3,695,956	90.4	140,745	82.6
Basilicata	85	64.9	460,935	79.9	13,856	63.8
Calabria	278	68.0	1,591,662	80.5	43,569	64.1
Sicily	291	74.6	4,308,463	84.6	96,110	86.5
Sardinia	145	38.5	1,038,102	62.4	50,486	60.4
SOUTH	**1,718**	**67.1**	**17,706,515**	**84.5**	**548,391**	**75.7**
ITALY	**5,487**	**67.3**	**50,326,296**	**82.2**	**1,480,900**	**45.4**

Figure 7

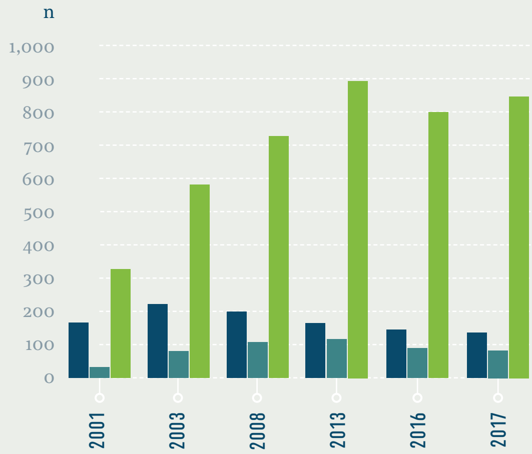
STATUS OF THE AGREEMENTS UPON EXPIRATION OF EACH FRAMEWORK AGREEMENT AND COVERAGE RATES OF THE AGREEMENTS. 2001/2017 HISTORICAL DATA SET.

Source: Comieco

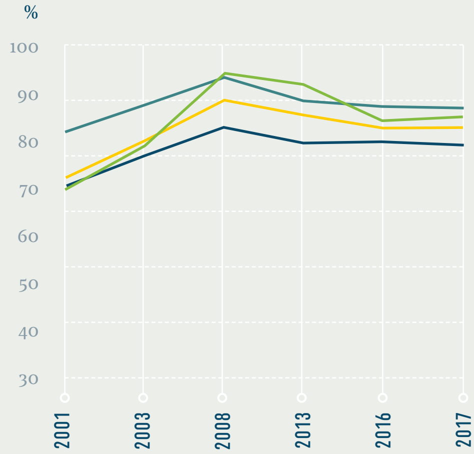
The high fragmentation of agreements, still in place in the South, hampers harmonious development. Comieco still plays a key role, even if the managed volumes, which account for 45.4% of total municipal separate collection, are declining vs. a peak above 75% (in 2002), consistently with the principle of subsidiarity.

- North
- Centre
- South
- Italy

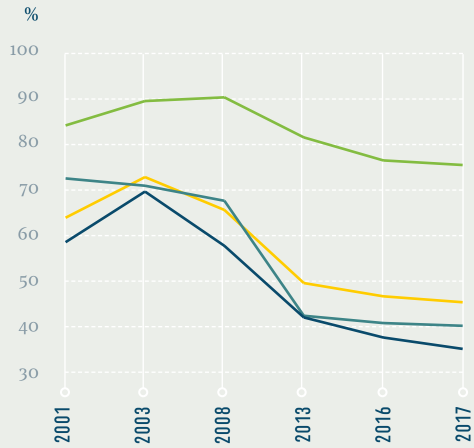
SIGNED AGREEMENTS



COVERED INHABITANTS



AMOUNTS MANAGED BY COMIECO VS. MUNICIPAL SC



COVERED CITIES

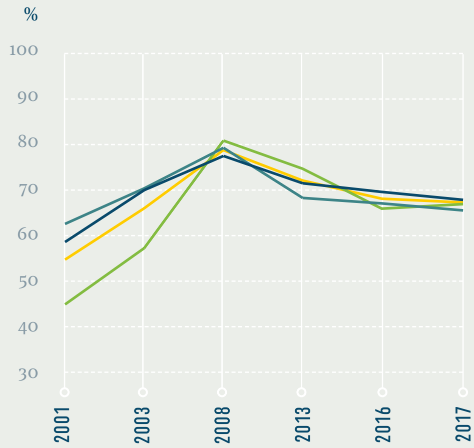
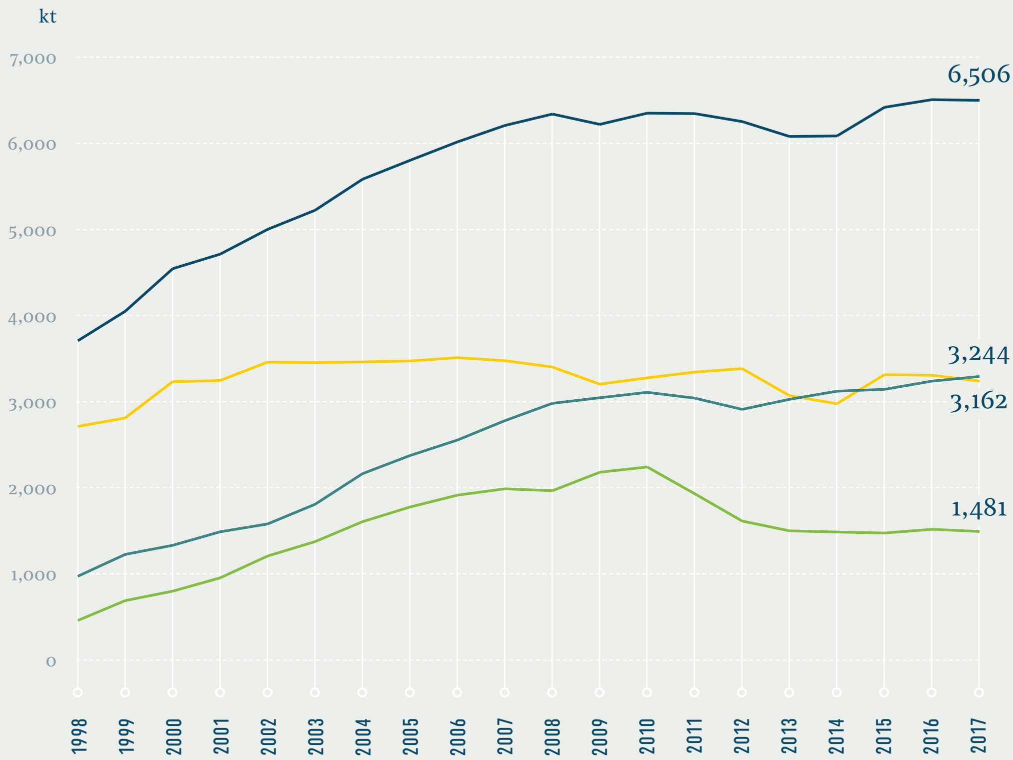


Figure 8

RATIO OF TOTAL PAPER AND BOARD COLLECTION MANAGED UNDER THE AGREEMENTS TO APPARENT COLLECTION. HISTORICAL DATA SET AND 2016-2017 COMPARISON.

Source: Comieco



- Apparent collection
- Municipal SC of paper and board
- Municipal SC of paper and board under the Household collection agreements
- Household collection

		1998	2003	2008	2013	2016	2017	Δ t 1998/2017	Δ % 1998/2017	Δ t 2016/2017	Δ % 2016/2017
Apparent collection	kt	3,749	5,227	6,316	6,062	6,479	6,506	2,757	73.5	27	0.4
Total municipal SC of paper and board	kt	1,001	1,810	2,945	2,991	3,210	3,262	2,261	225.9	53	1.6
Municipal SC of paper and board under the agreements	kt	485	1,362	1,928	1,482	1,499	1,481	996	205.3	-18	-1.2
Household collection	kt	2,748	3,417	3,371	3,071	3,269	3,244	495	18.0	-26	-0.8

Municipal SC of paper and board under the agreements vs. apparent collection	%	12.9	26.1	30.5	24.4	23.2	22.8
Municipal SC of paper and board under the agreements vs. municipal SC	%	48.5	75.2	65.5	49.6	46.7	45.4

ALLOCATIONS TO PARTIES UNDER THE AGREEMENTS

In 2017 Comieco invested a total of 110.3 million EUR to manage 1.48 million tons of paper and board collected at municipal level under the agreements. This includes 95.6 million t of packaging and 14.7 of graphic paper.
This means more than 8 million EUR (+8%) up compared to 2016, vs. a slight decline of the managed amounts. This increase derives mostly from the high quotation of paper for recycling, which produced a clear benefit in terms of variable household collection shares, but packaging shares also increased by almost 3% with managed amounts that grew, in proportion, by half that rate.
In 20 years of system operation (1998/2017) over 1.5 billion EUR were allocated to support municipal collection through the agreements, vital resources that promoted a threefold increase of collection volumes over the same period of time.

110.3 million EUR

allocated to the Cities

+8%

vs. 2016

Table 4

RESOURCES ALLOCATED TO THE PARTIES UNDER THE AGREEMENTS IN 2017. DETAILED BY AREAS.

Source: Comieco

The amounts managed by the Consortium are slightly declining (-1.2%), albeit with a higher economic investment (+8%). Over 110 million EUR were allocated to the Cities.

AREA	INHABITANTS UNDER THE AGREEMENTS	AMOUNT					
		PACKAGING	FMS	TOTAL	MANAGED PACKAGING	FMS	TOTAL
	n	t	t	t	kg/ab	kg/ab	kg/ab
North	22,015,605	498,962	111,152	610,114	22.7	5.0	27.7
Centre	10,604,176	206,536	115,860	322,396	19.5	10.9	30.4
South	17,706,515	337,934	210,457	548,391	19.1	11.9	31.0
ITALY	**50,326,296**	**1,043,431**	**437,469**	**1,480,900**	**20.7**	**8.7**	**29.4**

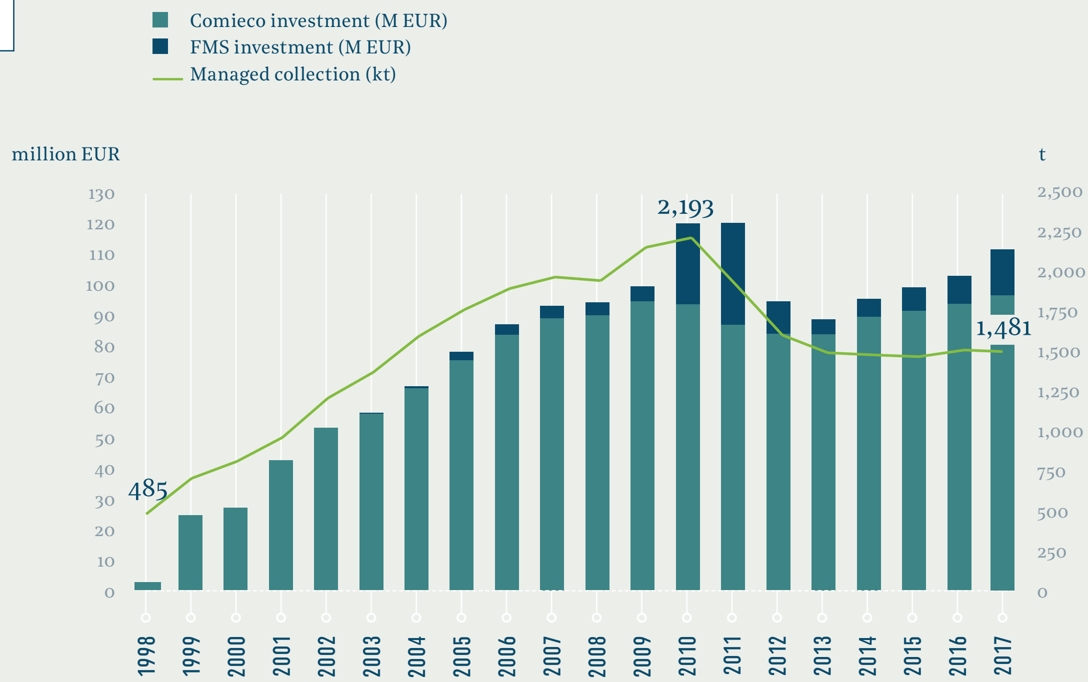
AREA	INHABITANTS UNDER THE AGREEMENTS	ECONOMIC RESOURCES					
		PACKAGING	FMS	TOTAL	MANAGED PACKAGING	FMS	TOTAL
	n	euro	euro	euro	euro/ab	euro/ab	euro/ab
North	22,015,605	47,945,787	4,014,855	51,960,642	2.2	0.2	2.4
Centre	10,604,176	18,747,692	3,709,540	22,457,232	1.8	0.3	2.1
South	17,706,515	28,890,322	6,959,066	35,849,388	1.6	0.4	2.0
ITALY	**50,326,296**	**95,583,801**	**14,683,462**	**110,267,263**	**1.9**	**0.3**	**2.2**

Figure 9

ECONOMIC INVESTMENT. 1998-2017 HISTORICAL DATA SET

Source: Comieco

Comieco managed almost 30 million tons of paper and board derived from municipal collection from 1988 to 2017, and paid considerations for over 1.5 billion EUR.



		1ST ANCI-CONAI AGREEMENT 1998-2003	2ND ANCI-CONAI AGREEMENT 2004-2008	3RD ANCI-CONAI AGREEMENT 2009-2013	4TH ANCI-CONAI AGREEMENT 2014-2017	TOTALE 1998-2017
Packaging	million EUR	204.2	400.3	439.0	368.0	1,411.4
FMS	million EUR	0.4	15.3	80.2	37.5	133.4
TOTAL	million EUR	204.6	415.6	519.2	405.4	1,544.8
MANAGED COLLECTION	t	5,523,979	9,088,263	9,295,707	5,906,720	29,814,669

		2016	2017	Δ 2016-17
Packaging	million EUR	93.0	95.6	2.8
FMS	million EUR	9.1	14.7	60.8
TOTAL	million EUR	102.1	110.3	8.0
MANAGED COLLECTION	kt	1,499,002	1,480,900	-1.2

FOCUSED LOANS TO THE SOUTH

Special projects for the South are confirmed for 2017. These include, in particular, the Plan for the South, sponsored by the Ministry of the Environment and of Territorial and Sea Protection for the purchase of equipment and vehicles to support separate paper and board collection in bigger cities, and the ANCI-Comieco tender in smaller ones.

In the 2014-2017 four-year period, the Consortium invested over 6.2 million EUR in medium-small cities with the ANCI-Comieco Tender alone. These amounts are intended for the purchase of paper and board collection equipment within the framework of projects for development of collection in low-performance Cities. In time, the access threshold was gradually updated, also in the light of gradual local service development, and binding targets were set for collection, with deadlines for the achievement thereof.

A total of 272 Cities benefited from loans in the four-year period and 221 of these are in the South, 46 in the Centre, and only 5 in the North. Fund allocation was performed in the same proportion, with 101thousand EUR invested in the North, 667thousand EUR in the Centre, and 5.443thousand in the South.

Each project benefits from a basic communication package aimed at improving user information, which was, in most cases, customized and expanded as requested by the local administrations. This support experience had both positive and negative aspects. Positive ones include the broad reach of these measures, the evident change of pace for projects fostered and supported by the Cities, a prompt and stable return in terms of collected amounts. Aspects to be improved include, in particular, the time to measure implementation, which is, on average, longer than expected – from submission of applications, systems start to operate in full capacity within 24 months on average.
This means that the measures implemented in the past two editions are not fully operational yet, and there is still some untapped potential. Monitoring data in these Cities for the first months of 2018 points out to a growth close to 10% vs. 2017.

35 kg/ab-year
per-capita threshold to access loans

272 Cities
involved in the plan

6.2 million EUR
invested in 4 years

Table 5

COMIECO-ANCI TENDER FOR THE PURCHASE OF EQUIPMENT IN SUPPORT OF PAPER AND BOARD COLLECTION. YEARS 2014-2017. DETAILED BY REGIONS.

Source: Comieco

The equipment tender is confirmed for the Cities behind schedule. Over 6 million EUR invested in four years. New access parameters are envisaged and specific targets are defined for the approved projects.

AREA	REGION	2014			2015		
		CITIES	INHABITANTS	LOAN AMOUNT	CITIES	INHABITANTS	LOAN AMOUNT
		n	n	euro	n	n	euro
North	Emilia Romagna	-	-	-	3	26,401	64,929
NORTH		**-**	**-**	**-**	**3**	**26,401**	**64,929**
Centre	Latium	18	164,714	258,071	13	16,572	75,347
Centre	Marche	-	-	-	-	-	-
Centre	Tuscany	1	3,230	9,160	1	22,495	48,640
CENTRE		**19**	**167,944**	**267,231**	**14**	**39,067**	**123,987**
South	Abruzzo	11	18,837	67,385	7	14,653	20,054
South	Basilicata	3	33,565	45,843	1	7,501	7,125
South	Calabria	18	93,748	248,214	21	130,820	429,048
South	Campania	17	289,262	532,342	8	76,445	261,125
South	Molise	3	59,290	48,372	-	-	-
South	Puglia	22	264,187	313,728	6	165,341	222,972
South	Sicily	8	120,328	245,138	23	265,476	533,324
SOUTH		**82**	**879,217**	**1,501,022**	**66**	**660,236**	**1,473,649**
ITALY		**101**	**1,047,161**	**1,768,253**	**83**	**725,704**	**1,662,566**

AREA	REGION	2016			2017		
		CITIES	INHABITANTS	LOAN AMOUNT	CITIES	INHABITANTS	LOAN AMOUNT
		n	n	euro	n	n	euro
North	Emilia Romegna	-	-	-	2	13,000	36,483
NORTH		**-**	**-**	**-**	**2**	**13,000**	**36,483**
Centre	Latium	8	213,483	255,245	-	-	-
Centre	Marche	5	13,200	20,115	-	-	-
Centre	Tuscany	-	-	-	-	-	-
CENTRE		**13**	**226,683**	**275,360**	**-**	**-**	**-**
South	Abruzzo	7	5,655	7,152	-	-	-
South	Basilicata	1	18,858	40,461	-	-	-
South	Calabria	12	129,801	445,220	1	5,750	16,043
South	Campania	6	136,288	186,453	2	28,808	133,682
South	Molise	-	-	-	-	-	-
South	Puglia	5	121,542	185,625	1	1,000	17,934
South	Sicily	27	391,406	954,453	11	228,499	481,949
SOUTH		**58**	**803,550**	**1,819,365**	**15**	**264,057**	**649,608**
ITALY		**71**	**1,030,233**	**2,094,725**	**17**	**277,057**	**686,091**

AREA	TOTAL 2014-2017		
	CITIES	INHABITANTS	LOAN AMOUNT
	n	n	euro
North	5	39,401	101,412
Centre	46	433,694	666,578
South	221	2,607,060	5,443,644
TOTALE	**272**	**3,080,155**	**6,211,635**

QUALITY – A PRIMARY GOAL ACROSS THE COUNTRY

The results of the tests performed in 2017 outline a different picture if both paper collection flows are considered, namely 1.01+1.02 (household collection) and 1.04+1.05 (business collection of packaging only).

As far as 1.01+1.02 is concerned, the average content of contaminants has slightly declined compared to 2016 (3.5%), but is still such as to classify "household" collection in the second bracket with respect to the reference thresholds provided for by the Technical Annex.

In this case too, the national data – generally not corresponding to the parameters – can and should be extracted and the behaviour of the individual macro-areas should be observed. While the performance of the North (1.8% in 1.01+1.02) is not declining but is, rather, improving, such improvement is offset by the generally poorer performance of the Centre (4.3% of contaminants) and South (4.0%).

The national figure shows signs of reversal compared to the previous year, but still too limited. Punctual monitoring through quality controls allows, in fact, to clearly identify critical players, such as certain big cities. Second-level controls, including on individual collection circuits, provide important information in view of improvement measures.

Quality is the main challenge for the next few years, to be addressed with prompt specific measures, particularly within the framework of the current actions and development projects. While, in fact, on one hand, start-up phases have intrinsic criticalities connected with the change of behaviours expected from users, on the other it is mandatory for services, once in full capacity, to be provided and monitored on a continuous and timely basis. This is the right way to create loyalty and habits for users and to deprive the supporters of the idea that "after all everything ends up in a landfill" of their alibi. "Quality for recycling" is the new paradigm.

In this respect cardboard collection from "business" users can be the model to follow. Proximity services with pre-defined frequencies and working times, widespread communication, the involvement of associations have produced in time a deeply-rooted packaging-collecting habit. The average quality data (contaminants = 0.8%) is broadly confirmed within the range of the first quality bracket and the variability observed for the 1.01+1.02 flow is not to be seen between the three macro-areas of the North, Centre and South.

For a decade now, the cardboard collected and sent to the sorting plants has been a material requiring minimal or no sorting, submitted to pressing and storage only as a recycling-ready secondary raw material.

1,210 analisi

tests a year

3.46%

average contaminants in 1.01+1.02

0.80%

average contaminants in 1.04+1.05

Table 6

QUALITY OF THE COLLECTED MATERIAL (AVERAGE CONTENT OF CONTAMINANTS). 2016-2017 COMPARISON BY MACRO AREAS.

Source: Comieco

The rate of contaminants in household collection flows remains above threshold. A positive trend is recorded for business collection. Quality is a challenge to be addressed in parallel with volume growth.

	YEAR 2016		YEAR 2017		Δ 2016/2017
	TEST	CONTAMINANTS	TEST	CONTAMINANTS	CONTAMINANTS
	n	%	n	%	%
1.01+1.02					
North	227	2.23	133	1.76	-0.47
Centre	150	3.58	221	4.29	0.71
South	252	3.35	358	4.03	0.68
ITALY	**629**	**3.60**	**712**	**3.46**	**-0.14**
1.04+1.05					
North	136	0.79	88	0.36	-0.43
Centre	67	0.77	68	0.48	-0.29
South	265	0.94	342	1.02	0.08
ITALY	**468**	**0.82**	**498**	**0.80**	**-0.02**

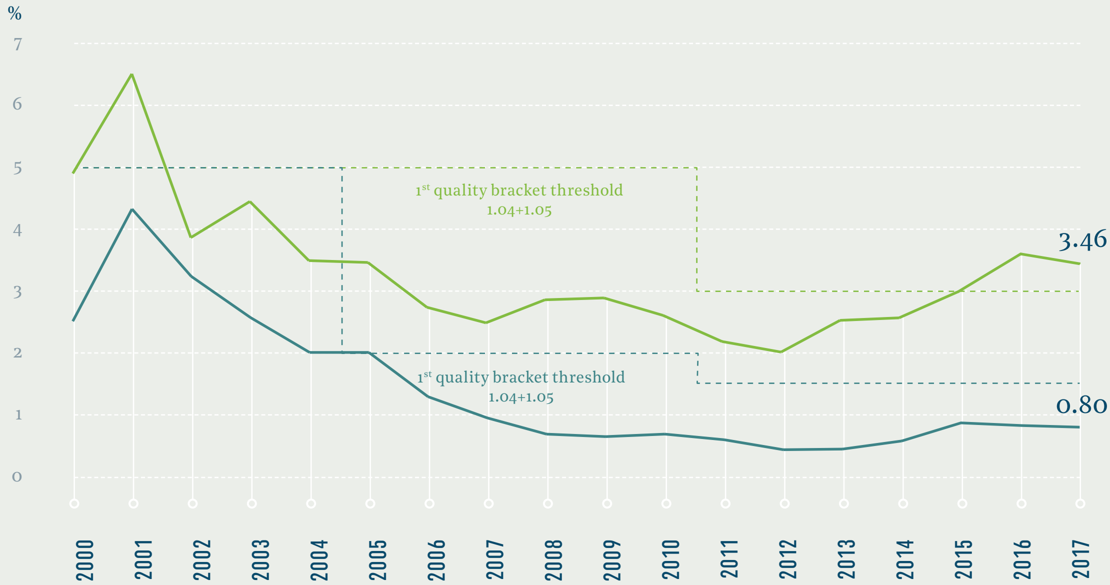
Figure 10

QUALITY OF THE COLLECTED MATERIAL (MEAN TREND OF CONTAMINANTS). 2000-2017 PERIOD.

Source: Comieco

— 1.01+1.02
— 1.04+1.05

The challenge of controls reverses the trend of the contents of contaminants in 1.01+1.02 that has been under way for some years. Business collections provide recycling-ready materials.



PERFORMED TESTS		1ST ANCI-CONAI AGREEMENT 1998-2003	2ND ANCI-CONAI AGREEMENT 2004-2008	3RD ANCI-CONAI AGREEMENT 2009-2013	4TH ANCI-CONAI AGREEMENT 2014-2017	TOTALE 1998-2017
1.01+1.02	n	1,006	3,456	4,040	2,871	11,373
1.04+1.05	n	594	3,591	4,204	2,057	10,446

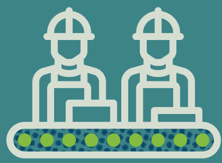
Note: The above results, until June 2014, refer to the total tests performed on both incoming and outgoing materials in order to determine the considerations due to the parties under the agreements. From July 2014 these results only refer to tests on incoming materials performed to determine the consideration.

THE WIDESPREAD NATIONAL RECYCLING PLANTS NETWORK

Materials collected under the management of Comieco at national level are conferred to 311 sorting plants that receive them and provide for sorting and pressing.
This network of plants that spreads across the national territory helps cost containment by ensuring that vehicles are unloaded a short distance away from collection points (17.6 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 and to create a critical mass across the plants network with the achievement of scale economies also in the processing phase by preventing the fragmentation of volumes across multiple small storage areas.

The materials processed in the sorting plants are recycled via two complementary channels.
Sixty percent (just less than 900thousand tons) of the amount managed by Comieco is entrusted on a pro-quota basis to 55 plants (paper mills) that ensure recycling across the national territory.
The other 40% (approximately 600thousand tons) is awarded – by regular auctions – to parties having the necessary operational capacity to ensure recycling, either in Italy or abroad. In 2017, 26 parties were awarded at least one lot. Ninety-four percent of this material was recycled in Italian plants.

Almost 98% of the overall amounts managed by the Consortium is recycled by paper mills in Italy.



311
sorting plants

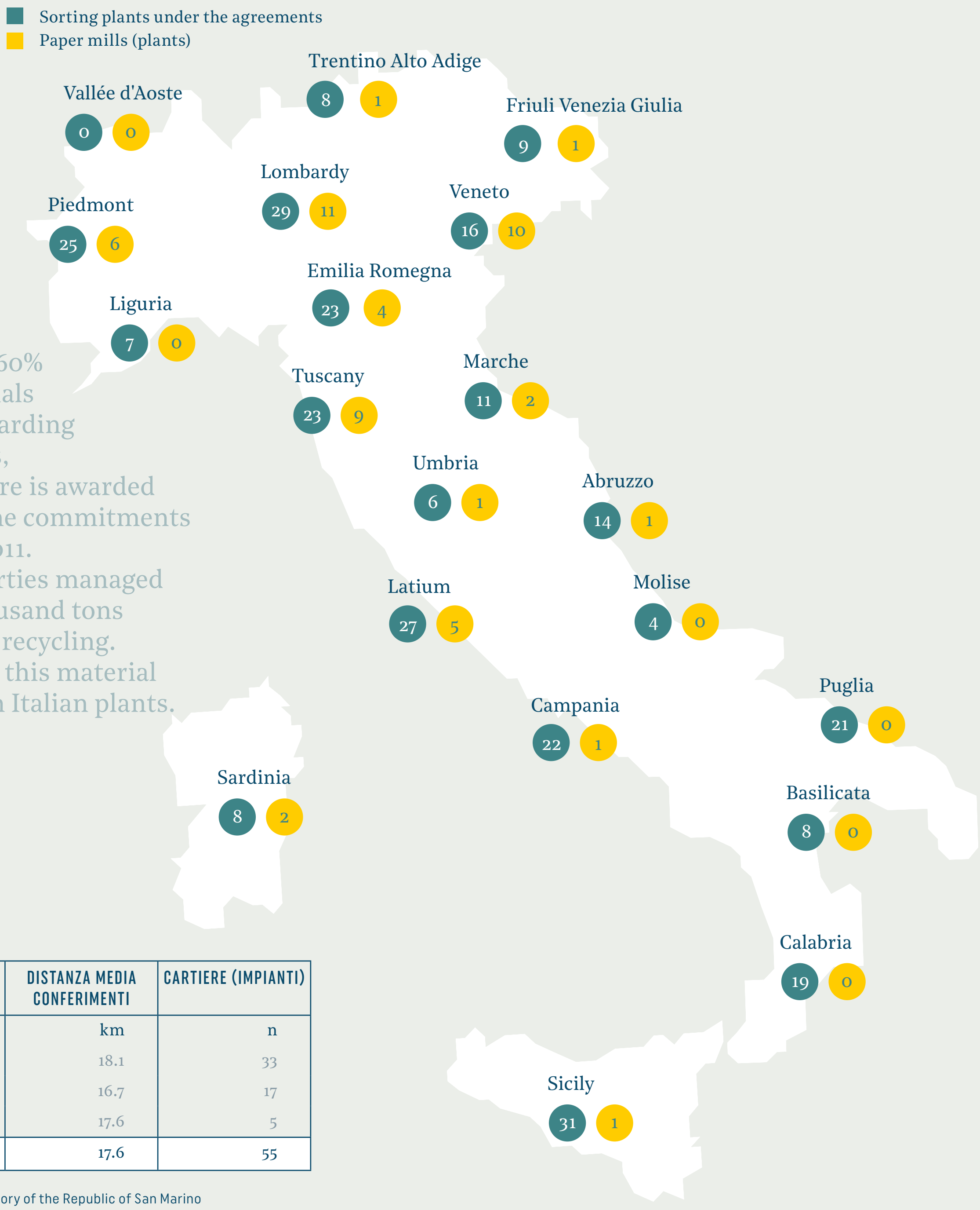
55
paper mills recycling 98%
of the paper managed by Comieco

17.6 km
average distance from collection points

Figure 11

THE RECYCLING SYSTEMS NETWORK. YEAR 2017.

Source: Comieco



Comieco ensures that 60% of the managed materials is recycled through awarding to member paper mills, and the remaining share is awarded at auctions based on the commitments made with AGCM in 2011. In 2017, 26 awarded parties managed approximately 600thousand tons of paper and board for recycling. Ninety-four percent of this material was anyway recycled in Italian plants.

AREA	PIATTAFORME IN CONVENZIONE	DISTANZA MEDIA CONFERIMENTI	CARTIERE (IMPIANTI)
	n	km	n
North (*)	117	18.1	33
Centre	67	16.7	17
South	127	17.6	5
TOTAL	311	17.6	55

(*) one paper mill is located within the territory of the Republic of San Marino

OVERALL SCENARIO OF THE "COUNTRY SYSTEM"

GUIDANCE FROM THE PAPER SECTOR

Paper production in 2017 amounted to just less than 9.1 million tons, 2.1% up compared to 2016. The packaging sector is a major player (+2.8%), whose pace is twice as fast as for other paper productions (+1.4%), driven by the "tissue" segment, whereas the graphic paper segment is stable (-2.0%).
For the first time in history, packaging production is equal to other paper productions, thus consolidating a slow, yet ongoing recovery that has been under way for five years. Production has increased from 3.9 million tons in 2012 to 4.5 million tons in 2017, with a 3% average annual growth rate.

Shifting our focus further downstream, the analysis of the historical data set of apparent consumption highlights, after almost two decades of parallel trend, a separation between packaging consumption and graphic paper consumption. From 1990 to 2007 the "packaging" and "graphic paper" lines of this indicator show a parallel trend, with homogeneous growth above 50% in the period under study. In the following ten years (2008/2017) graphic paper consumption fell from the 2007 peak (4.8 million tons) to less than 3 million in 2017 – below the baseline value (1990) considered, thus declining at a rate that is double than the growth rate. In the same period, even considering the fluctuations due to the crisis, packaging consumption continued to grow, totalling more than 6 million tons in 2017. The graphic paper/ packaging ratio in 2017 is 47.6%.
This figure can be interpreted as the effect of a significant replacement brought about by IT technologies in the publishing and data storage sector. In particular, graphic paper production declined in the past decade, as also confirmed by the circulation data of ADS (press circulation data monitoring service), which shows that the average monthly circulation of newspaper was substantially reduced by half in the same period.

The value of B2C e-commerce in Italy in 2017 is estimated by «Osservatorio E-commerce B2C, Netcomm - School of Management of the Milan Polytechnic University» at 24 billion EUR, or 6% of purchases. If only product e-commerce is considered, i.e. the part of e-commerce that calls for logistics and packaging, the total value is 12.2 billion EUR, 28% up vs. 2017 and equal to 52% of total e-commerce in Italy. The estimated volume of deliveries performed in Italy every month is around 15 million EUR.
The increasing e-commerce volumes and the development of multi-channel models redesign logistic flows across our cities. New flows call for a growing presence of small and medium delivery vehicles in Italian cities, delivering e-commerce products to the customers' homes and to pick-up points. Volumes are by now significant and the troubles for circulation and mobility caused by these new flows of goods are obvious. The issue is particularly serious in big cities, with one buyer every two inhabitants (vs. 4.6 in small cities with less than 10thousand inhabitants) and where mobility is more difficult than in small ones. According to estimates, about 15 million deliveries are performed in Italy every month through e-commerce. If these are broken down according to the number of inhabitants and in consideration of e-shopper density, for example, an estimated 23,000 deliveries are performed in Milan every day.

This data confirms the strength of recycling channels. Italian paper mills continue to use paper for recycling, domestic consumption is close to 5 million tons, 2.2% up vs. 2016. The other share of paper for recycling collected across the national territory – apparent collection – is recycled abroad, and the net export balance is confirmed above 1.5 million tons, albeit slightly declining (-4%) vs. 2016. In absolute volumes (-68thousand tons) this is not a striking figure, but may turn out important. As known, in fact, in July 2017 China notified to the WTO (World Trade Organization) the blocking of imports of several recovered materials for quality reasons, effective from early 2018. This country, which imports over 27 million tons of paper for recycling every year, is the main destination of our exports, for over 1 million tons. In order to prevent troubles, it is therefore vital to ensure quality across the supply chain. This measure created a divide in the market of paper for recycling. While the first six months saw a consolidation of the growth under way since 2016, in the second part of the year, after the Chinese government's measure, a sharp reversal brought quotations at very low levels in the early months of 2018, to values comparable to those of early 2009, in combination with the financial downturn.

Facing this dynamic and complicated picture, the packaging recovery and recycling targets are confirmed and consolidated. Out of 4.9 million tons consumed (+3.4%), just less than 3.9

million tons are recycled, which means 79.8%. If the share of paper and board packaging recovered as energy is also considered – almost 400thousand tons last year – the overall recovery rate is 87.7%.

The paper sector is among the recycling leaders in Italy and paper and board packaging, in terms of volumes and rates, is confirmed as the pillar of the CONAI system. But what and how many benefits come from this process? There are both direct and indirect benefits. System indicators can be used to attribute an economic value to each item.
Raw material availability and reduced CO2 production are the main benefits. If applied to the 1.043 million tons of packaging managed by Comieco in 2017, the estimated economic value of environmental benefits is 113 million EUR. An expanded analysis starting from 2005 provides a total of over 1.1 billion. Alongside this analysis we believe that the positive environmental impact connected with avoided disposal should also be mentioned, combined with the social benefits connected with new job generation and, more generally, greater land protection, a key civic value.

79.8%

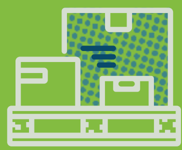
Paper and board packaging recycling

+2.1%

Paper production recovery

87.7%

Paper and board packaging recovery



-68 thousand t

Net exports

4.9 million t

Paper and board packaging consumption

Table 7

PAPER AND BOARD PACKAGING RECOVERY AND RECYCLING RESULTS ACHIEVED IN 2017.

Source: Comieco

The development of sorting-plant processing contracts results into a decline of the share of recycled packaging vs. mixed paper for recycling, combined with a qualitative and economic improvement of materials ready for manufacturing processes.

RECYCLING AND RECOVERY RATE CALCULATION	YEAR 2017	Δ 2016/2017
	t	%
Apparent paper and board packaging consumption	4,868,054	3.4
Waste paper and board packaging (paper and packaging) from 1.01+1.02 recycled in Italy	373,667	8.3
Waste paper and board packaging (packaging only) from 1.04+1.05 recycled in Italy	2,170,279	5.5
Paper for recycling obtained from waste packaging recycled abroad	1,341,567	-0.6
TOTAL RECYCLED WASTE PACKAGING	3,885,513	3.6
PAPER AND BOARD PACKAGING RECOVERED AS ENERGY OR WASTE-BASED FUEL	382,768	-5.2
TOTAL RECOVERED PAPER AND BOARD PACKAGING	4,268,281	2.7

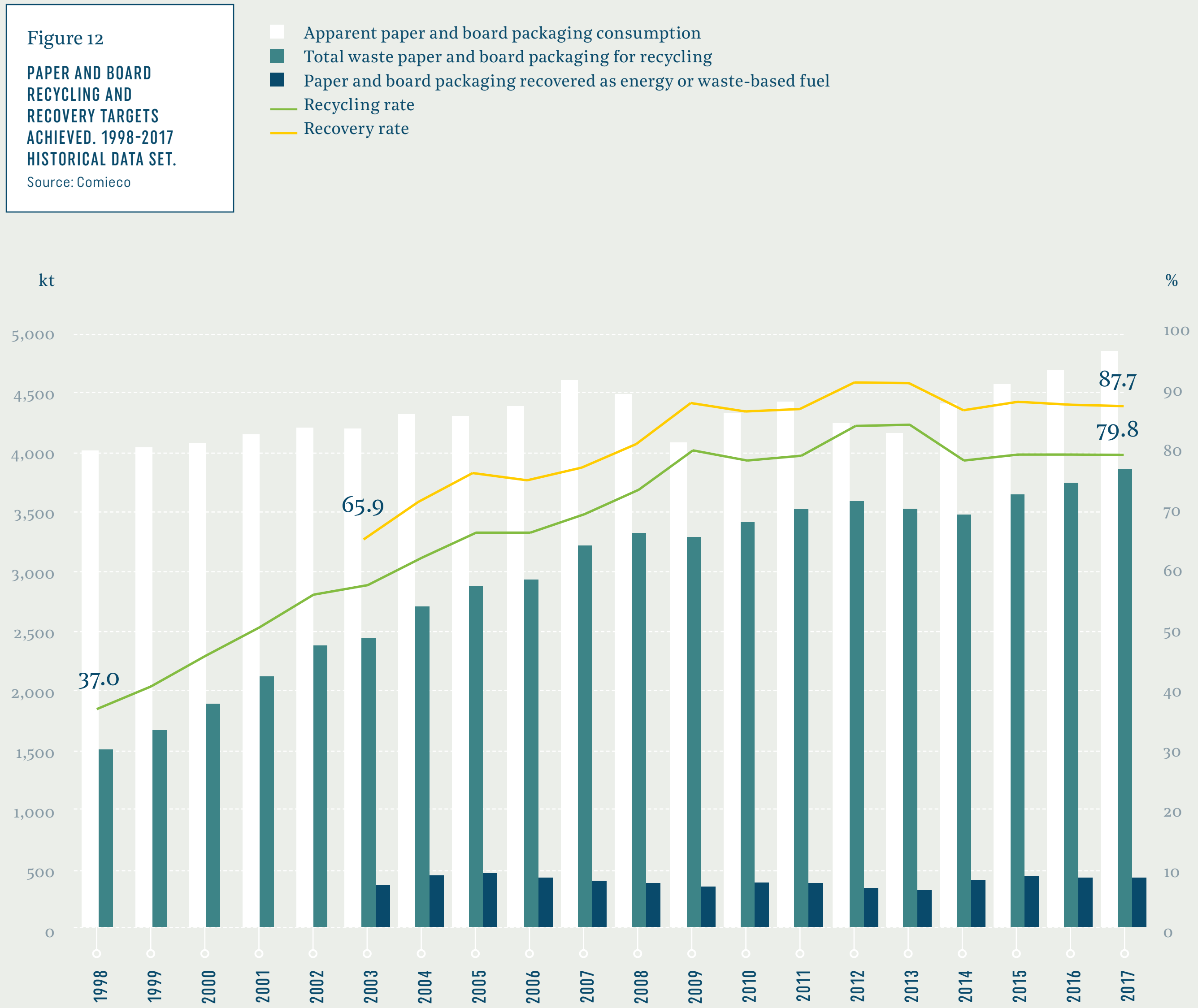
	YEAR 2017
	%
RECYCLING	79.8
ENERGY RECOVERY	7.9
RECOVERY	87.7

Note: Apparent consumption data for 2013 was adjusted by CONAI, apparent consumption data for 2014 also includes tubes and rolls subject to the CAC (the CONAI environmental contribution) from 1/1/2014.

Figure 12

PAPER AND BOARD RECYCLING AND RECOVERY TARGETS ACHIEVED. 1998-2017 HISTORICAL DATA SET.

Source: Comieco



Notes:
- Energy recovery before 2003 only monitored for the amounts managed under the agreements. Overall data not available.
- Apparent consumption data for 2013 was adjusted by CONAI, apparent consumption data for 2014 also includes tubes and rolls subject to the CAC (the CONAI environmental contribution) from 1/1/2014.

Table 8

DIRECT AND INDIRECT BENEFITS OF PAPER AND BOARD RECYCLING MANAGED BY COMIECO. 2017 DATA.

Source: CONAI data processed by studio Fieschi for CONAI

The benefits generated through the recycling of managed packaging (1.04 million tons) in 2017 are worth an estimated 113 million EUR. The 2005-2017 aggregate data points out to more than 1 billion EUR benefits, calculated as the value of the raw material and of the avoided emissions.

INDICATORS WITHIN THE CONAI BOUNDARIES (MANAGED BY COMIECO)

INDICATOR		2017	TOTALE 2005-2017
Amount of conferred packaging	kt	1,043	13,192
Fractions for recycling	kt	1,043	13,192
Fractions for energy recovery	kt	-	-
Fractions for other forms of disposal	kt	-	-

ENVIRONMENTAL BENEFITS

INDICATOR		2017	TOTALE 2005-2017
Secondary raw material obtained from recycling	kt	1,043	13,192
Electric power produced from energy recovery	TJ	-	-
Thermal power produced from energy recovery	TJ	-	-
Primary energy saving through recycling	TJ	13,363	177,964
CO_2 production avoided through recycling	kt CO_2 eq	968	11,973
CO_2 production avoided through energy recovery	kt CO_2 eq	-	-

ECONOMIC VALUE

CATEGORY			2017	TOTALE 2005-2017
Direct benefits	Economic value of the secondary raw material obtained from recycling	Million EUR	84	764
	Economic value of the energy obtained from recycling	Million EUR	-	-
Indirect benefits	Economic value of the avoided CO_2 production	Million EUR	29	358
BENEFICI COMPLESSIVI		Million EUR	**113**	**1,122**

Table 9

PAPER AND BOARD PRODUCTION IN 2017.
Source: ISTAT data processed by Assocarta and Assocarta estimates

The increase in the production of paper and board packaging and paper for hygienic-sanitary use in general offsets the decline of graphic paper production. Import-export trends are particularly strong in this context.

		PRODUCTION (A)	IMPORT (B)	EXPORT (C)	APPARENT CONSUMPTION (A+B-C)
Paper and board packaging (Paper. board. and cardboard)	t	4,495,745	3,143,911	1,551,154	6,088,502
Δ 2016/2017	%	2.8	3.0	2.1	3.1
Other paper and board (paper for graphic and hygienic-sanitary use)	t	4,575,401	2,136,012	2,503,357	4,208,056
Δ 2016/2017	%	1.4	1.7	3.3	0.4
TOTAL PAPER PRODUCTION	t	**9,071,146**	**5,279,923**	**4,054,511**	**10,296,558**
Δ 2016/2017	%	**2.1**	**2.5**	**2.8**	**2.0**

Table 10

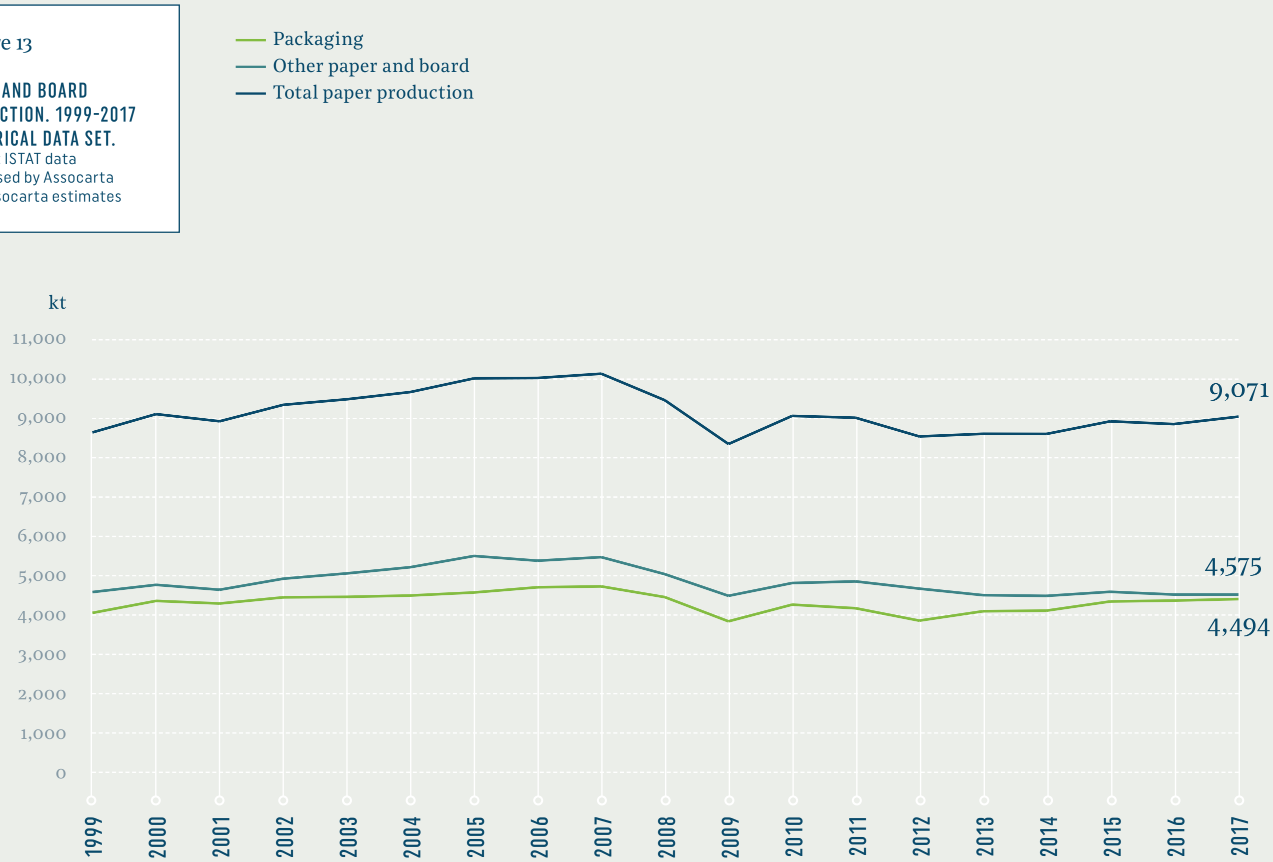
CONSUMPTION, IMPORT, EXPORT OF PAPER FOR RECYCLING AND APPARENT COLLECTION*. 2016-2017 VARIATIONS.
Source: Assocarta data processed by Comieco

		IMPORT (A)	EXPORT (B)	CONSUMPTION (C)	APPARENT COLLECTION (B+C-A)*
2016	kt	353	1,933	4,887	6,467
2017	kt	355	1,867	4,994	6,506
Δ 2016/2017	%	**0.5**	**-3.4**	**2.2**	**0.6**

* Apparent collection: Consumption - Import + Export

Figure 13

PAPER AND BOARD PRODUCTION. 1999-2017 HISTORICAL DATA SET.
Source: ISTAT data processed by Assocarta and Assocarta estimates



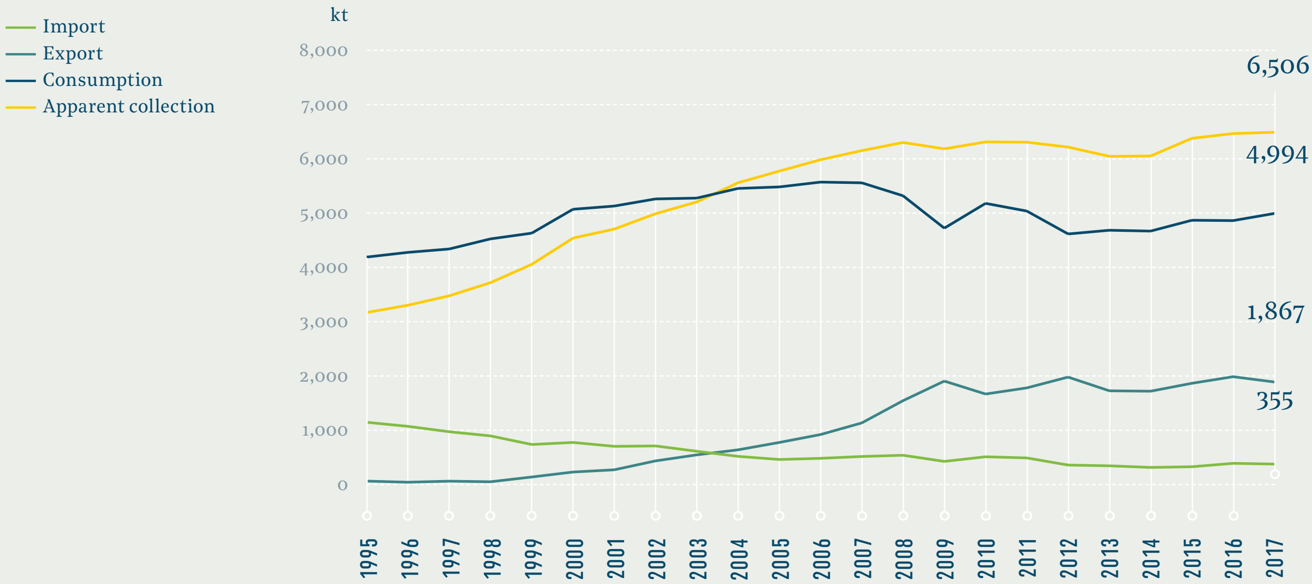
		1999	2003	2008	2013	2016	2017	1999/2017		2016/2017	
								Δ kt	Δ %	Δ kt	Δ %
Packaging	kt	4,071	4,440	4,434	4,109	4,374	4,496	425	10.4	122	2.8
Other paper and board	kt	4,615	5,051	5,033	4,543	4,514	4,575	-39	-0.9	61	1.4
TOTALE PRODUZIONE CARTARIA	kt	8,686	9,491	9,467	8,652	8,888	9,071	386	4.4	183	2.1

Figure 14

CONSUMPTION, IMPORT, EXPORT OF PAPER FOR RECYCLING AND APPARENT COLLECTION* - 1995-2017 PERIOD

Source: Assocarta data processed by Comieco

The domestic consumption of paper for recycling increases to a total of 5 million tons. The net export balance is confirmed at above 1.5 million tons.



		1999	2003	2008	2013	2016	2017	1999/2017		2016/2017	
								Δ kt	Δ %	Δ kt	Δ %
Import	kt	854	589	520	338	353	355	-499	-58.5	2	0.5
Export	kt	42	528	1,507	1,685	1,933	1,867	1,825	4,344.8	-67	-3.4
Consumption	kt	4,561	5,288	5,329	4,715	4,887	4,994	433	9.5	107	2.2
APPARENT COLLECTION	kt	3,749	5,227	6,316	6,062	6,467	6,506	2,757	73.5	39	0.6
NET EXPORT	kt	-812	-61	987	1,347	1,580	1,512				

* Apparent collection: Consumption - Import + Export

Figure 15

RATIO OF APPARENT GRAPHIC PAPER CONSUMPTION TO PACKAGING. 1990-2017 HISTORICAL DATA SET.

Source: Assocarta data processed by Value Quest

The ratio of graphic paper consumption to packaging paper consumption gradually changed over time. This phenomenon emerged in 2009 and developed in time until values fell below the 1990 threshold. The different composition of the consumption mix also brings about a significant change of the “quality” of the collected materials and of subsequent issues connected with the processing of paper for recycling.

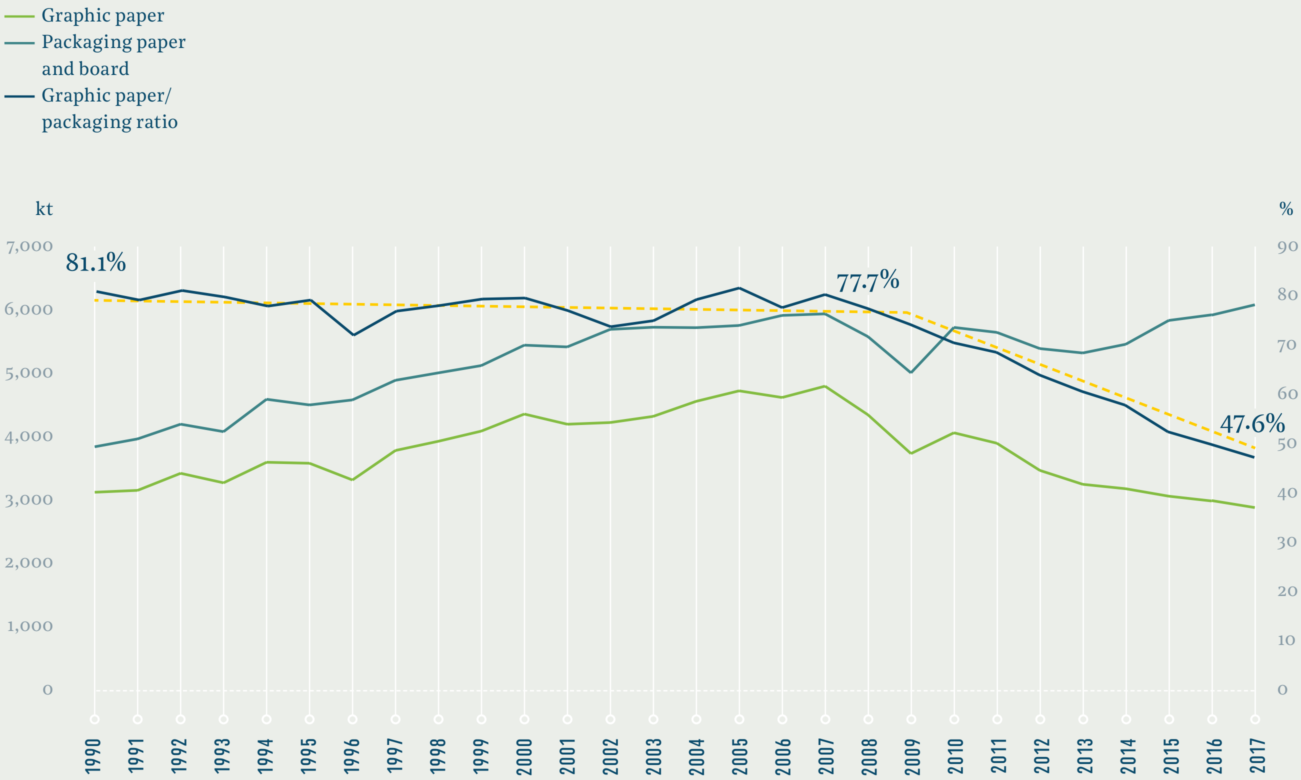
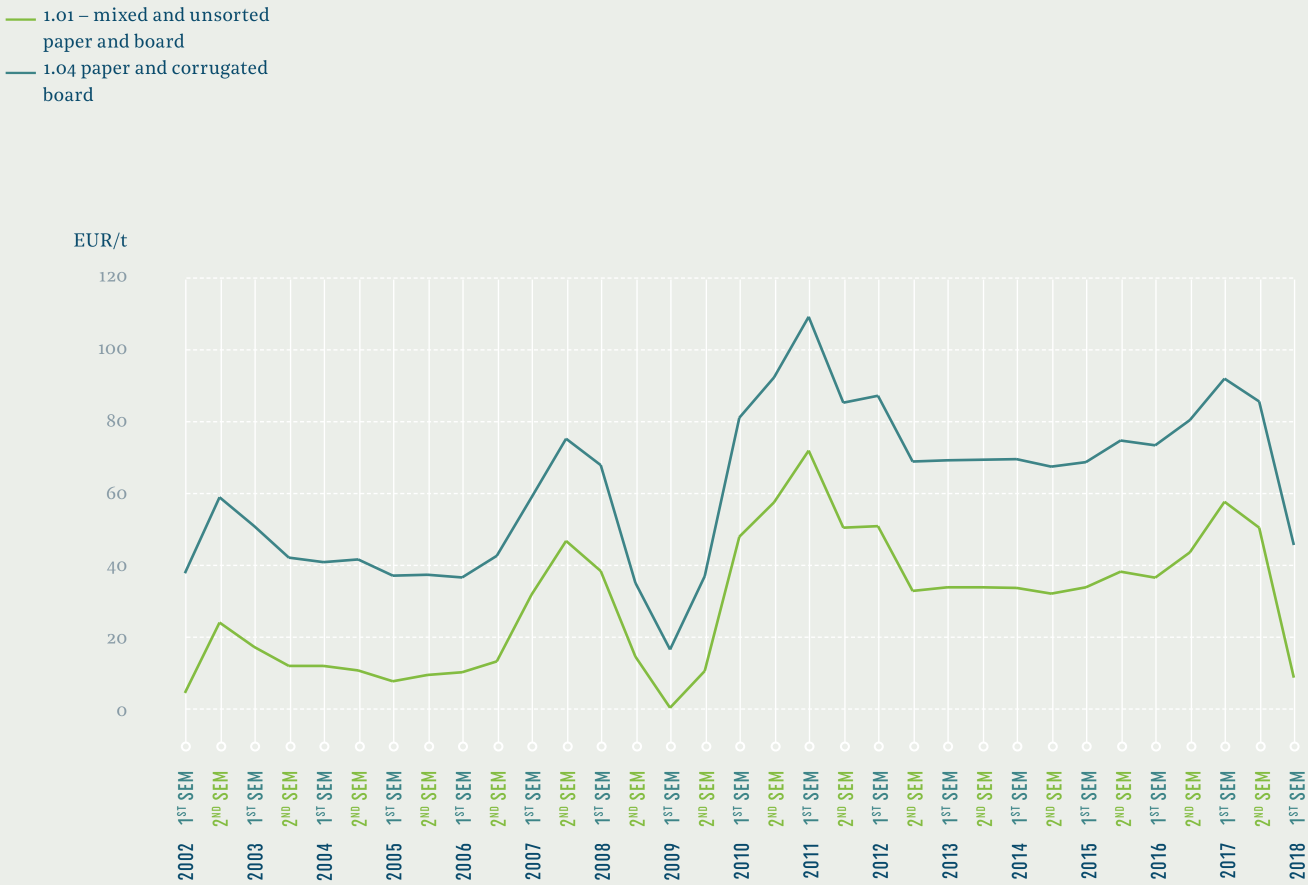


Figure 16

PERIODICAL RECORDING OF AVERAGE PAPER FOR RECYCLING VALUES (EUR/T). JANUARY 2002 – MAY 2018 PERIOD.

Source: Milan Chamber of Commerce



NOTE ON THE METHOD

The processing method adopted for data on national paper and board collection is the same as in the previous years. Some of the 2016 collection data is updated, particularly for the regions of Campania, Friuli Venezia Giulia, Puglia, Tuscany, and Veneto. The related data (total area and national data, per-capita data, etc.) is updated accordingly.

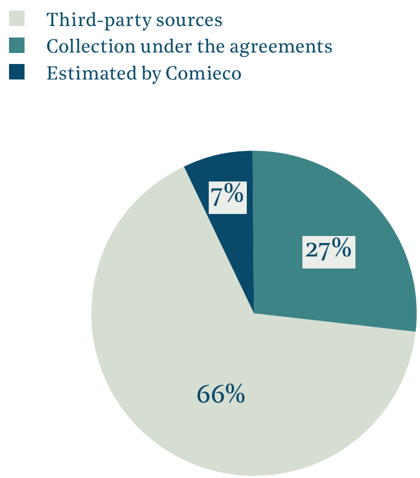
Data processed by Entities and/or organizations in charge of the monitoring or management of waste flows (ISPRA; Regions, Agencies, Provinces and Work Groups, ANCI, Cities, operators, plants, etc.) was mainly used to determine separate paper and board collection levels.

The data thus acquired is overlapped and compared to the data available to Comieco within the framework of its activities (management of the agreements) to ensure consistency and, if necessary, to carry out further focused reviews.

Processing is made at province level and, if necessary and possible, a more in-depth analysis is performed (e.g. Cities) for more punctual assessment.

Whenever "official" data is not available, Comieco estimates the provincial collection level starting from its own data base (data on collection by the parties under the agreements). Estimates consider separate paper and board collection as being actively in place across the national territory. As to 2017 evaluations, constituting the object of this Report, 66% of collection data comes from third-party sources, 27% refers to the amounts managed directly by the Consortium, or notified by the parties to the agreements as provided for by the Technical Annex (without any other sources), and 7% is based on estimated amounts.

SOURCES AND METHOD.



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