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Istituto Superiore per la Protezione e la Ricerca Ambientale

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RAPPORTI

Report on Waste from Economic Activities 2021

Summary data

345 bis/2021

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The Report confirms ISPRA's commitment to ensure that information and knowledge relating to an important sector, such as that of waste, are available to all.

Coordination by Valeria FRITTELLONI.

CHAPTER 1

GENERATION OF WASTE FROM ECONOMIC ACTIVITIES

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CHAPTER 2

TREATMENT OF WASTE FROM ECONOMIC ACTIVITIES

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CHAPTER 3

MONITORING OF SPECIFIC WASTE FLOWS

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INDEX

GENERATION OF WASTE FROM ECONOMIC ACTIVITIES

At national level the generation of waste from economic activities (in short EAW) is quantified from the information contained in the mandatory declarations (called MUD). MUD is annually submitted by the subjects obliged to declare quantities of waste generated, transported and recovered or disposed of during the year that preceded the declaration, pursuant to art. 189 of Legislative Decree no. 152/2006.
The latest data available on EAW refer to the year 2019 and are extracted from the declarations of the year 2020. Data and information from MUD are integrated with the quantities estimated by ISPRA for those manufacture sectors that are fully or partially exempted from the mandatory declarations (e.g., the construction and demolition sector), in accordance with the current legislation.

In 2019, the total amount of EAW generated nationally has been almost 154 million tonnes. Between 2018 and 2019 waste generation increased of 7,3%, approximately 10,5 million tonnes. This increase is almost entirely attributable to non-hazardous wastes, that represents 93,4% of the total wastes generated. In fact, non hazardous wastes increased by almost 10,4 million tonnes (+ 7,8%), while hazardous wastes increased by 110 thousand tonnes (+ 1,1%). In particular, the non-hazardous wastes from construction and demolition operations had a 14,2% (8,5 million tonnes) increase.

Table 1.1 – National generation of waste from economic activities, years 2017 – 2019

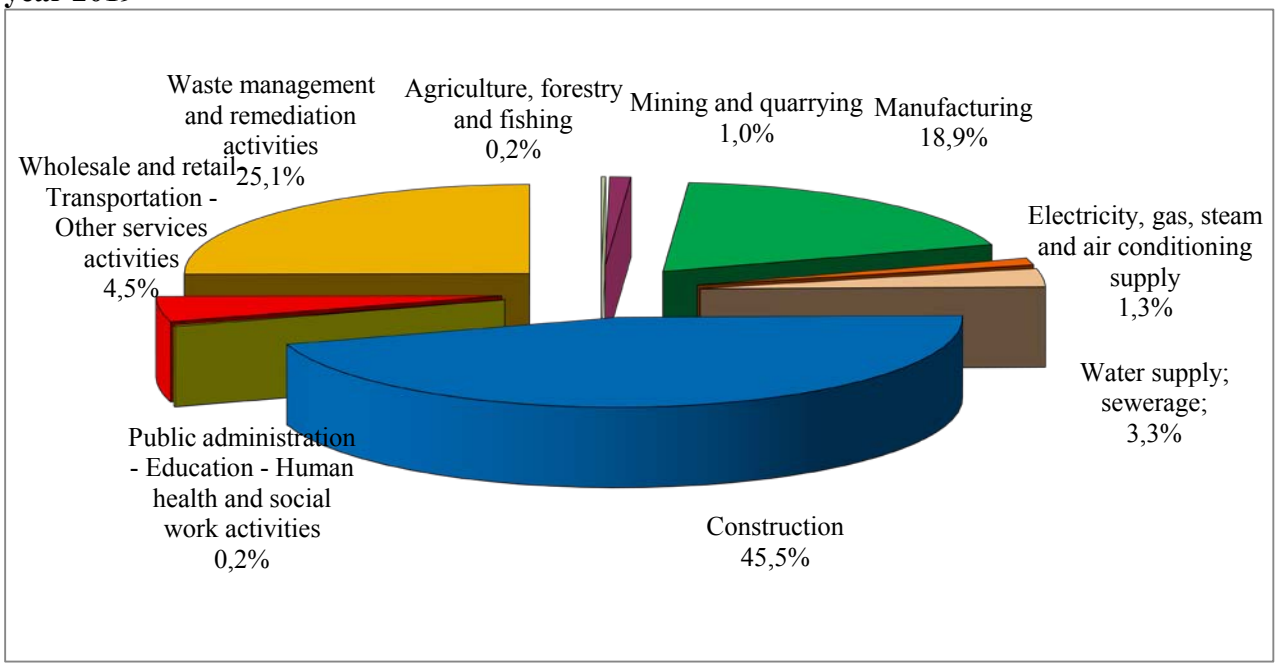
Type of waste	Quantity (tonnes)		
	2017	2018	2019
Non-hazardous wastes excluding construction and demolition waste	73.114.426	73.621.720	75.484.906
Construction and demolition wastes	56.112.305	59.812.827	68.334.771
Total of non-hazardous wastes (NH)	**129.226.731**	**133.434.547**	**143.819.677**
Hazardous wastes excluding end-of-life vehicles	8.366.836	8.622.066	8.616.601
End-of-life vehicles	1.302.640	1.423.089	1.538.046
Total of hazardous wastes (H)	**9.669.476**	**10.045.155**	**10.154.647**
Total of wastes from economic activities	**138.896.207***	**143.479.702***	**153.974.324***

*quantities of wastes deriving from the treatment of municipal waste are included.
Source: ISPRA

The largest contribution to the total generation of EAW is given by the construction and demolition sector (NACE[1]$_{rev.2}$ Sector F - Construction) and accounts for 45,5% of the total amount, with over 70 million tonnes (Figure 1.1). This quantity includes wastes from construction and demolition operations and other wastes produced by these activities (packaging wastes, spent oils ...). Waste treatment and environmental remediation activities (NACE$_{rev.2}$ Sector E - Water supply; sewerage; waste management and remediation activities) account for 25,1% of the total waste generation (38,6 million tonnes), while all manufacturing activities (NACE$_{rev.2}$ Sector C - Manufacturing) represent 18,9% (approximately 29,1 million tonnes). The other remaining economic sectors contribute, overall, to 10,5% (16,1 million tonnes) of EAW generated.

[1] NACE Rev. 2: Statistical classification of economic activities in the European Community, Rev. 2

Figure 1.1 – Percentage distribution of total waste generation, by sector of economic activity, year 2019



Source: ISPRA

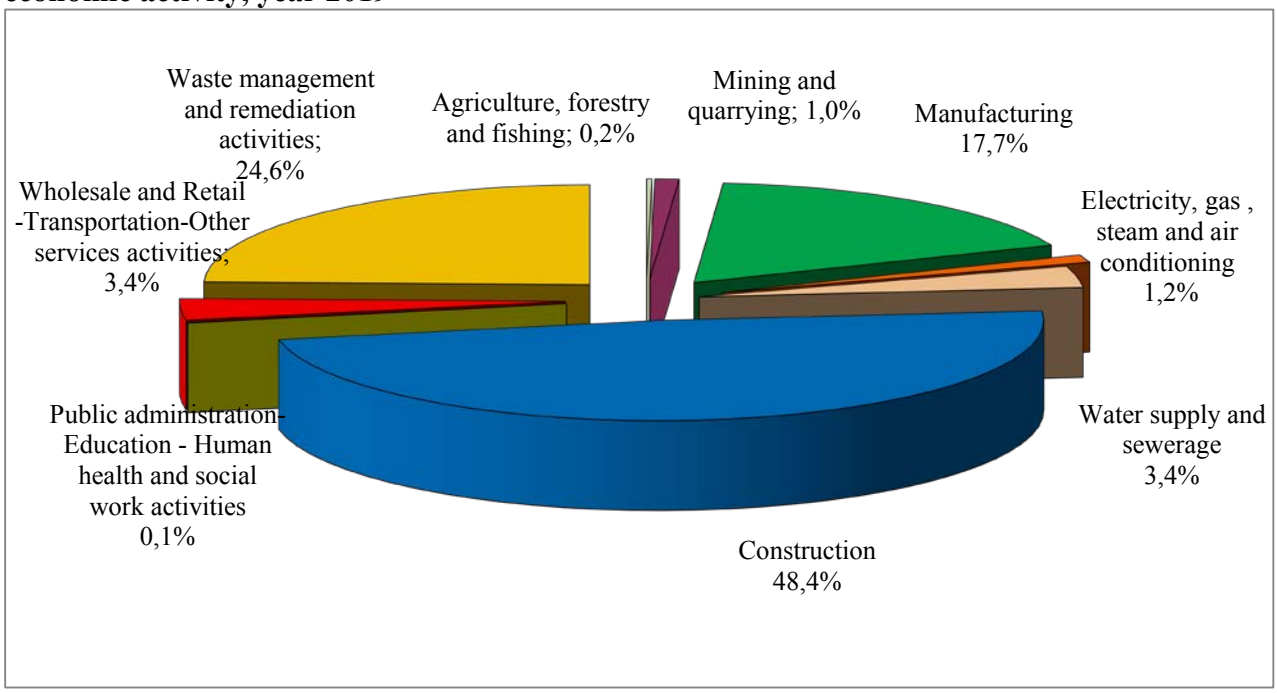
Regarding the generation of non-hazardous wastes (Figure 1.2), the percentage distribution between the various sectors of economic activities reflects the distribution of the total wastes generation, as it can be assumed in consideration of the high incidence of this type of waste on the total of wastes produced (93,4% of the total quantity).

A share of 48,4% of the total non-hazardous wastes generated, corresponding to 69,6 million tonnes, derives from the construction and demolition activities ($NACE_{rev.2}$ Sector F), followed by activities of waste treatment and remediation (24,6% - $NACE_{rev.2}$ Sector E) and the manufacturing sector (17,7%- $NACE_{rev.2}$ Sector C), corresponding respectively, to 35,3 million tonnes (this amount includes the quantities of waste deriving from the treatment of municipal waste) and almost 25,4 million tonnes. The remaining sectors, together, account for 9,3% of the total amount of non-hazardous wastes produced (approximately 13,5 million tonnes).

Data analysis by type of non-hazardous waste generated shows that wastes from construction and demolition operations (EWL[2] 17) constitute 47,5% of the total, those produced by treatment of wastes and wastewater (EWL 19) correspond to 27,5%, followed by wastes produced by thermal processes (EWL 10), representing 6,1%, and wastes not otherwise specified in the European List of Waste (EWL 16), 4,1% (Figure 1.3).

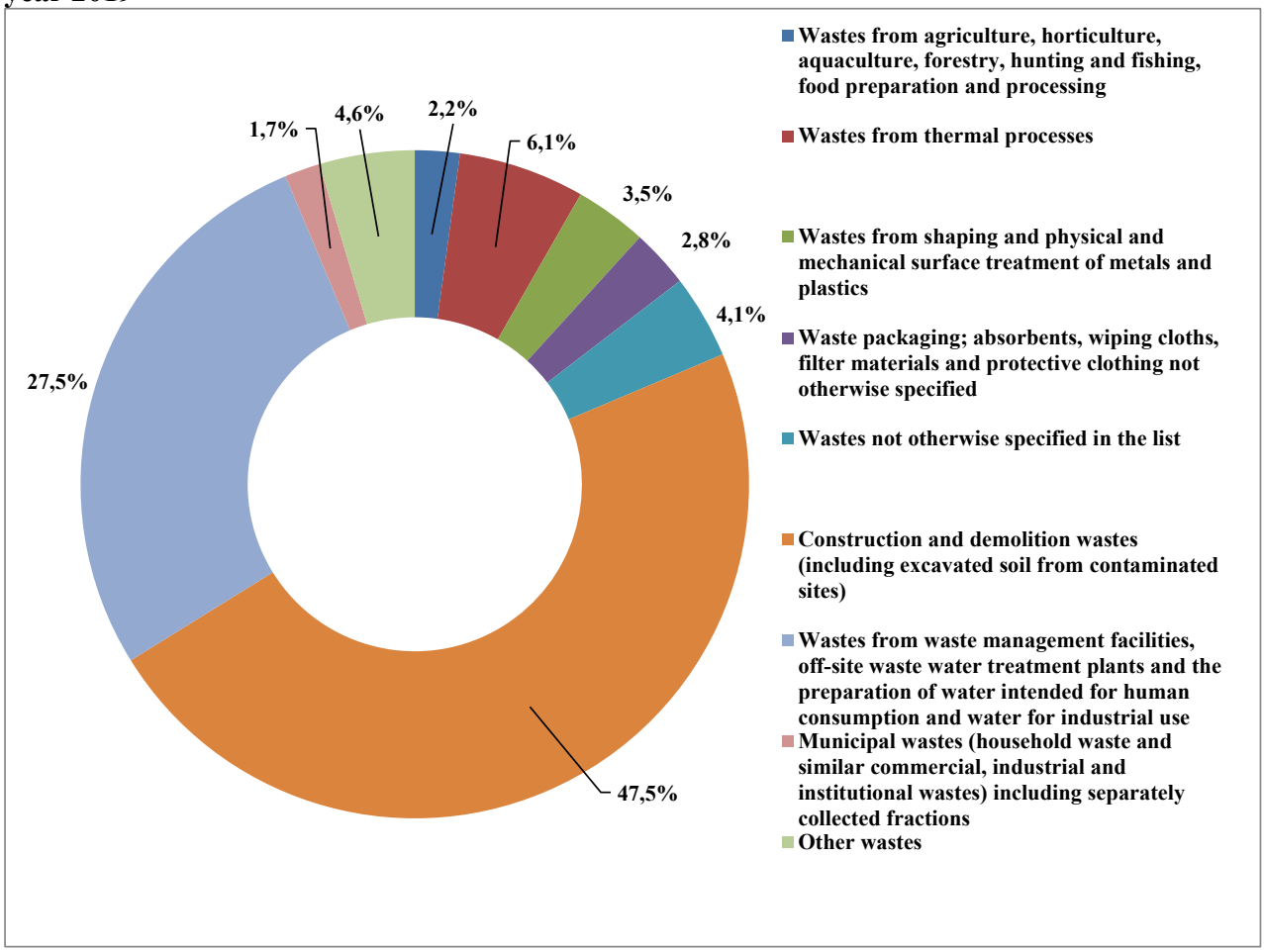
[2] European Waste List.

Figure 1.2 – Percentage distribution of non-hazardous wastes generation, by sector of economic activity, year 2019



Source: ISPRA

Figure 1.3 – Percentage distribution of non-hazardous wastes generation, by type of waste, year 2019



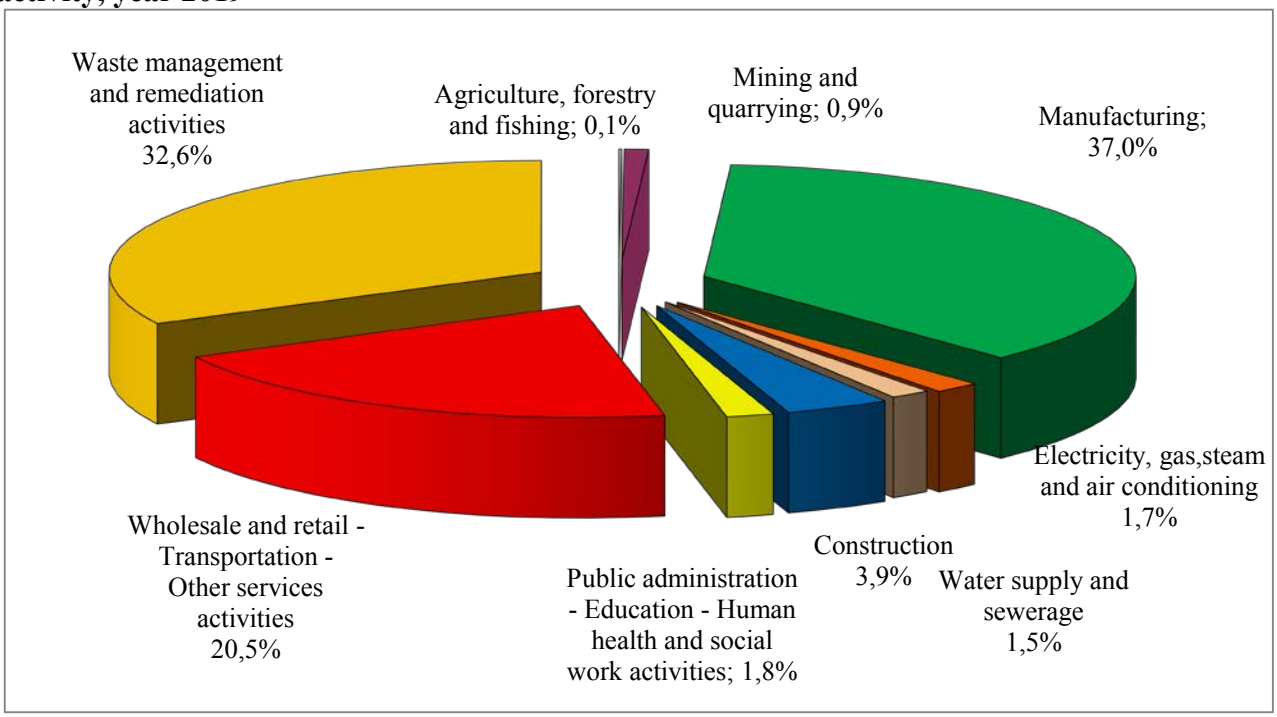
Source: ISPRA

The manufacturing sector also produces 37% of the total hazardous wastes, corresponding to 3,8 million tonnes (Figure 1.4). Waste treatment and environmental remediation sector is accountable for 32,6% of the total hazardous wastes generated, equal to 3,3 million tonnes. This sector is followed by the Wholesale and Retail -Transportation-Other services activities sectors ($NACE_{rev.2}$ Sector G, H and others) with a generation of 20,5% of the total, almost 2,1 million tonnes, of which over 1,5 million tonnes of end-of-life vehicles.

The sectors of manufacture of coke and products deriving from petroleum refining ($NACE_{rev.2}$ Sector C19) manufacture of chemical and pharmaceutical products ($NACE_{rev.2}$ Sector C20 - C21) and rubber articles and plastics ($NACE_{rev.2}$ Sector C22), together account for 45,5% (1,7 million tonnes) of the total hazardous wastes produced by the whole manufacturing sector.
The metallurgical sector ($NACE_{rev.2}$ Sector C24 - Manufacture of basic metals), produces of 981 thousand tonnes of hazardous wastes (26,1% of the whole sector's wastes generation), while the manufacture of metal products, excluding machinery and equipment ($NACE_{rev.2}$ Sector C25), produces 426 thousand tonnes of hazardous wastes (11,4%).

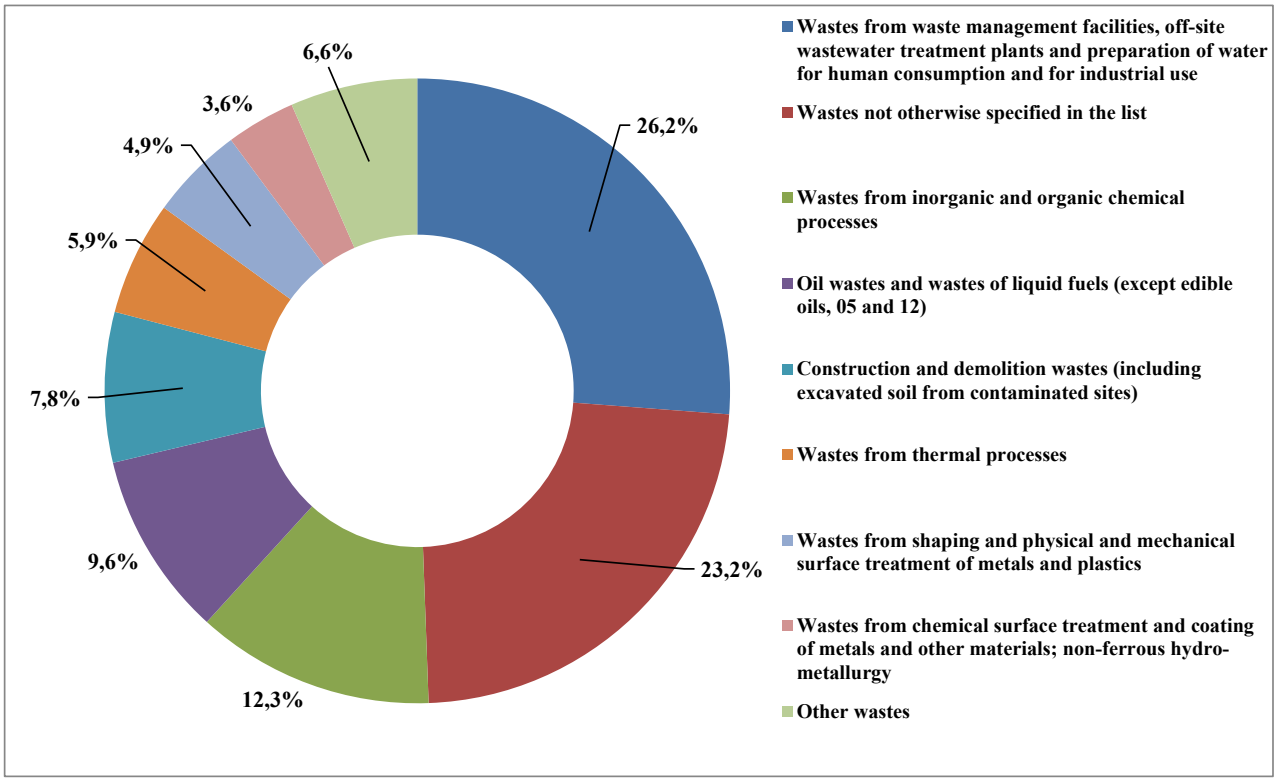
Data analysis by type of hazardous waste generated in 2019 shows that 26,2% of the total consists of wastes produced by treatment of wastes and wastewater (EWL 19), while 23,2% are wastes not otherwise specified in the European List of Waste (EWL 16) including end-of-life vehicles (ELV), electrical and electronic equipment (WEEE), batteries and accumulators (Figure 1.5). Wastes from inorganic and organic chemical processes (EWL 06 and EWL 07) together represent 13,2% of the total amount of hazardous waste generated, while oil wastes and wastes of liquid fuels (EWL 13) and wastes deriving from construction and demolition operations (EWL 17) are respectively 9,6% and 7,8% of the total. Wastes from thermal processes (EWL 10) correspond to 5,9% and wastes from the surface processing of metals and plastics (EWL 11) to 4,9%.

Figure 1.4 – Percentage distribution of hazardous waste generation, by sector of economic activity, year 2019



Source: ISPRA

Figure 1.5 – Percentage distribution of hazardous wastes generation, by type of waste, year 2019

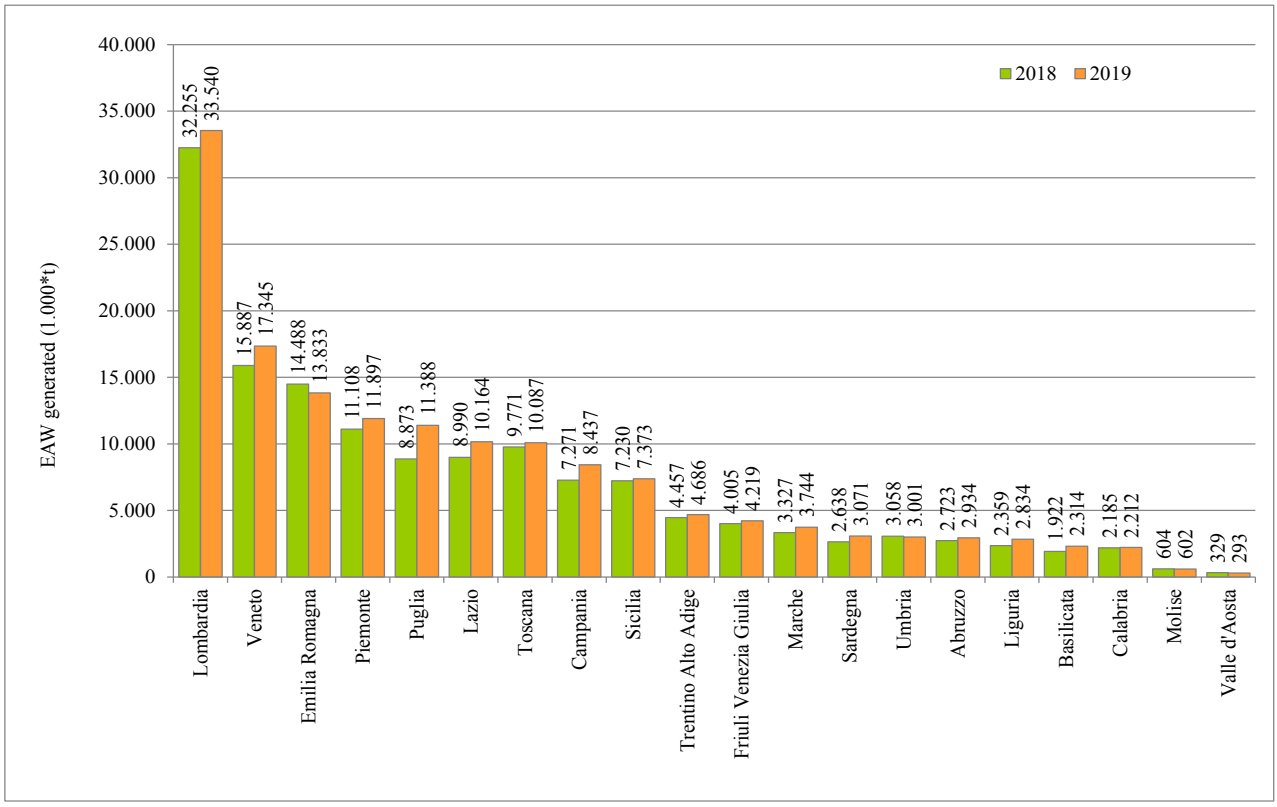


Source: ISPRA

At macro-area level, the generation of waste from economic activities, is mainly in Northern Italy, with 88,6 million tonnes (equal to 57,6% of the overall national data). Wastes generation from Central Italy stands at 27 million tonnes (17,5% of the total), while in Southern Italy stands at 38,3 million tonnes (24,9%).

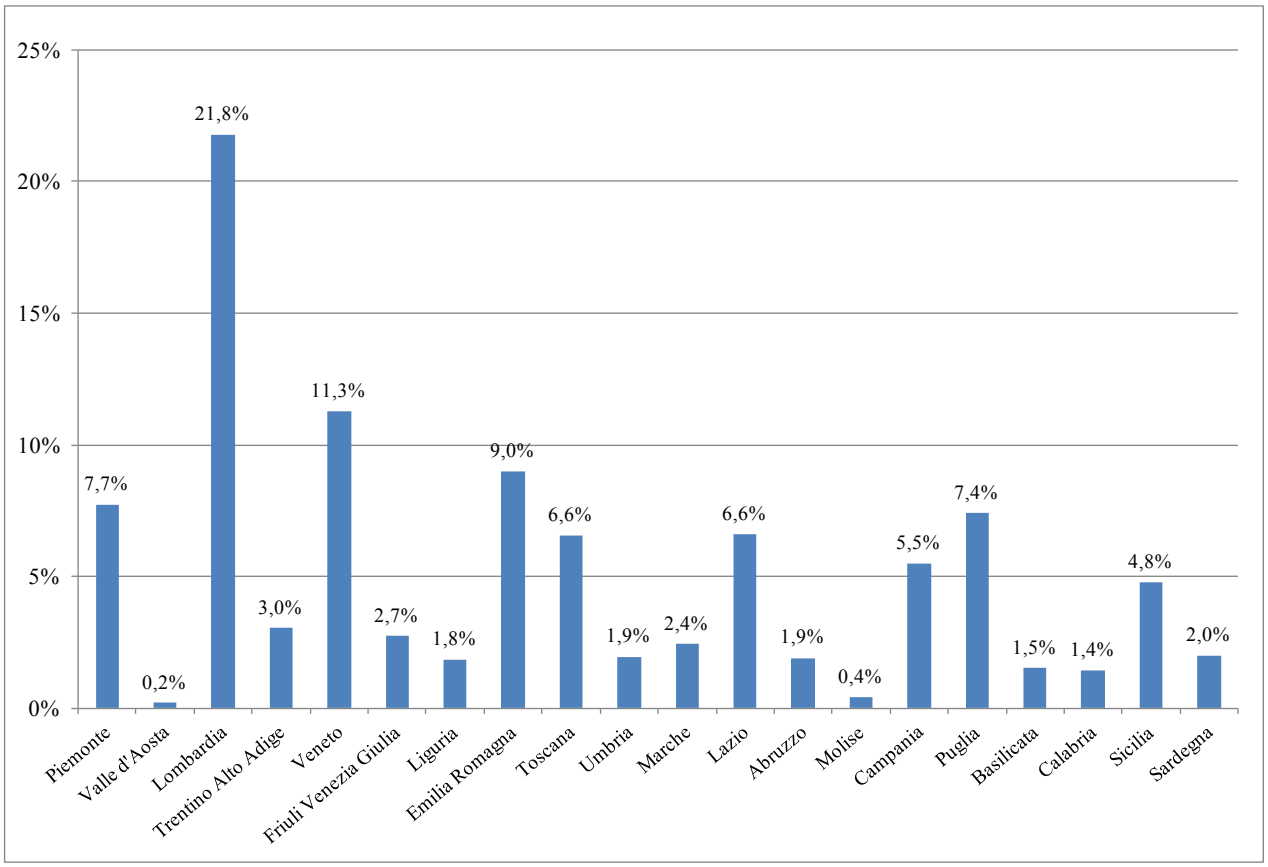
At regional level (Figures 1.6, 1.7, 1.8), Lombardia produces 37,8% of the total waste generated in Northern Italy with over 33,5 million tonnes, followed by Veneto with 17,3 million tonnes (19,6%), Emilia-Romagna with almost 13,8 million tonnes (15,6%) and Piemonte with almost 11,9 million tonnes (13,4%).
Among the regions of Central Italy, the highest amount of waste generated are in Lazio with about 10,2 million tonnes equal to 37,7% of the production of the macro-area, and Toscana with almost 10,1 million tonnes (37, 4%).
In the Southern Italy, Puglia with an overall production of EAW of almost 11,4 million tonnes, represents 29,7% of the total of the macro-area, followed by Campania with 8,4 million tonnes (22%) and Sicilia (about 7,4 million tonnes, 19,2%).

Figure 1.6 – Total generation of waste from economic activities at regional level, years 2018 – 2019



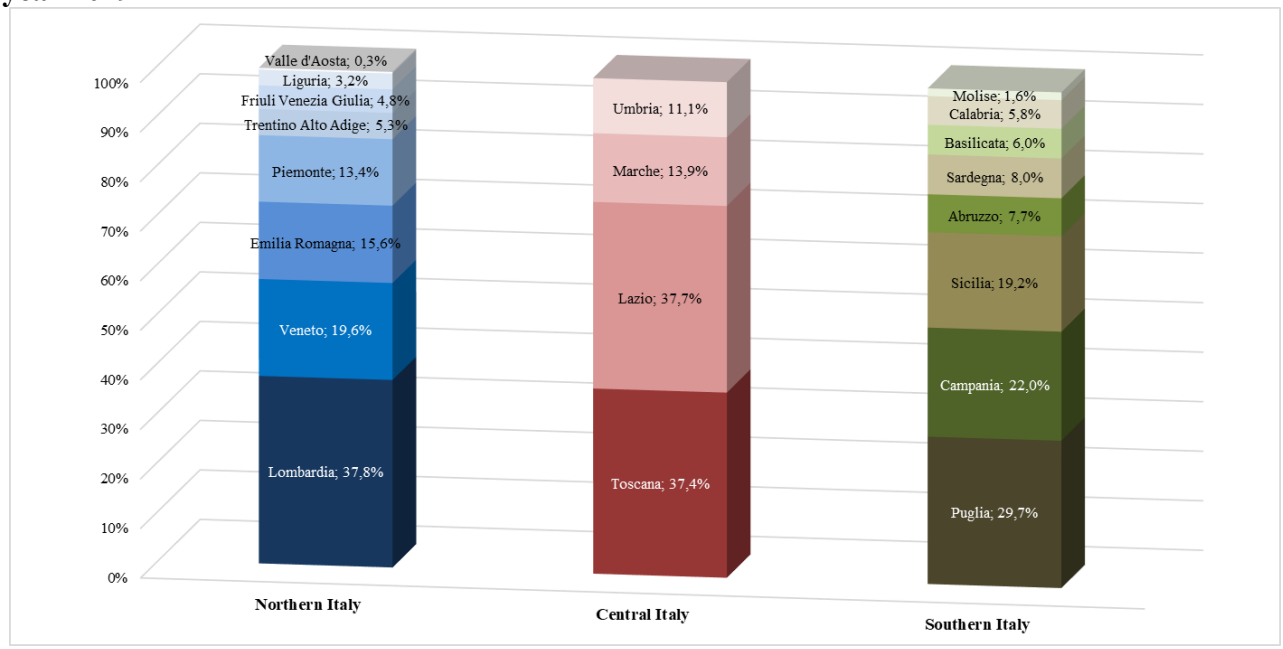
Source: ISPRA

Figure 1.7 – Incidence rates of regional waste generation related to total national value, year 2019



Source: ISPRA

Figure 1.8 – Incidence rates of regional waste generation related to total macro-area value, year 2019

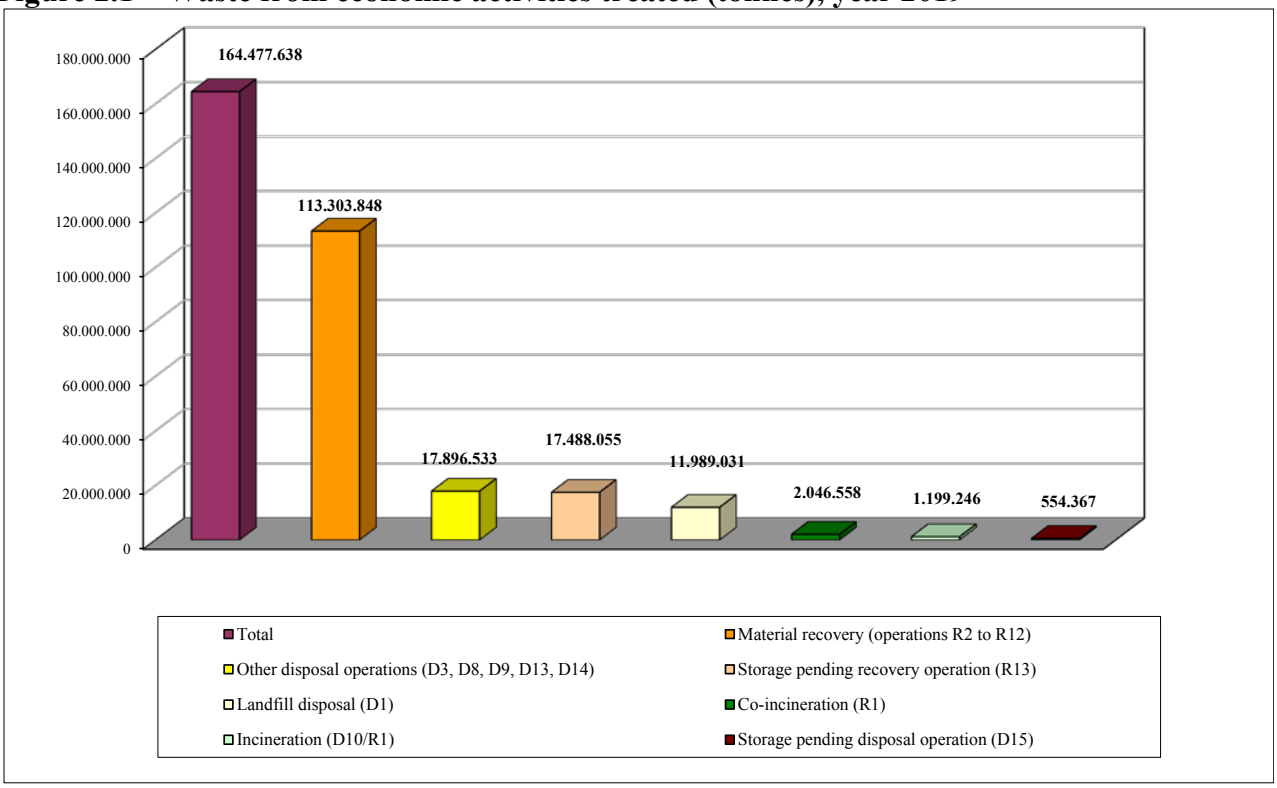


Source: ISPRA

TREATMENT OF WASTE FROM ECONOMIC ACTIVITIES

The total amount of EAW treated in Italy (by recovery or disposal operations) is 164,5 million tonnes, of which 154,7 million tonnes (94% of the total) are non-hazardous and the remaining 9,8 million tonnes (6% of the total) are hazardous waste. The total amount treated includes 18 million tonnes of waste in storage at plants and producers at the date of 31/12/2019.
Compared to 2018, the total amount treated increased by 7,8%; specifically, the quantities recovered increased by 9,6%, while those sent for disposal by 1,3%.
The main form of treatment is material recovery (operations R2 to R12) accounting for 68,9% of the total waste treated (113,3 million tonnes), followed by other disposal operations (D3, D8, D9, D13, D14) with 10,9% (17,9 million tonnes) and landfill disposal (D1) with 7,3% (12 million tonnes). The amount of wastes co-incinerated[3] (R1; 2 million tonnes) and incinerated (D10/R1; 1,2 million tonnes) is minimal, accounting for 1,2% and 0,7% of the total respectively (Figures 2.1 and 2.2).

Figure 2.1 – Waste from economic activities treated (tonnes), year 2019

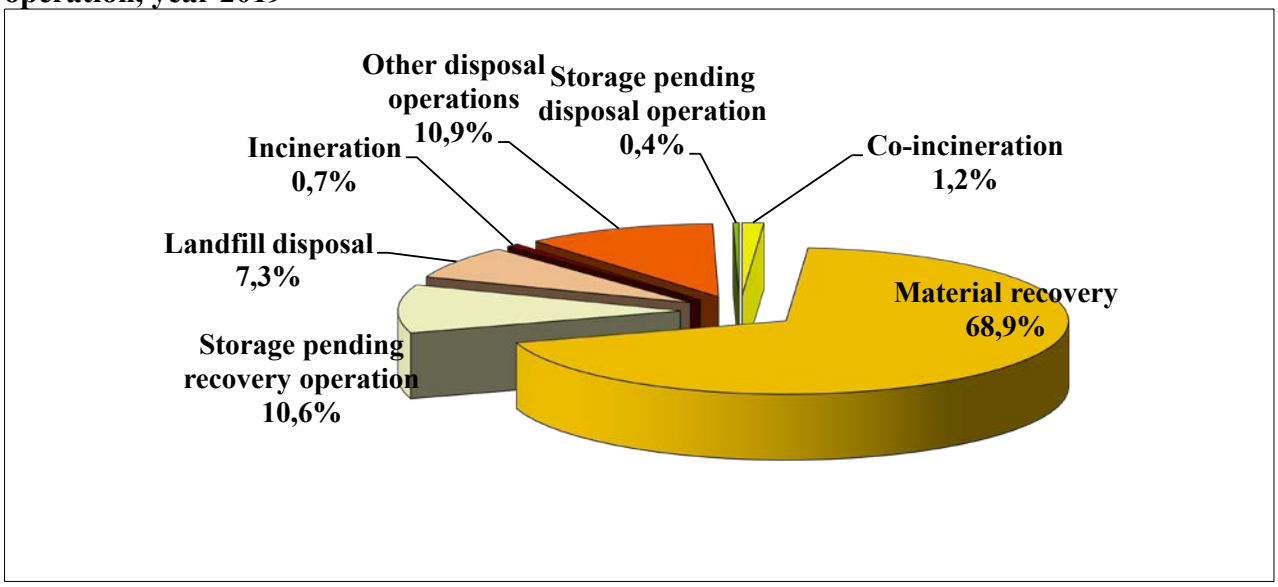


R1: Use principally as a fuel or other means to generate energy, **R2**: Solvent reclamation/regeneration, **R3**: Recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes), **R4**: Recycling/reclamation of metals and metal compounds, **R5**: Recycling/reclamation of other inorganic materials, **R6**: Regeneration of acids or bases, **R7:** Recovery of components used for pollution abatement, **R8:** Recovery of components from catalysts, **R9:** Oil re-refining or other reuses of oil, **R10:** Land treatment resulting in benefit to agriculture or ecological improvement, **R11:** Use of waste obtained from any of the operations numbered R 1 to R 10, **R12:** Exchange of waste for submission to any of the operations numbered R 1 to R 11, **R13:** Storage of waste pending any of the operations numbered R 1 to R 12 (excluding temporary storage, pending collection, on the site where the waste is produced).
D1: Deposit into or on to land (e.g. landfill, etc.), **D3**: Deep injection (e.g. injection of pumpable discards into wells, salt domes or naturally occurring repositories, etc.), **D8:** Biological treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12, **D9:** Physical-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any

[3] "co-incineration": the use of wastes as a regular or additional fuel in a co-incineration plant or the thermal treatment of waste for the purpose of disposal in a co-incineration plant; "co-incineration plant": any stationary or mobile plant whose main purpose is the generation of energy or production of material products, and (a) which uses wastes as a regular or additional fuel; or (b) in which waste is thermally treated for the purpose of disposal.

of the operations numbered D 1 to D 12 (e.g. evaporation, drying, calcination, etc.), **D10:** Incineration on land, **D13:** Blending or mixing prior to submission to any of the operations numbered D 1 to D 12, **D14:** Repackaging prior to submission to any of the operations numbered D 1 to D 13, **D15:** Storage pending any of the operations numbered D 1 to D 14 (excluding temporary storage, pending collection, on the site where the waste is produced).
Note: D10 includes quantities of hazardous waste treated in incineration plants with energy recovery dedicated predominantly to the treatment of municipal waste and classified R1 according to Annex II of Directive 2008/98/EC.
Source: ISPRA

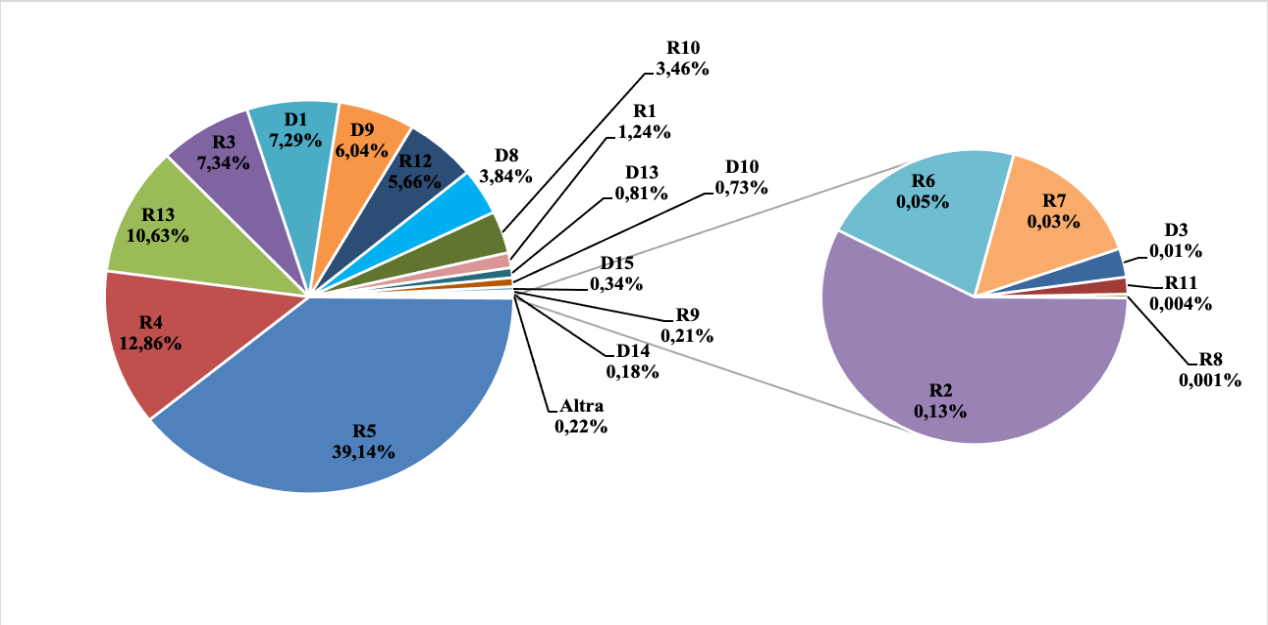
Figure 2.2 – Percentage distribution of waste from economic activities, by type of treatment operation, year 2019



Note: Incineration includes quantities of waste treated in incineration plants with energy recovery dedicated, predominantly, to the treatment of municipal waste and classified R1 according to Annex II of Directive 2008/98/EC.
Source: ISPRA

As reported in previous years, the most used treatment operations are those aimed at waste recovery. Specifically, the recycling/recovery of inorganic substances (R5) represents 39,1% (64,4 million tonnes) of the total waste treated and increased of 9,9% (5,8 million tonnes) if compared to 2018. These wastes subjected to R5 operation are mainly generated from construction and demolition activities (55,6 million tonnes) and are generally recovered in road embankments and road foundations (Figure 2.3).

Figure 2.3 – Percentage distribution of waste from economic activities, by specific treatment operation, year 2019

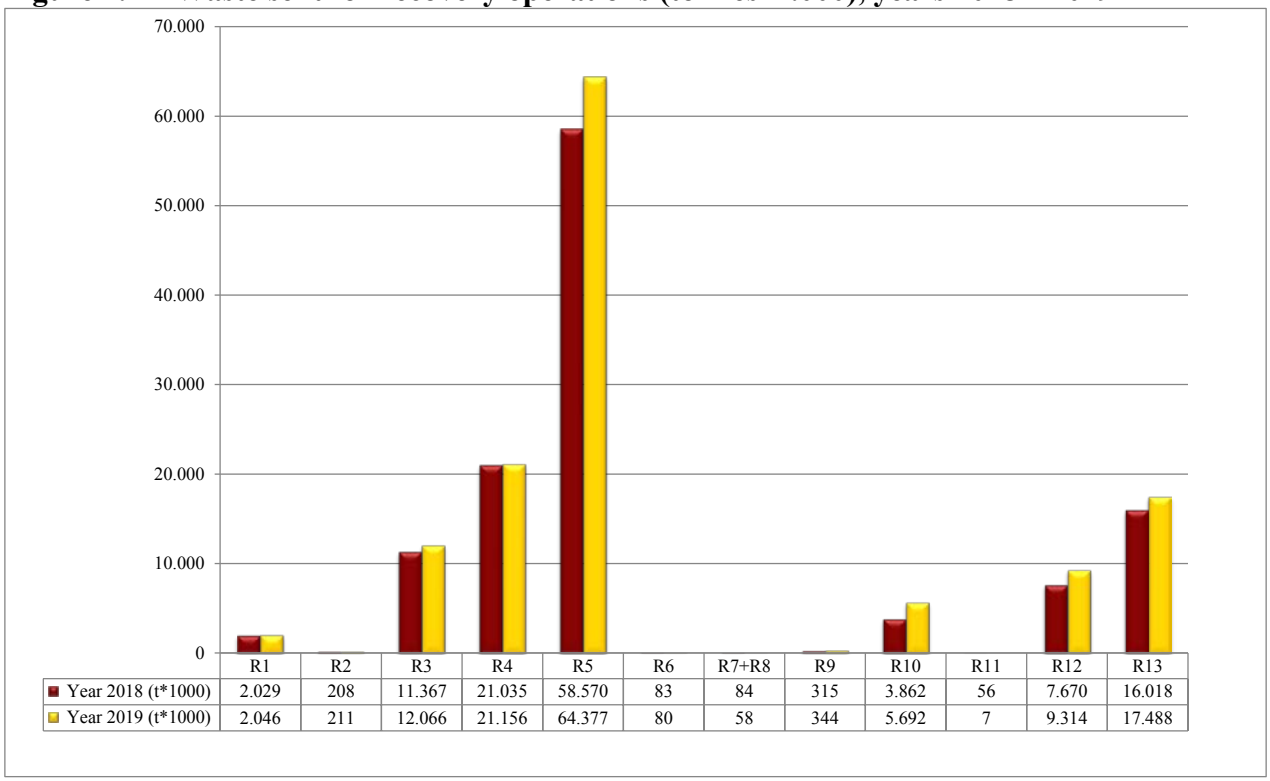


Source: ISPRA

The recovery of metals and metal compounds (R4) amounts to 21,2 million tonnes (12,9% of the total) and mainly is carried out, in steel mills in Northern Italy. This quantity increases by 121 thousand tonnes compared to 2018 (+0,6%).
The recovery of organic substances (R3) represents 7,3% of the total (12,1 million tonnes) and mainly concerns, paper, cardboard and wood; the increase recorded is 698 thousand tonnes (+6,1%) compared to 2018. Land treatment for the benefit of agriculture and ecology (R10), amounts to 5,7 million tonnes.
With regard to disposal operations, the quantities disposed of in landfills (D1), amount to 7,3% of the total (12 million tonnes) with an increase of 101 thousand tonnes (+0,9%) compared to 2018.
Waste undergoing physicochemical treatment (D9) accounts for 6% of the total (9,9 million tonnes); compared to 2018, the amount decreases by 83 thousand tonnes (-0,8%). The kind of waste predominantly treated are aqueous liquid wastes (EWL 1610**) and landfill leachate (EWL 1907**).

The quantities of wastes sent for biological treatment (D8) are also significant, amounting to 3,8% of the total (6,3 million tonnes); compared to 2018, there is an increase of 169 thousand tonnes (+ 2,7%). These are, mainly, landfill leachate, septic tank sludge and sludge produced by urban wastewater treatment.
Figures 2.4 and 2.5 show details of the quantities of waste from economic activities sent for recovery and disposal operations in 2018-2019.

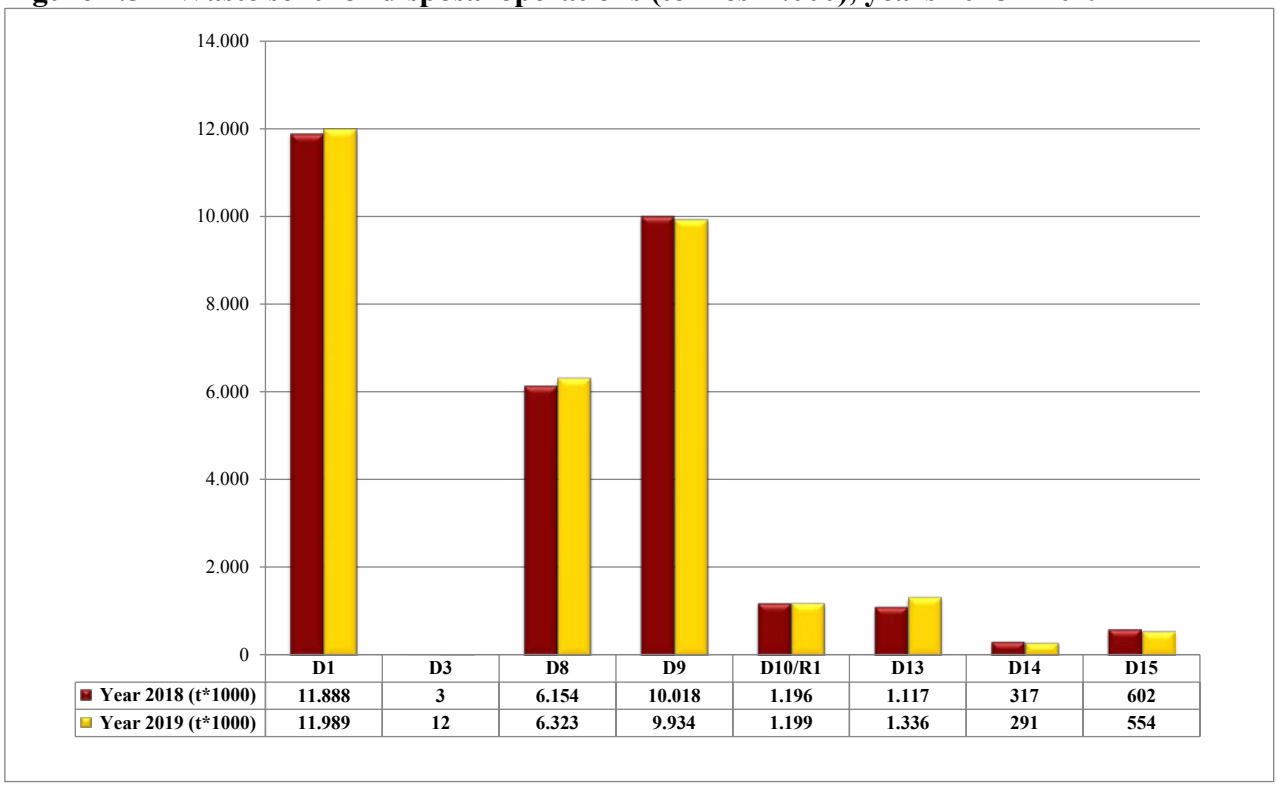
Figure 2.4 – Waste sent for recovery operations (tonnes*1.000), years 2018 – 2019



	R1	R2	R3	R4	R5	R6	R7+R8	R9	R10	R11	R12	R13
Year 2018 (t*1000)	2.029	208	11.367	21.035	58.570	83	84	315	3.862	56	7.670	16.018
Year 2019 (t*1000)	2.046	211	12.066	21.156	64.377	80	58	344	5.692	7	9.314	17.488

Source: ISPRA

Figure 2.5 – Waste sent for disposal operations (tonnes*1.000), years 2018 – 2019

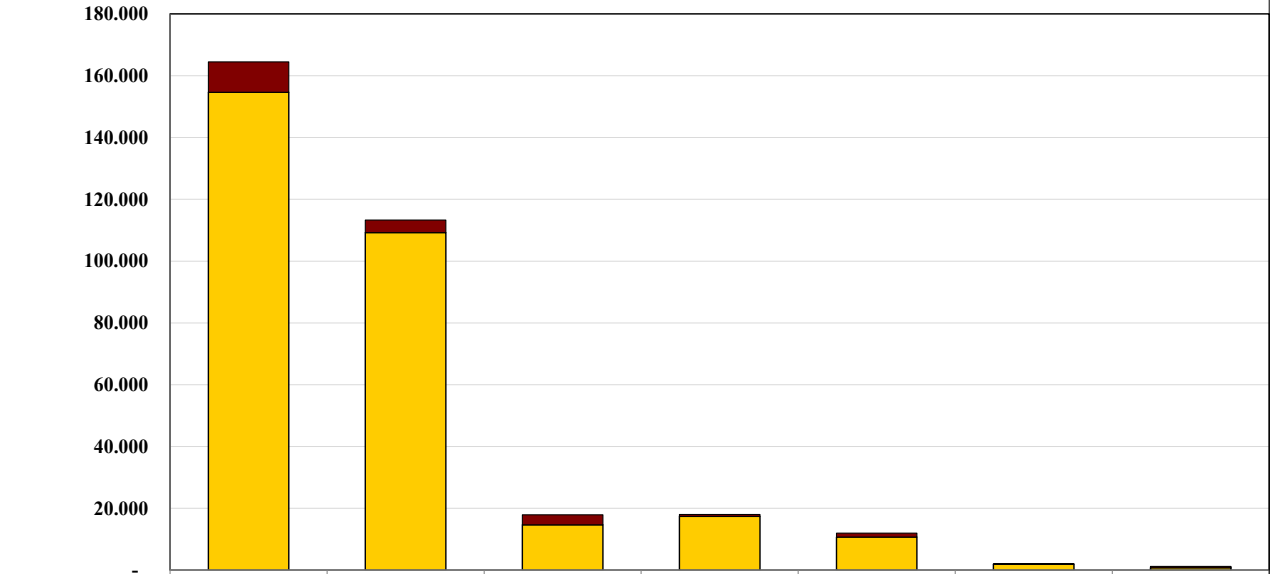


	D1	D3	D8	D9	D10/R1	D13	D14	D15
Year 2018 (t*1000)	11.888	3	6.154	10.018	1.196	1.117	317	602
Year 2019 (t*1000)	11.989	12	6.323	9.934	1.199	1.336	291	554

Note: D10 includes quantities of hazardous waste treated in incineration plants with energy recovery dedicated predominantly to the treatment of municipal waste and classified R1 according to Annex II of Directive 2008/98/EC.
Source: ISPRA

Non-hazardous and hazardous wastes are quantified below by treatment type (Figure 2.6).

Figure 2.6 – Non-hazardous and hazardous waste by treatment type (tonnes*1.000), year 2019

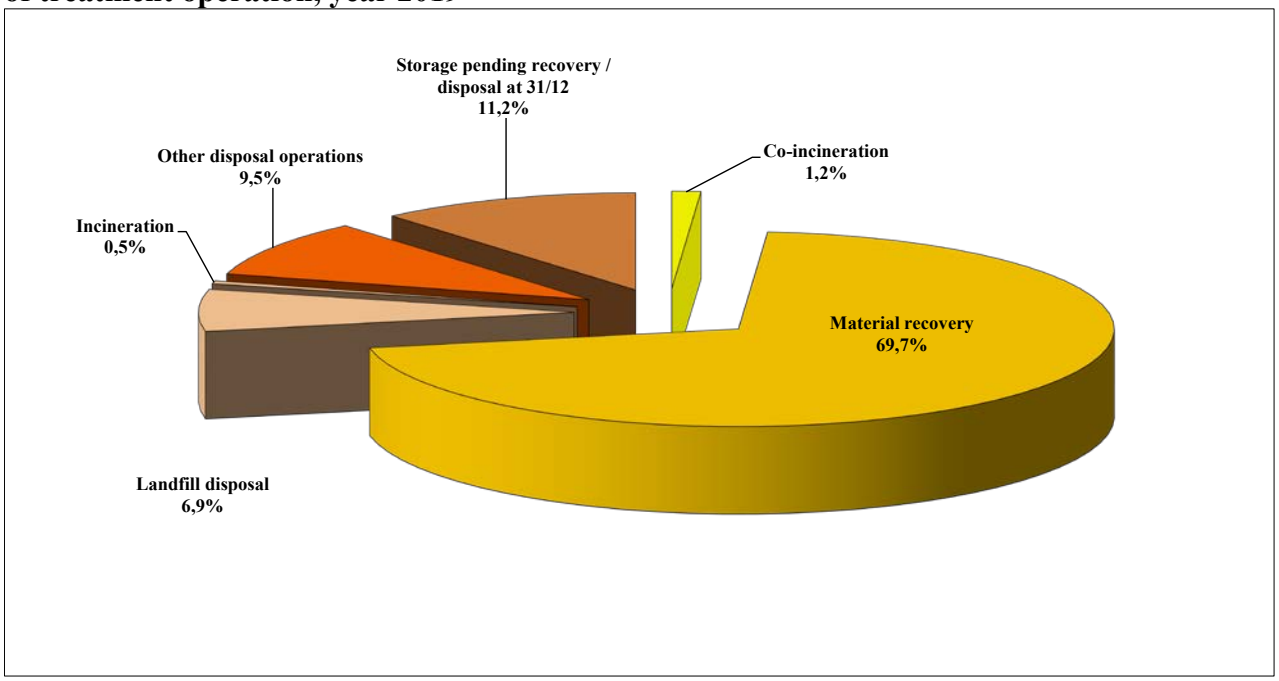


	Total	Material recovery	Other disposal operations	Storage pending recovery / disposal at 31/12	Landfill disposal	Co-incineration	Incineration
Hazardous	9.798	4.086	3.250	651	1.260	121	430
Non-hazardous	154.678	109.217	14.647	17.391	10.729	1.925	769

Note: Incineration includes quantities of hazardous waste treated in incineration plants with energy recovery dedicated, predominantly, to the treatment of municipal waste and classified R1 according to Annex II of Directive 2008/98/EC.
Source: ISPRA

The total amount of **non-hazardous waste** treated is 154,7 million tonnes, of which 128,2 million tonnes are sent for recovery operations (+9,6% compared to 2018), while 26,5 million tonnes are destined for disposal operations (Figure 2.7).
Material recovery operations (R2 to R12) concerned an amount of 109,2 million tonnes of waste, representing 69,7% of the total non-hazardous waste treated. In particular, the recovery of inorganic substances (R5) concerns 64 million tonnes of waste and compared to 2018, shows an increase of 5,8 million tonnes (+10%). These are mainly wastes from construction and demolition activities.
The recovery of metals or metal compounds (R4) involves 19,5 million tonnes, an almost stable value compared to the previous year. The recovery of organic substances (R3) concerns 11,8 million tonnes of waste.
Wastes treated with R12 operation, approximately 8 million tonnes, increased by 1,5 million tonnes (+22,2%) compared to 2018; this operation may include: pre-treatment, sorting, fragmentation, compaction, pelletisation, drying, shredding, conditioning, reconditioning, separation and grouping.
Recovery for the benefit of agriculture and ecology (R10) shows an increase of 1,8 million tonnes (+47,4%). The quantities of non-hazardous waste recovered for generating energy (R1) are stable.
Among the disposal operations, the most widespread are: landfill (D1) with 10,7 million tonnes of waste (compared to 2018, +122 thousand tonnes, +1,2%), chemical-physical treatment (D9) with 7,7 million tonnes, (+1,2%) and biological treatment (D8), with 6,1 million tonnes (+129 thousand tonnes, +2,1%).

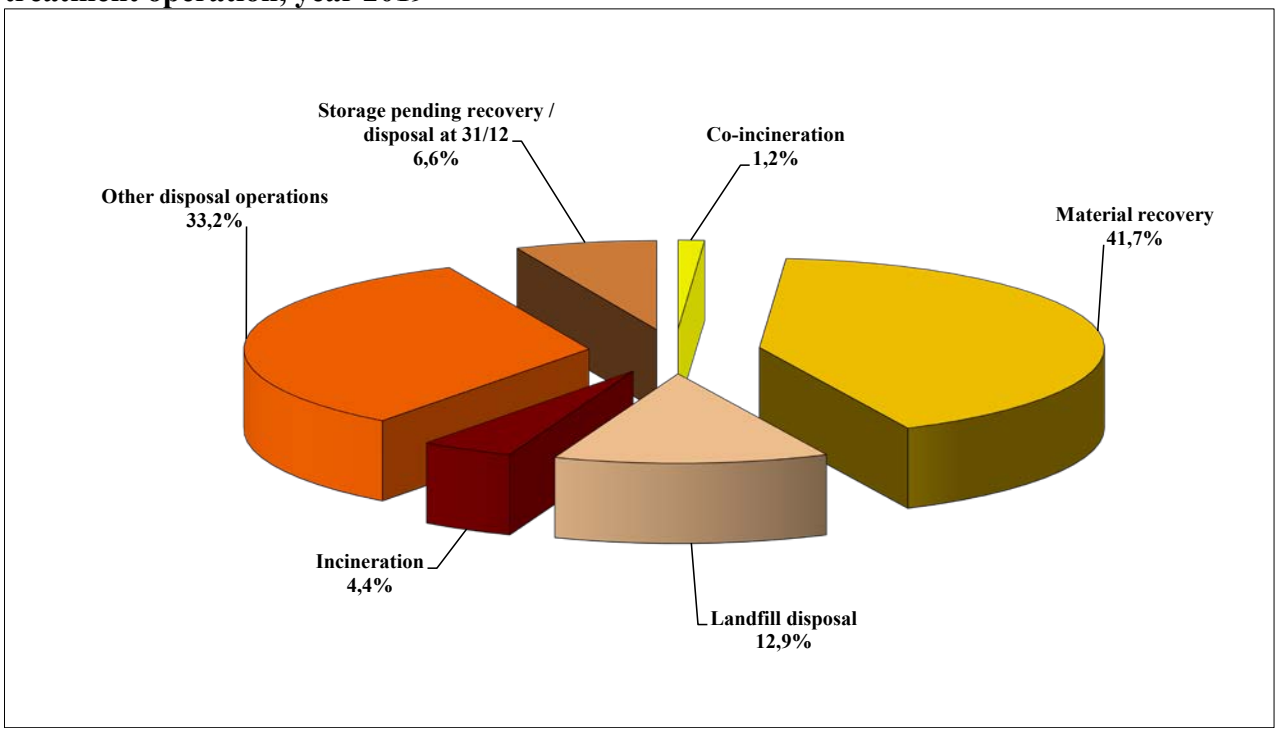
Figure 2.7 – Percentage distribution of non-hazardous waste from economic activities, by type of treatment operation, year 2019



Note: Incineration includes quantities of waste treated in incineration plants with energy recovery dedicated, predominantly, to the treatment of municipal waste and classified R1 according to Annex II of Directive 2008/98/EC.
Source: ISPRA

Hazardous waste treated were 9,8 million tonnes, of which 4,1 million tonnes are sent for material recovery (41,7% of the total hazardous waste treated). Recycling/recovery of metals or metal compounds (R4) amounts to 1,7 million tonnes and mainly concerns end-of-life vehicles (894 thousand tonnes).
Intermediate disposal operations (D8, D9, D13, D14) involved 3,2 million tonnes of waste, equal to 33,2% of total hazardous waste. Among these, chemical-physical treatment (D9) is the most common operation with 2,3 million tonnes or 43,7% of the total hazardous waste disposed of. Landfilling (D1), with about 1,3 million tonnes, decrease by 1,6% (-21 thousand tonnes; Figure 2.8).

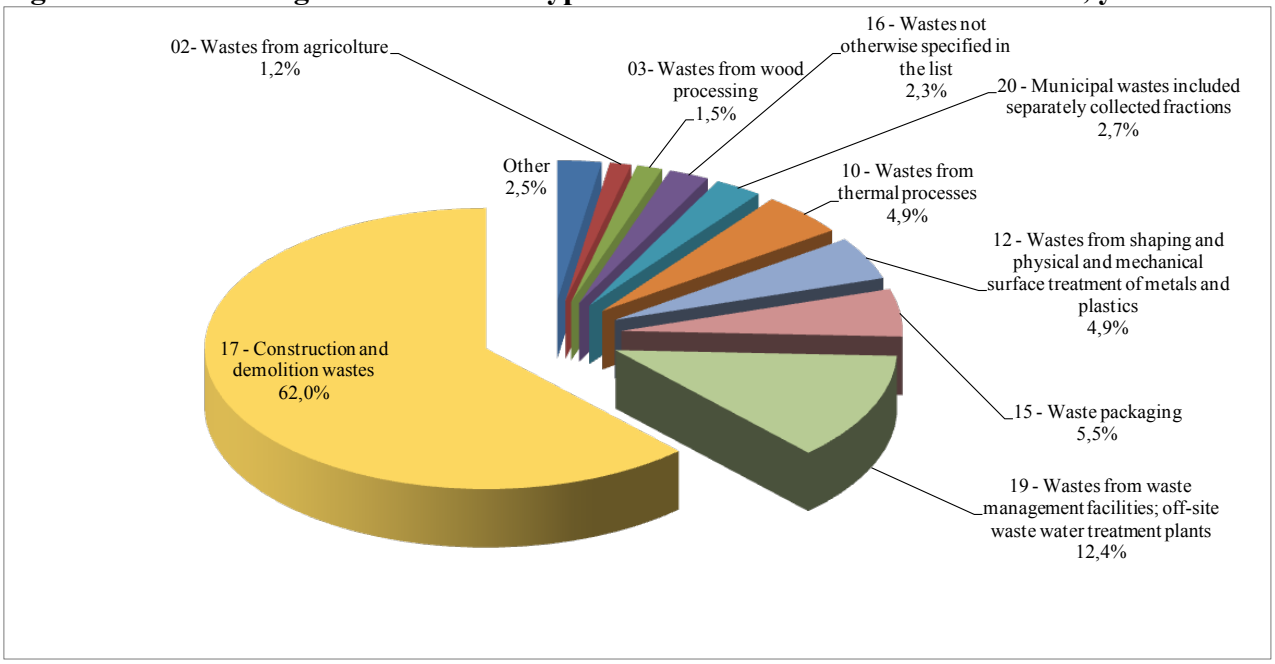
Figure 2.8 – Percentage distribution of hazardous waste from economic activities, by type of treatment operation, year 2019



Note: Incineration includes quantities of waste treated in incineration plants with energy recovery dedicated, predominantly, to the treatment of municipal waste and classified R1 according to Annex II of Directive 2008/98/EC.
Source: ISPRA

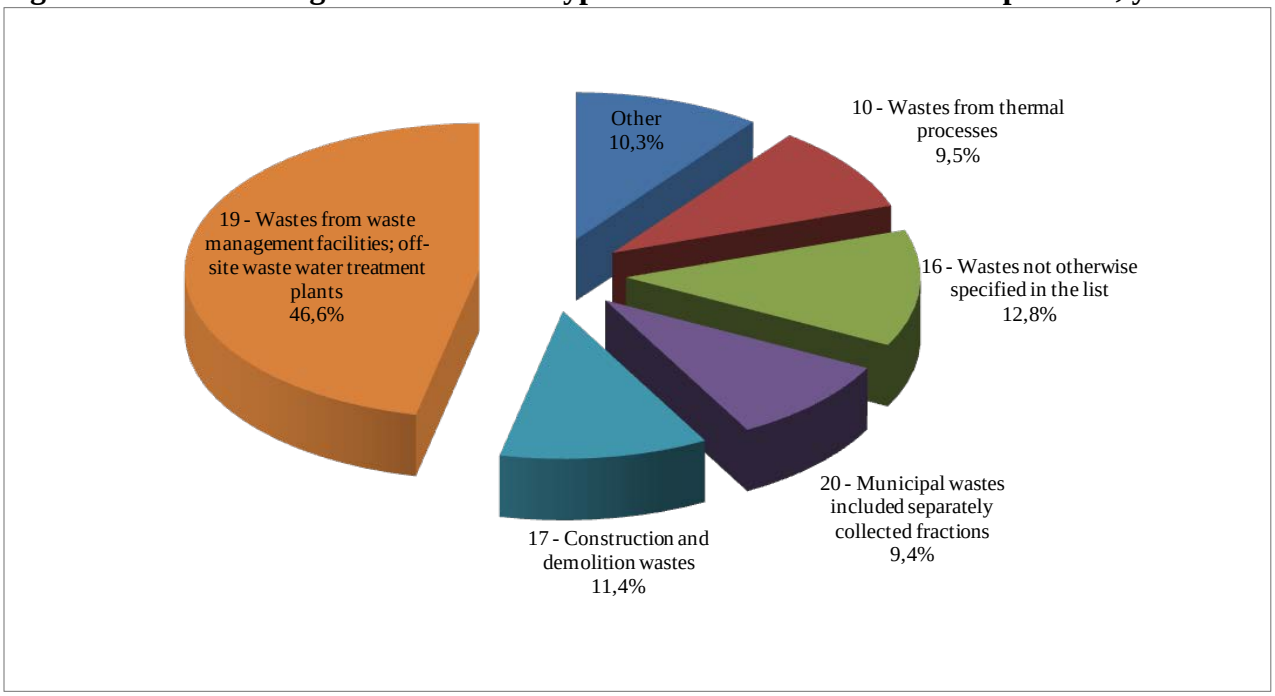
The following figures (from 2.9 to 2.12), show the types of **non-hazardous and hazardous** wastes from the different chapters of the European Waste List sent for recovery/disposal operations.

Figure 2.9 – Percentage distribution of types of non-hazardous waste recovered, year 2019



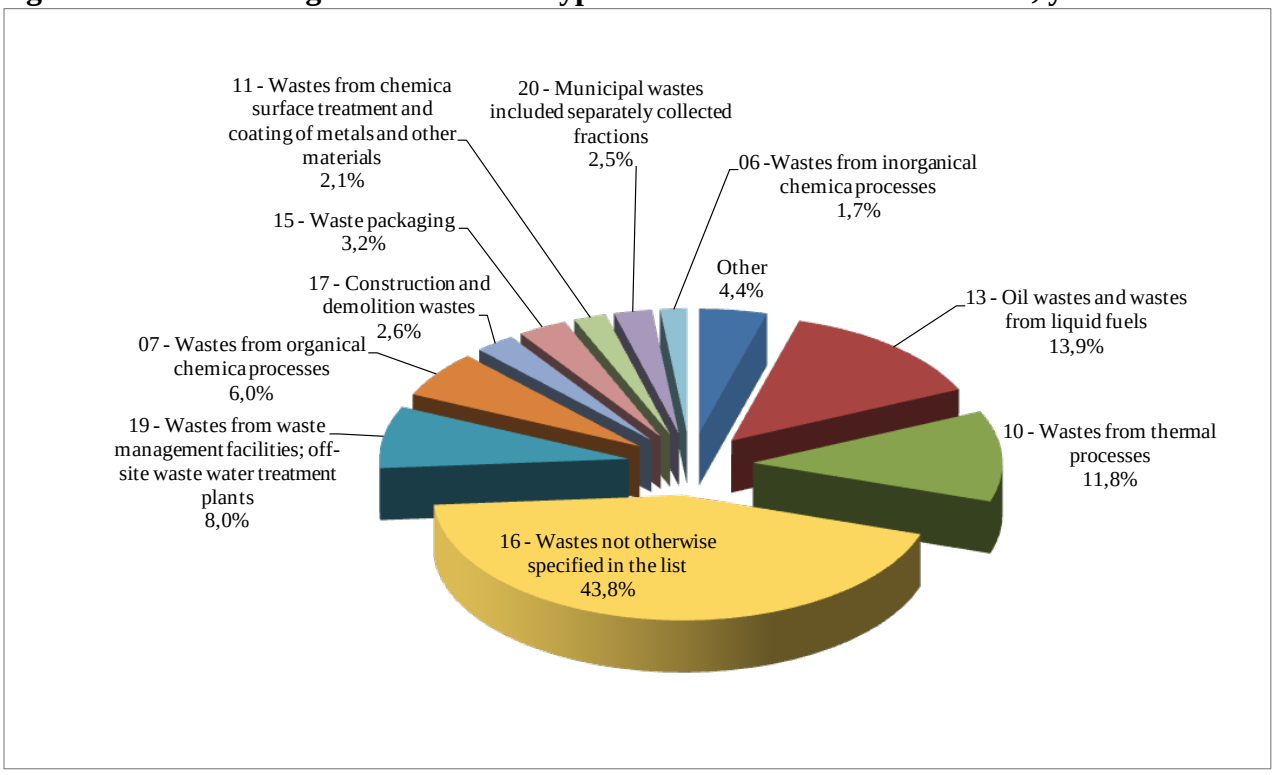
Source: ISPRA

Figure 2.10 – Percentage distribution of types of non-hazardous waste disposed of, year 2019



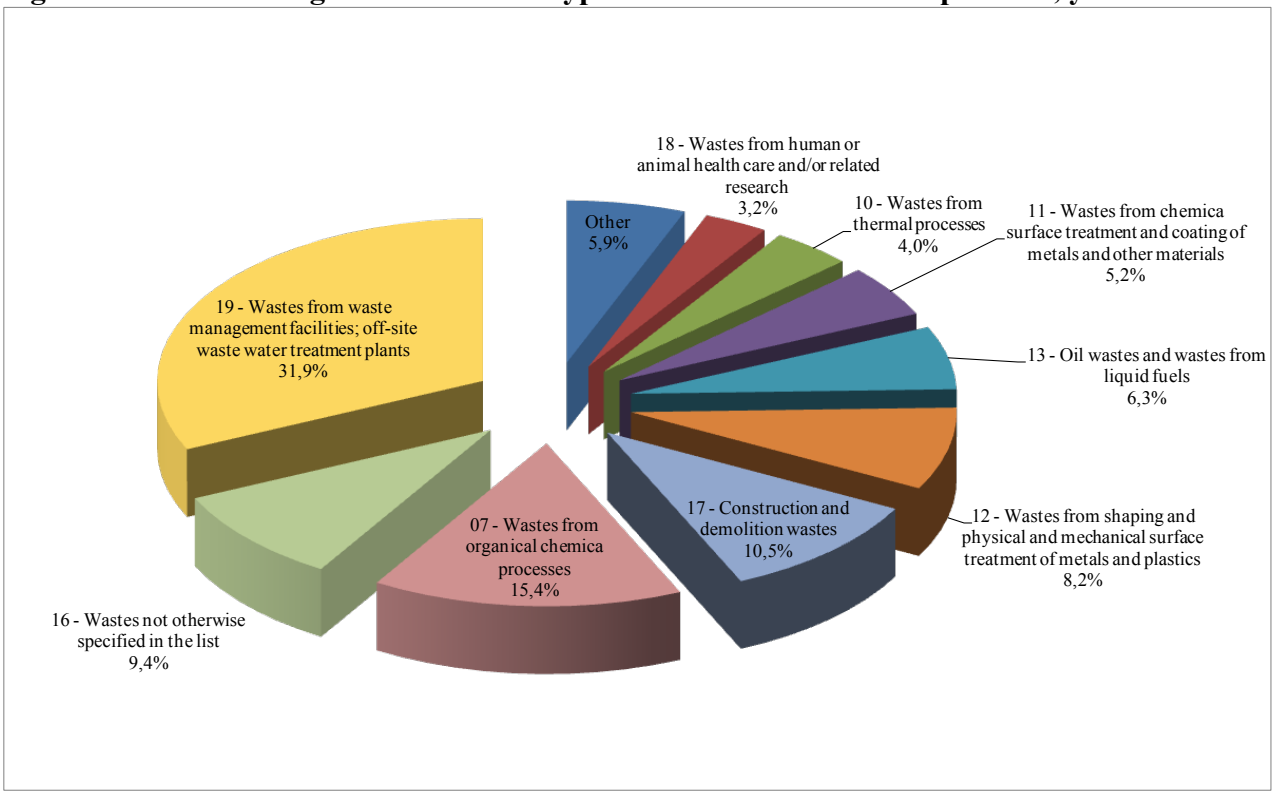
Source: ISPRA

Figure 2.11 – Percentage distribution of types of hazardous waste recovered, year 2019



Source: ISPRA

Figure 2.12 – Percentage distribution of types of hazardous waste disposed of, year 2019



Source: ISPRA

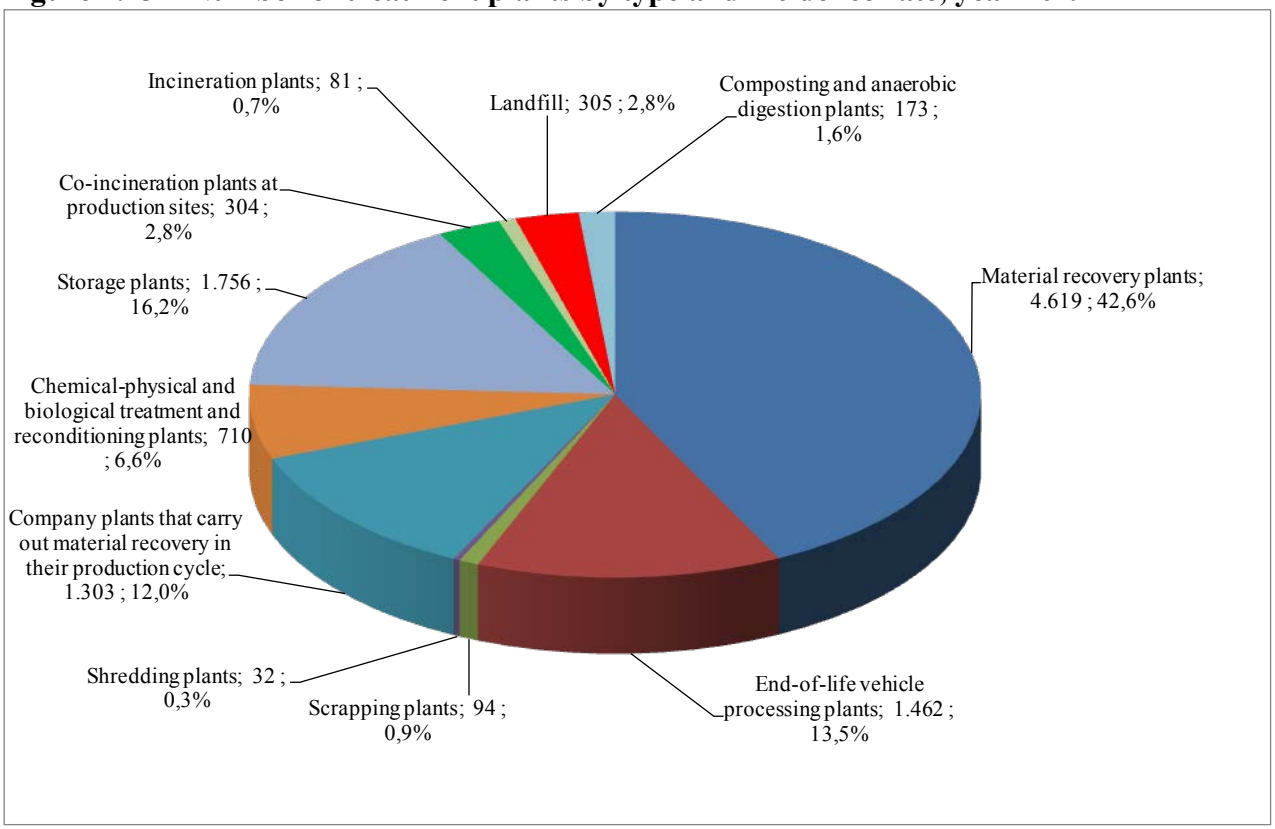
Table 2.1 and Figure 2.13 show the number of treatment plants by type and the incidence rate on the total national plants.
Material recovery plants, amounting to 4.619, represent 42,6% of the total; plants exclusively dedicated to the storage of waste before recovery/disposal operations, are 1.756 (16,2% of the total); end-of-life vehicle processing plants represent 13,5% of the total, (1.462 plants); industrial plants that perform material recovery within their production cycle, amounting to 1.303, represent 12%of the total.

Table 2.1 – Number of plants grouped by type and by macro area, year 2019

Type of plant	Northern Italy	Central Italy	Southern Italy	Italy
Material recovery plants	2.625	857	1.137	4.619
End-of-life vehicle processing plants	635	236	591	1.462
Scrapping plants	55	25	14	94
Shredding plants	19	8	5	32
Company plants that carry out material recovery in their production cycle	833	208	262	1.303
Chemical-physical and biological treatment and reconditioning plants	404	176	130	710
Storage plants	1.060	330	366	1.756
Co-incineration plants at production sites	198	61	45	304
Incineration plants	46	9	26	81
Landfill	172	45	88	305
Composting and anaerobic digestion plants *	105	25	43	173
Total	6.152	1.980	2.707	10.839

* Composting and anaerobic digestion plants dedicated to the biological treatment of municipal waste, which also recover waste from economic activities (sludge and agro-industrial residues).
Source: ISPRA

Figure 2.13 – Number of treatment plants by type and incidence rate, year 2019



Source: ISPRA

2.1 Co-incineration of waste from economic activities

In Italy, there are 304 production plants that co-incinerate wastes, of which 255 process more than 100 tonnes/year of waste, the remaining 49 plants process small quantities of waste exclusively for the recovery of thermal/electric energy for their own production cycle. The total amount of EAW co-incinerated is approximately 2 million tonnes and shows a slight increase of 17 thousand tonnes compared to the year 2018 (+0,9%).
Non-hazardous waste co-incinerated in 2019 are over 1,9 million tonnes (94,1% of the total), with an increase of +0,5% compared to 2018. Hazardous waste, over 121 thousand tonnes (5,9% of the total), also shows a slight increase of 7%.
The largest quantity of hazardous waste is recovered in Northern Italy (72,3% of the total), followed by Southern (15,1%) and Central Italy (12,6%). In particular, in Lombardia almost 562 thousand tonnes of hazardous waste (27,4% of the total) were co-incinerated, followed by Emilia Romagna with over 354 thousand tonnes (17,3%), Veneto with almost 222 thousand tonnes (10,8%), Friuli-Venezia Giulia with almost 167 thousand tonnes (8,2%), Umbria with 164 thousand tonnes (8%), Puglia with 118 thousand tonnes (5,8%) and Piemonte with 110 thousand tonnes (5,4%).

Table 2.1.1 - Waste from economic activities co-incinerated (tonnes), year 2019

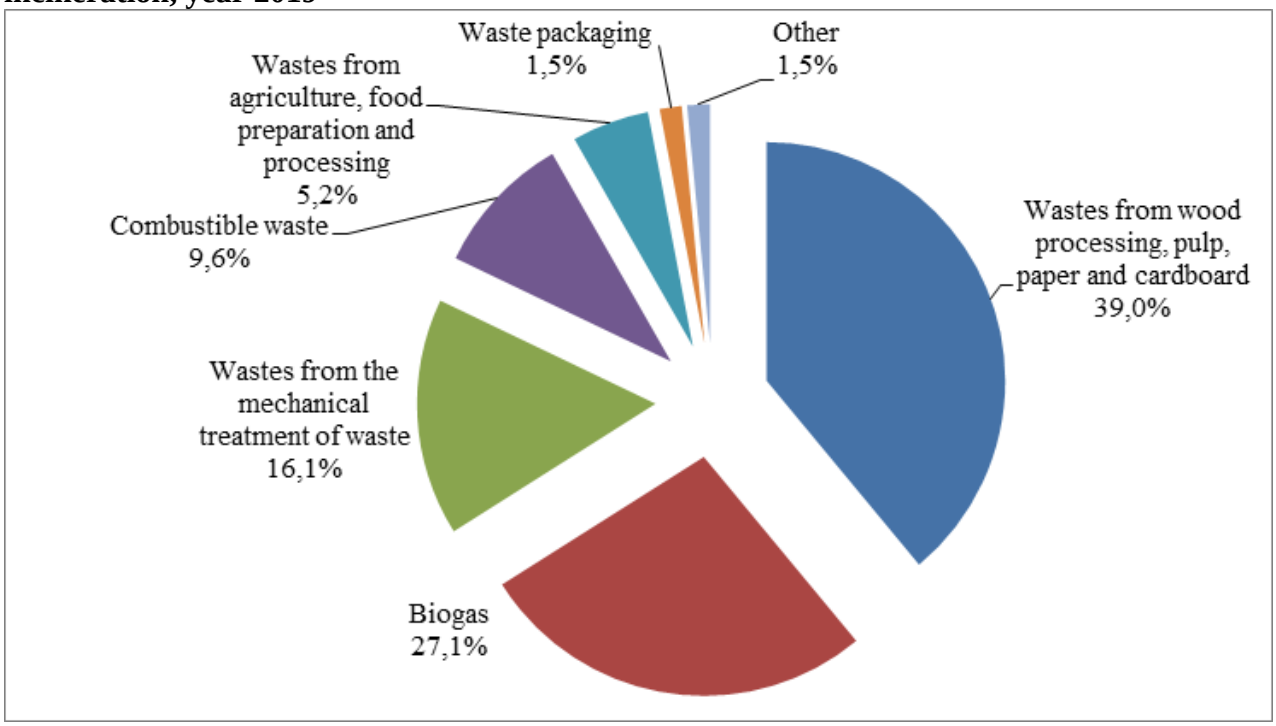
Region	Hazardous waste	Non-hazardous waste	Total waste	(%) on total of co-incinerated wastes
Piemonte	8.372	101.662	110.034	5,4
Lombardia	14.860	546.746	561.606	27,4
Trentino-Alto Adige	0	19.948	19.948	1
Veneto	0	221.995	221.995	10,8
Friuli-Venezia Giulia	21.781	145.128	166.909	8,2
Liguria	0	45.894	45.894	2,2
Emilia-Romagna	46.667	307.699	354.366	17,3
Northern Italy	**91.680**	**1.389.072**	**1.480.752**	**72,3**
Toscana	0	38.840	38.840	1,9
Umbria	0	164.093	164.093	8
Marche	0	37.985	37.985	1,9
Lazio	0	16.900	16.900	0,8
Central Italy	**0**	**257.818**	**257.818**	**12,6**
Abruzzo	0	708	708	0
Molise	0	22.816	22.816	1,1
Campania	0	10.556	10.556	0,5
Puglia	0	118.076	118.076	5,8
Basilicata	0	34.505	34.505	1,7
Calabria	22.591	26.621	49.212	2,4
Sicilia	3.946	60.840	64.786	3,2
Sardegna	3.009	4.318	7.327	0,4
Southern Italy	**29.546**	**278.440**	**307.986**	**15,1**
TOTAL	**121.226**	**1.925.330**	**2.046.556**	**100**

Source: ISPRA

The largest amount of non-hazardous waste co-incinerated (Figure 2.1.1) derive from the following types of waste: wastes from wood processing, paper and related products (EWL 03**), with more than 750 thousand tonnes (39%), biogas (EWL 190699), with almost 521 thousand tonnes (27,1%) and wastes from mechanical treatment of waste (EWL 1912**), with more than 309 thousand tonnes (16,1%). The largest amount of co-incinerated hazardous waste (Figure 2.1.2) come from the following types of waste: wastes from physical/chemical treatments of waste (EWL 1902**) and wastes from wastewater treatment plants (EWL 1908**), with almost 61 thousand tonnes (50,1%), waste from the mechanical treatment of waste (EWL 1912**), with about 40 thousand tonnes

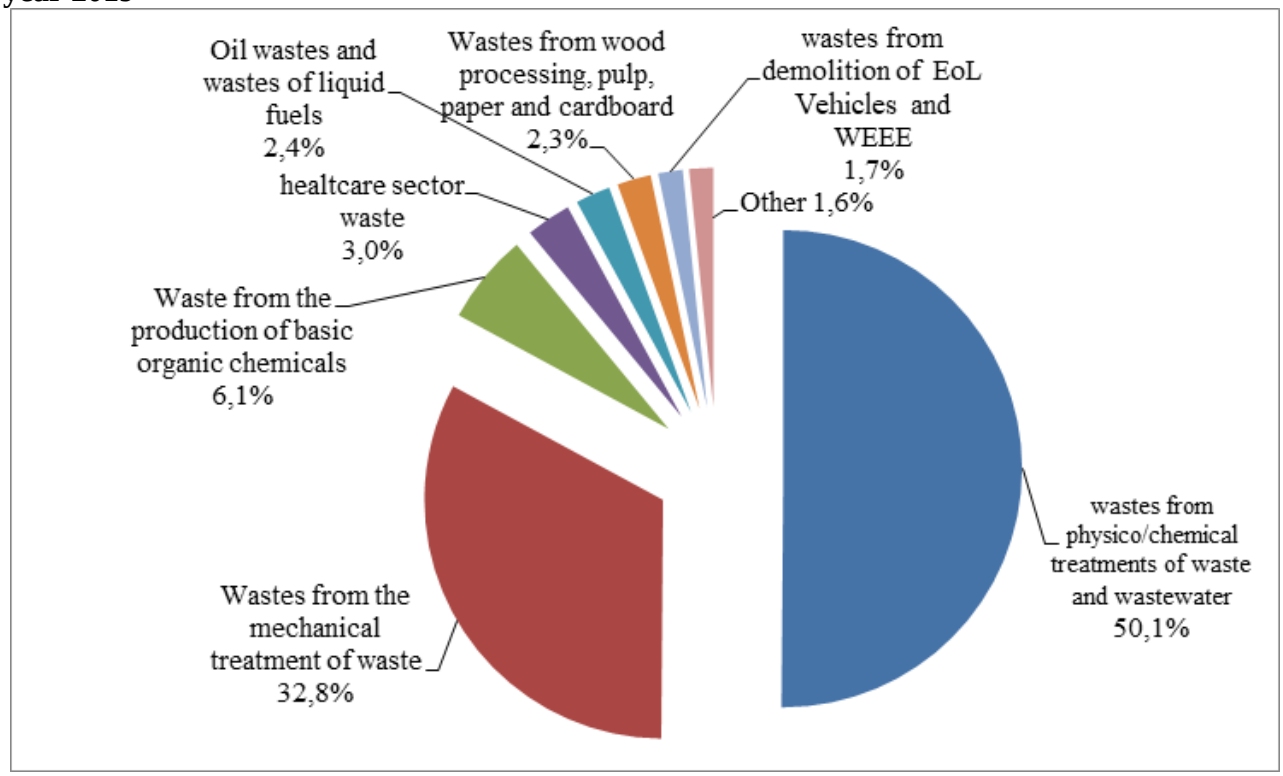
(32,8%), waste from the production of basic organic chemicals (EWL 07**), with more than 7.000 tonnes (6,1%) and waste from the healthcare sector (EWL 18**), with almost 4.000 tonnes. (3%).

Figure 2.1.1 - Percentage distribution of types of non-hazardous waste sent for co-incineration, year 2019



Source: ISPRA

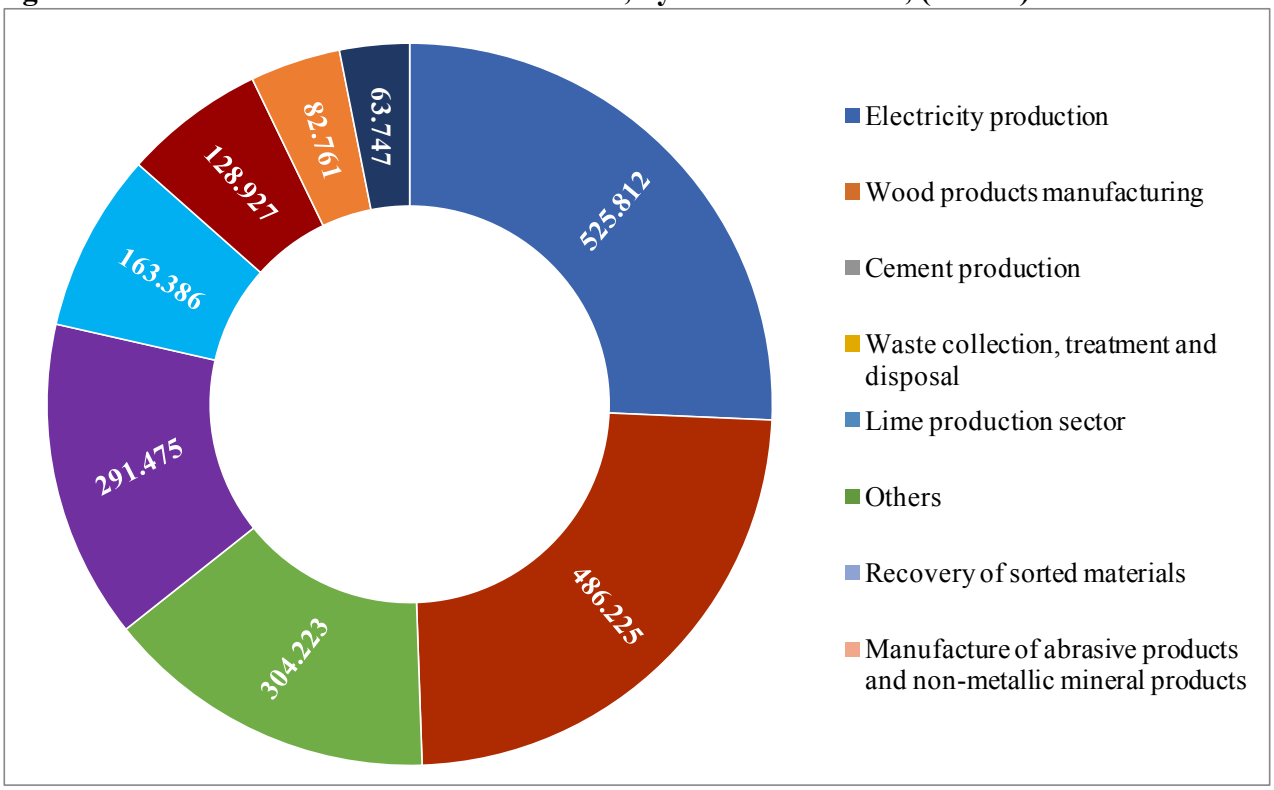
Figure 2.1.2 - Percentage distribution of types of hazardous waste sent for co-incineration, year 2019



Source: ISPRA

The industrial sectors that used the largest quantities of waste as a substitute for conventional fuels are: the electricity production sector ($NACE_{REV.2}$ Sector D.35), with almost 526 thousand tonnes (25,7%), followed by the wood products manufacturing sector ($NACE_{REV.2}$ Sector C.16), with 486 thousand tonnes (23,8%), the cement production sector ($NACE_{REV.2}$ Sector C.23.51), with 304 thousand tonnes (14,9%), the waste collection, treatment and disposal sector with ($NACE_{REV.2}$ Section E.38) over 291 thousand tonnes (14,2%) and the lime production sector ($NACE_{REV.2}$ Sector C.23.52) with about 163 thousand tonnes (8%; Figure 2.1.3).

Figure 2.1.3 – Amount of waste co-incinerated, by industrial sector, (tonnes) anno 2019



Source: ISPRA

2.2 Incineration of waste from economic activities

Approximately 1,2 million tonnes of EAW were incinerated, of which 769 thousand tonnes (64,1% of the total) were non-hazardous and 430 thousand tonnes (35,9% of the total) were hazardous. These quantities are treated both in incineration plants dedicated to EAW and in plants mainly dedicated to the treatment of municipal waste, authorized as energy recovery plants (Note 4 of Annex C of Legislative Decree 152/06). In particular, over 717 thousand tonnes were incinerated with the R1 recovery operation and almost 482 thousand tonnes with D10 operation. Compared to 2018, there was a slight increase of 0,3% in the amount of EAW incinerated, equal to 3 thousand tonnes.
There are 81 operative incineration plants treating EAW, 46 are located in Northern Italy, 9 in Central Italy and 26 in Southern Italy.
In line with the distribution of the plants, data analysis shows that wastes are mainly incinerated in the plants located in Northern Italy (83,3% of the total with almost one million tonnes), followed by Southern with 14,5% (174 thousand tonnes) and Central with 2,2% (almost 27 thousand tonnes).

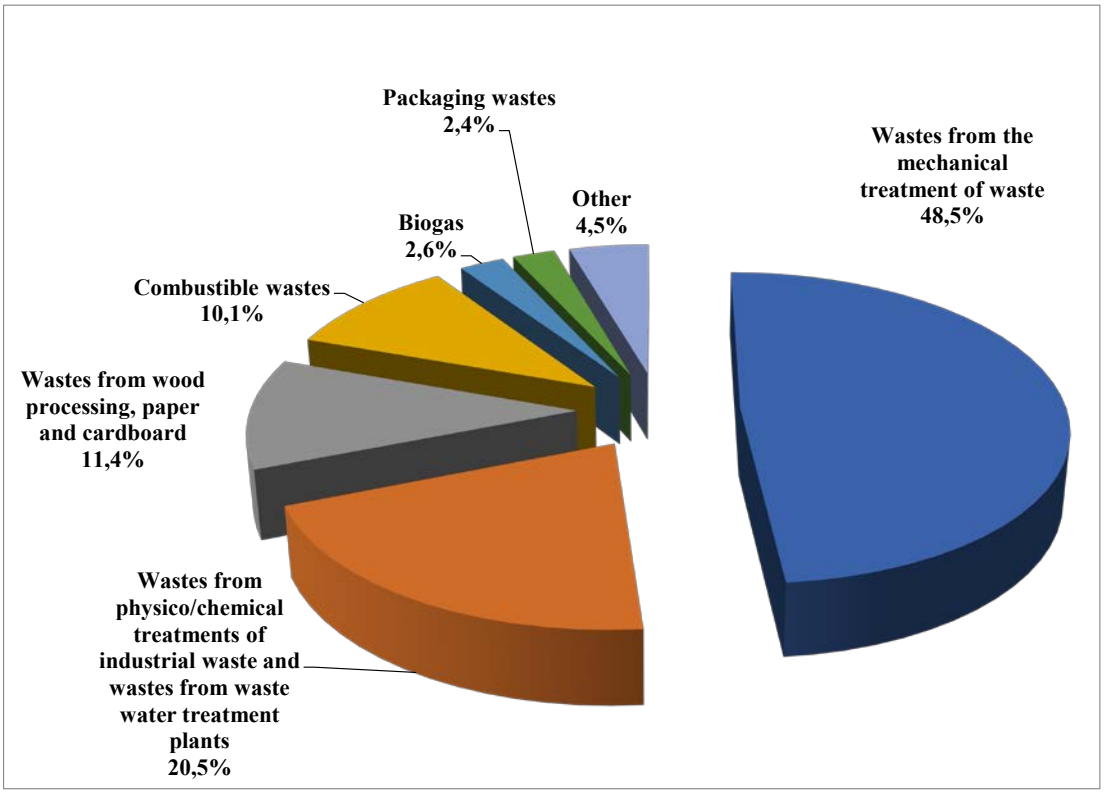
Table 2.2.1 - Number of plants and amount of waste from economic activities incinerated (tonnes), year 2019

Region	Number of Plants	Hazardous waste	Non hazardous waste	Total	% on total of wastes incinerated
Piemonte	3	1.339	67.206	68.545	5,7
Lombardia	23	182.239	436.335	618.574	51,6
Trentino-Alto Adige	2	46	2.950	2.996	0,2
Veneto	5	45.775	3.218	48.993	4,1
Friuli-Venezia Giulia	2	0	31.085	31.085	2,6
Emilia-Romagna	11	76.390	151.630	228.020	19,0
Northern Italy	**46**	**305.789**	**692.424**	**998.213**	**83,2**
Toscana	8	6.767	17.388	24.155	2,0
Lazio	1	2.800	0	2.800	0,2
Central Italy	**9**	**9.567**	**17.388**	**26.955**	**2,2**
Abruzzo	2	17.706	162	17.868	1,5
Molise	3	4.539	10.869	15.408	1,3
Campania	3	15.545	635	16.180	1,3
Puglia	7	6.969	10.983	17.952	1,5
Basilicata	1	26.479	13.268	39.747	3,3
Calabria	5	3.506	7.936	11.442	1,0
Sicilia	3	34.614	5.157	39.771	3,3
Sardegna	2	5.322	10.388	15.710	1,3
Southern Italy	**26**	**114.680**	**59.398**	**174.078**	**14,5**
TOTAL	**81**	**430.036**	**769.210**	**1.199.246**	**100**

Source: ISPRA

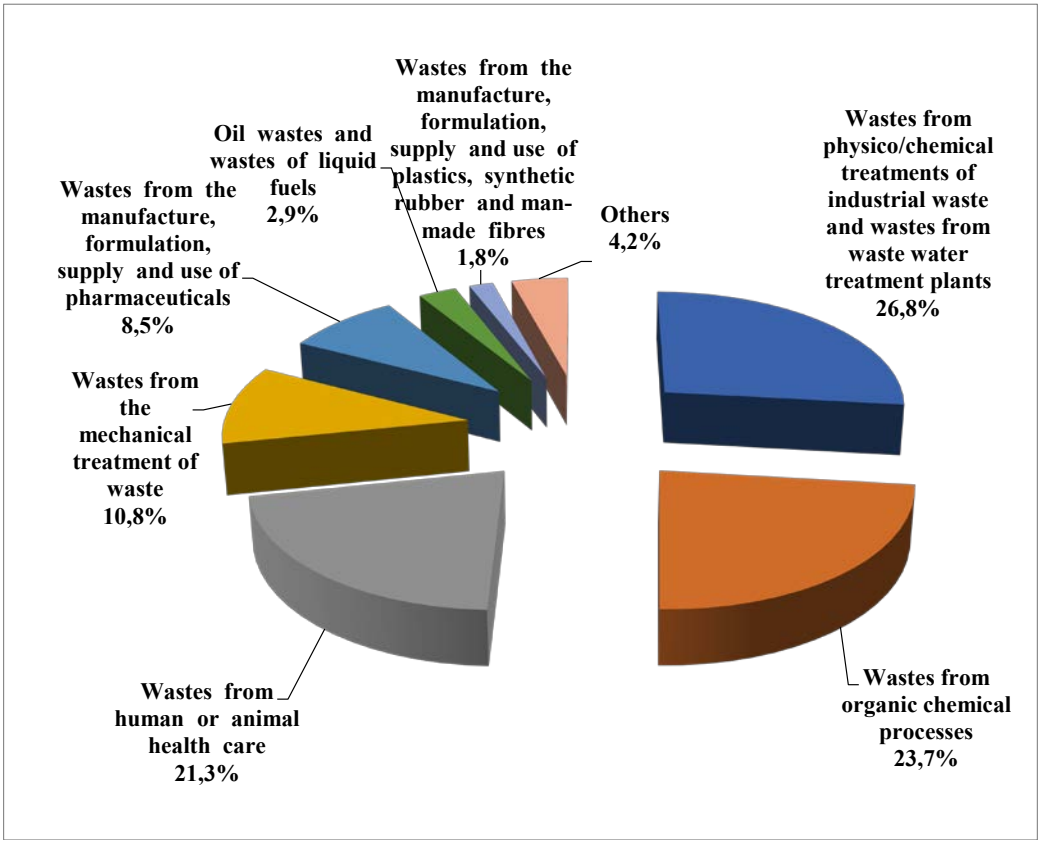
The largest quantity of non-hazardous waste incinerated (Figure 2.2.1) are: wastes from the mechanical treatment of waste (EWL 1912**), with a quantity of almost 373 thousand tonnes (48,5%), wastes from physical/chemical treatments of waste (EWL 1902**) and wastes from wastewater treatment plants (EWL 1908**), with over 157 thousand tonnes (20,5%), waste from wood processing, paper and related products (EWL 03**) with almost 88 thousand tonnes (11,4%) and combustible waste (EWL 191210) with over 78 thousand tonnes (10,2%).
With regards to hazardous waste, incineration mainly concerns wastes from physical/chemical treatments of waste (EWL 1902**) and wastes from wastewater treatment plants (EWL 1908**) with 115 thousand tonnes (26,8%), wastes from the production of basic organic chemicals (EWL 07**) with almost 102 thousand tonnes (23,7%) and wastes from the healthcare sector (EWL 18**) with 92 thousand tonnes (21,3%; Figure 2.2.2).

Figure 2.2.1 - Percentage distribution of types of non-hazardous waste sent for incineration, year 2019



Source: ISPRA

Figure 2.2.2 - Percentage distribution of types of hazardous waste sent for incineration, year 2019

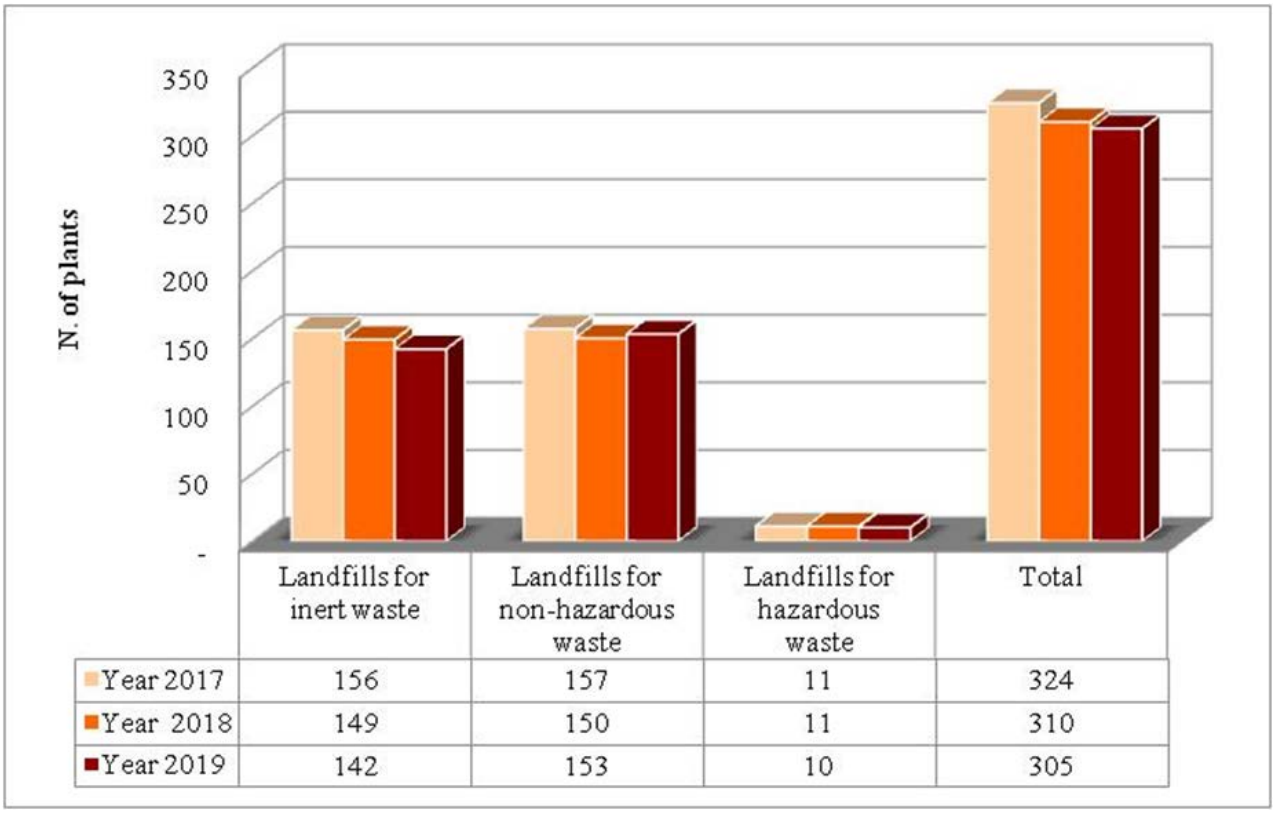


Source: ISPRA

2.3 Landfill disposal of waste from economic activities

The total number of operational landfills is 305; 142 are landfills for inert waste (46,5% of the total operating plants), 153 are landfills for non-hazardous waste (50,2% of the total), and 10 are landfills for hazardous waste (3,3% of the total).
The analysis of the three-year period 2017 - 2019 shows a progressive decrease in the total number of operational landfills from 324 in 2017, to 310 in 2018, to 305 in 2019 (Figure 2.3.1).

Figure 2.3.1 - Number of landfills for the disposal of waste from economic activities, divided by landfill categories, years 2017 - 2019



	Landfills for inert waste	Landfills for non-hazardous waste	Landfills for hazardous waste	Total
Year 2017	156	157	11	324
Year 2018	149	150	11	310
Year 2019	142	153	10	305

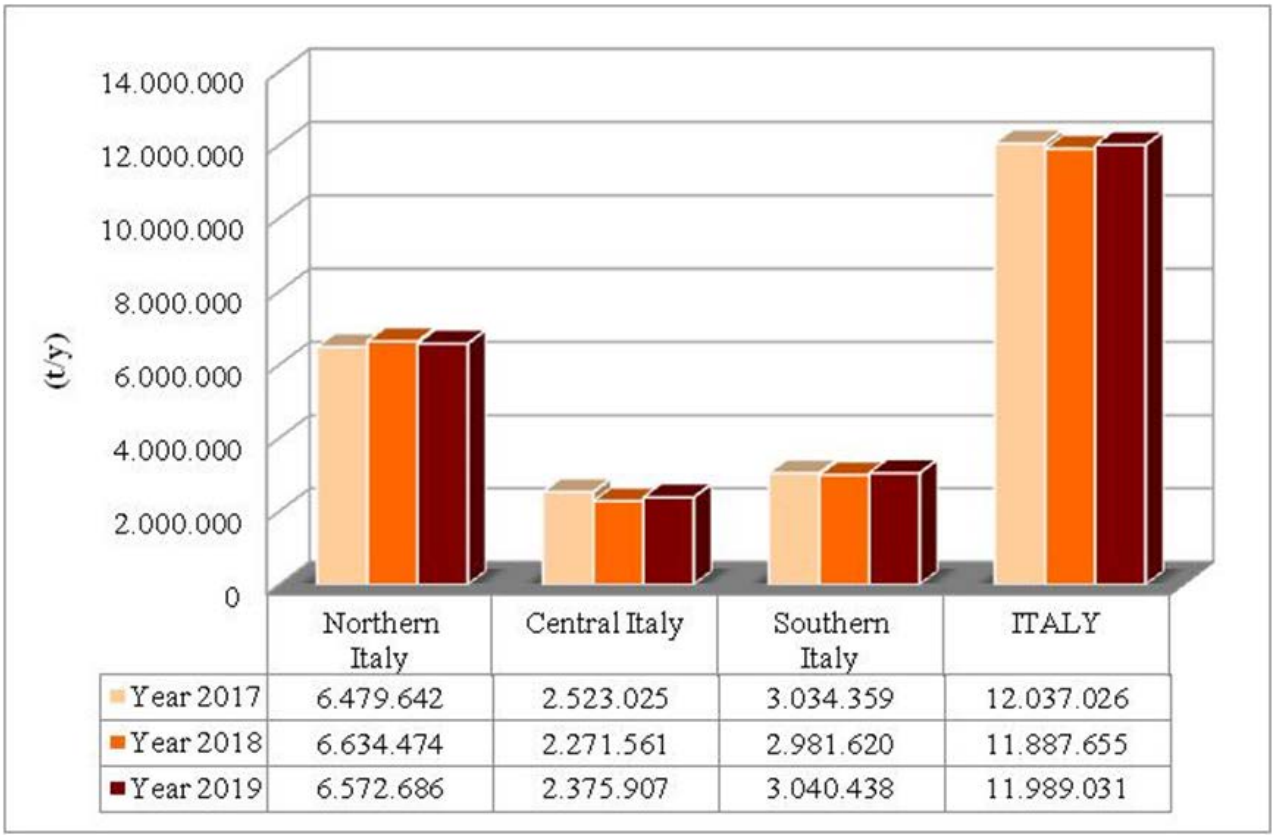
Source: ISPRA

Most of the landfills are in Northern Italy where there are 172 plants; 45 landfills are located in Central Italy and 88 in Southern Italy, therefore there is an uneven distribution on the national territory following the trend of the production of EAW, closely linked to the pattern of industrial settlements of the Country.

The overall quantities of EAW disposed of in landfills amount to approximately 12 million tonnes, equal to 7,3% of the quantity of EAW managed at national level (approximately 164,5 million tonnes). Compared to 2018, there is a slight increase of 101 thousand tonnes (+ 0,9), nonetheless showing a substantially stable trend.
The analysis of the amount of EAW disposed of in the different landfill categories, shows the following distribution: approximately 4,4 million tonnes are allocated in landfills for inert wastes (37% of total waste disposed of), 6,5 million tonnes in landfills for non-hazardous wastes (54,3%), and 1 million tonnes in landfills for hazardous waste (8,7%).

Plants in Northern Italy dispose of 54,8% of the total waste landfilled, equal to 6,6 million tonnes of waste with a decrease, of about 62 thousand tonnes (-0,9%) compared to 2018. The plants in Central Italy dispose of 19,1% with an increase of 4,6% (+104 thousand tonnes); the amount of waste landfilled went, in fact, from 2,3 million tonnes in 2018 to about 2,4 million tonnes in 2019. In Southern Italy, 25,4% of the national total is disposed of, with an increase of 2% (+59 thousand tonnes, Figure 2.3.2).

Figure 2.3.2 - Disposal in landfills of waste from economic activities, by geographical macro-area (tonnes), years 2017 - 2019



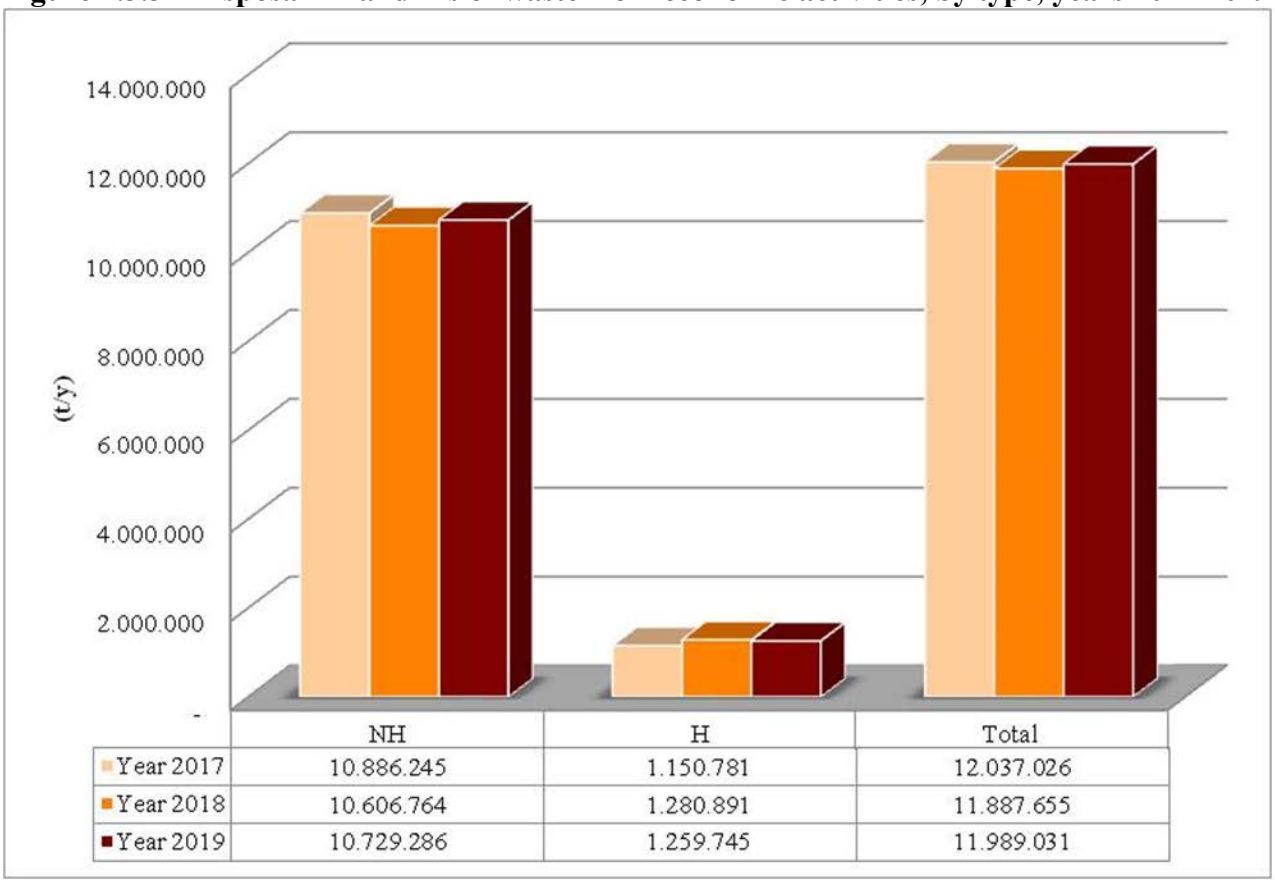
	Northern Italy	Central Italy	Southern Italy	ITALY
Year 2017	6.479.642	2.523.025	3.034.359	12.037.026
Year 2018	6.634.474	2.271.561	2.981.620	11.887.655
Year 2019	6.572.686	2.375.907	3.040.438	11.989.031

Source: ISPRA

The amount of non-hazardous waste disposed of in landfills is 10,7 million tonnes and represents 89,5% of the total waste disposed of at national level; around 1,3 million tonnes are, instead, hazardous waste (10,5% of the total, Figure 2.3.3). Non-hazardous waste disposed of in landfills increased by approximately 123 thousand tonnes (+ 1,2%), while hazardous waste appears stable.

The region where the largest quantities of waste are disposed of is Lombardia (3,1 million tonnes equal to 47,5% of Northern Italy and 26,1% of the national total), followed by Veneto (1,4 million tonnes, equal to 21,9% of the Northern Italy and 12% of the national total) and Puglia (1,3 million tonnes, equal to 42.8% of the Southern Italy and 10,9% of the national total; Table 2.3.1). These regions also present the largest number of productive settlements in the Country.

Figure 2.3.3 - Disposal in landfills of waste from economic activities, by type, years 2017-2019



	NH	H	Total
Year 2017	10.886.245	1.150.781	12.037.026
Year 2018	10.606.764	1.280.891	11.887.655
Year 2019	10.729.286	1.259.745	11.989.031

NH: non-hazardous; **H**: hazardous
Source: ISPRA

The main types of **non-hazardous** waste disposed of in landfills are wastes produced by waste treatment operations (EWL 19) representing 41,3% of the total of non-hazardous waste landfilled, wastes produced by thermal processes (EWL 10) representing 22,2%, wastes from construction and demolition operations (EWL 17) 25,8% and wastes resulting from exploration, mining or quarrying, physical and chemical treatment of minerals (EWL 01) 6%. At single EWL code level, soil and stones (EWL code 170504), represent the largest share amounting to 1,8 million tonnes (16,8% of the total non-hazardous waste).

A percentage of 54,8% of **hazardous** waste disposed of is represented by wastes from treatment operations of waste (EWL 19), 31,6% by waste from construction and demolition operations (EWL 17), 7,5% by waste products from thermal processes (EWL 10) and 5,3% from wastes produced by the chemical surface treatment and coating of metals and other materials and non-ferrous hydrometallurgical wastes (EWL 11). At single EWL code level, partially stabilized wastes (EWL code 190304*) represent the largest share (617 thousand tonnes, equal to 49% of the total hazardous waste).
The prevalence of waste identified with EWL 19 in landfill disposal represents a fairly predictable figure considering that treatment preliminary to disposal is mandatory by law for all types of waste exception made for inert wastes being the treatment not technically feasible and for other wastes if preliminary treatment does not contribute to preventing or reducing the impact on the environment.

Waste containing asbestos are disposed of in 19 dedicated landfills and amounts to 249 thousand tonnes, representing 2,1% of the total landfilled and 19,8% of the share of hazardous waste. About 77,1% is disposed of in Northern Italy (192 thousand tonnes), 4,8% in Central Italy (12 thousand tonnes), and 18,1% in Southern Italy (45 thousand tonnes). These wastes are almost entirely made up of construction materials containing asbestos (EWL code170605*), with a total amount of 245 thousand tonnes (98,3% of the total disposed of).

Table 2.3.1 - Waste disposal in landfills, by region, by landfill category and type of waste (tonnes), year 2019

Region	Landfills for inert waste (t/y)			Landfills for non-hazardous waste (t/y)			Landfills for hazardous waste (t/y)			ITALY (t/y)		
	NH	H	Total	NH	H	Total	NH	H	Total	NH	H	Total
Piemonte	137.855	0	137.855	370.167	11.363	381.530	10.617	213.844	224.461	518.639	225.207	743.846
Valle d'Aosta	49.638	0	49.638	58.193	487	58.680	0	0	0	107.831	487	108.318
Lombardia	2.256.843	0	2.256.843	523.613	174.884	698.497	89.675	79.211	168.886	2.870.131	254.095	3.124.226
Trentino-Alto Adige	11.650	0	11.650	58.536	2	58.538	0	0	0	70.186	2	70.188
Veneto	511.200	0	511.200	836.208	94.618	930.826	0	0	0	1.347.408	94.618	1.442.026
Friuli-Venezia Giulia	123.916	0	123.916	53.463	73.446	126.909	0	0	0	177.379	73.446	250.825
Liguria	131.487	0	131.487	301.877	0	301.877	0	0	0	433.364	0	433.364
Emilia-Romagna	0	0	0	347.265	52.628	399.893	0	0	0	347.265	52.628	399.893
Northern Italy	**3.222.589**	**0**	**3.222.589**	**2.549.322**	**407.428**	**2.956.750**	**100.292**	**293.055**	**393.347**	**5.872.203**	**700.483**	**6.572.686**
Toscana	0	0	0	710.414	10.671	721.085	0	0	0	710.414	10.671	721.085
Umbria	0	0	0	14.302	0	14.302	360.292	79.042	439.334	374.594	79.042	453.636
Marche	0	0	0	158.767	1.316	160.083	0	52.676	52.676	158.767	53.992	212.759
Lazio	780.459	0	780.459	120.472	0	120.472	87.496	0	87.496	988.427	0	988.427
Central Italy	**780.459**	**0**	**780.459**	**1.003.955**	**11.987**	**1.015.942**	**447.788**	**131.718**	**579.506**	**2.232.202**	**143.705**	**2.375.907**
Abruzzo	0	0	0	0	19.482	19.482	0	0	0	0	19.482	19.482
Molise	54	0	54	12.210	0	12.210	0	0	0	12.264	0	12.264
Campania	0	0	0	0	0	0	0	0	0	0	0	0
Puglia	130.792	0	130.792	1.168.791	0	1.168.791	609	1.560	2.169	1.300.192	1.560	1.301.752
Basilicata	7.626	0	7.626	116.690	22.008	138.698	0	0	0	124.316	22.008	146.324
Calabria	0	0	0	66.174	0	66.174	762	69.425	70.187	66.936	69.425	136.361
Sicilia	31.248	0	31.248	292.818	18.346	311.164	0	0	0	324.066	18.346	342.412
Sardegna	263.747	0	263.747	533.360	284.736	818.096	0	0	0	797.107	284.736	1.081.843
Southern Italy	**433.467**	**0**	**433.467**	**2.190.043**	**344.572**	**2.534.615**	**1.371**	**70.985**	**72.356**	**2.624.881**	**415.557**	**3.040.438**
TOTAL	**4.436.515**	**0**	**4.436.515**	**5.743.320**	**763.987**	**6.507.307**	**549.451**	**495.758**	**1.045.209**	**10.729.286**	**1.259.745**	**11.989.031**

NH: non-hazardous; **H**: hazardous

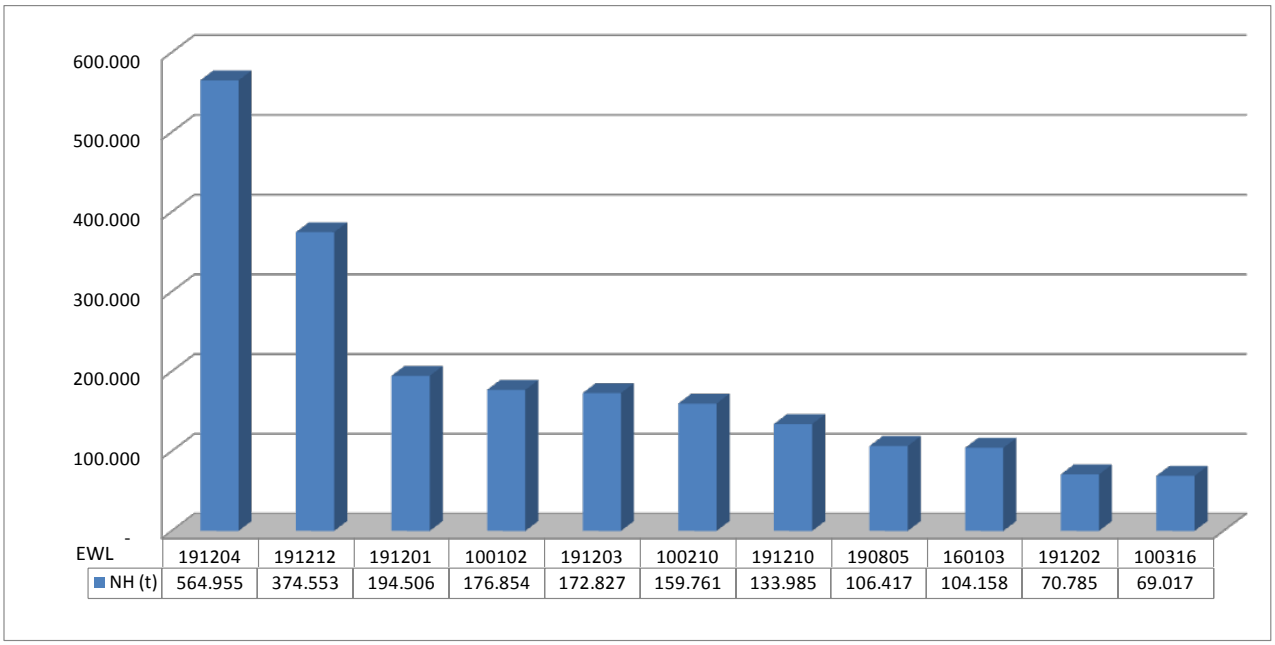
Source: ISPRA

2.4 Import and export of waste from economic activities

The total amount of exported EAW is over 3,9 million tonnes, while the imported amount is over 7 million tonnes. A rate of 69,7% of the exported waste (over 2,7 million tonnes) consists of non-hazardous waste and the remaining 30,3% (approximately 1,2 million tonnes) of hazardous waste.
Compared to 2018, the total quantity exported shows an increase of 13,4% exclusively due to non-hazardous EAW, the increase of which is about 512 thousand tonnes (+22,9%); on the other hand, hazardous waste decreased by approximately 45 thousand tonnes (-3,6%).

The most exported non-hazardous waste (62,7% of the total non-hazardous waste) are plastic and rubber (565 thousand tonnes), paper and cardboard (195 thousand tonnes), which are mainly destined for Turkey, Austria and Germany, while wastes produced by waste treatment plants (approximately 375 thousand tonnes) are sent to Portugal.

Figure 2.4.1 - Main types of non-hazardous waste from economic activities exported (tonnes), 2019



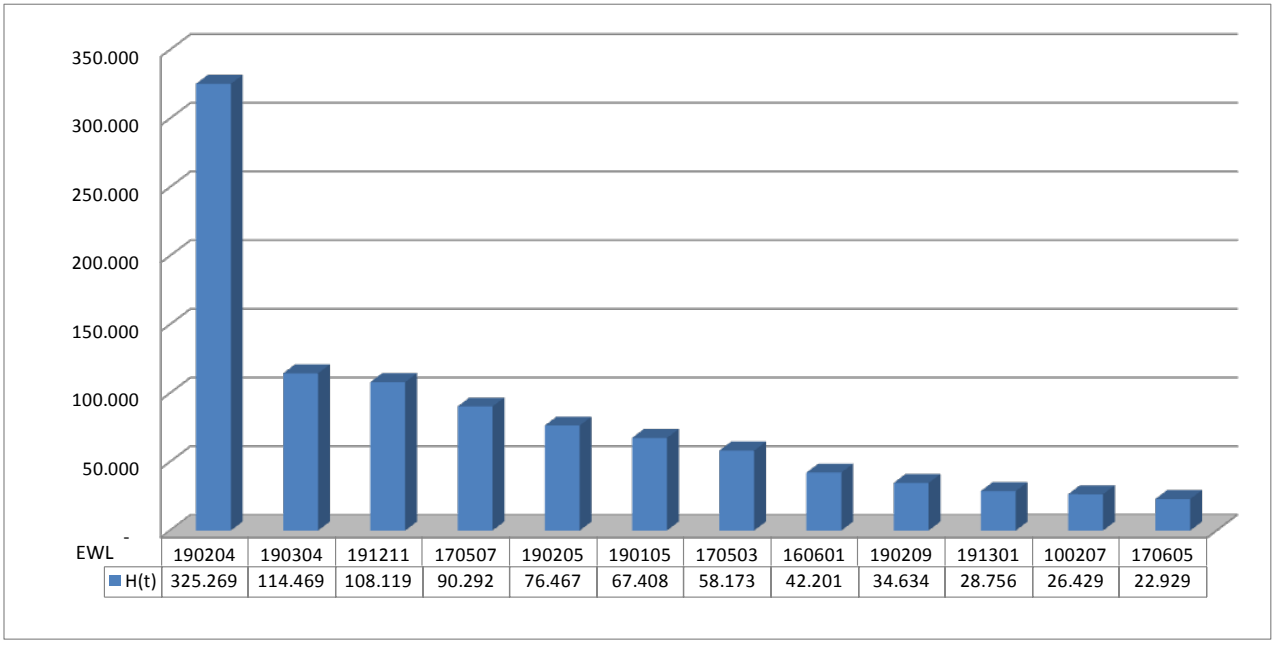
EWL	191204	191212	191201	100102	191203	100210	191210	190805	160103	191202	100316
NH (t)	564.955	374.553	194.506	176.854	172.827	159.761	133.985	106.417	104.158	70.785	69.017

EWL 191204: plastic and rubber; **EWL 191212**: other wastes from mechanical treatment of waste; **EWL 191201**: paper and cardboard; **EWL 100102**: coal fly ash; **EWL 191203**: non-ferrous metals; **EWL 100210**: mill scales; **EWL 191210**: combustible waste; **EWL 190805**: sludge from treatment of urban wastewater; **EWL 160103**: end-of-life tyres; **EWL 191202**: ferrous metal; **EWL 100316**: skimmings.
Source: ISPRA

About 68% of the exported hazardous waste, 813 thousand tonnes, is generated by waste treatment plants; among these, premixed wastes composed of at least one hazardous waste are prevalent, with more than 325 thousand tonnes, followed by wastes marked as hazardous partially stabilised, equal to 114 thousand tonnes. Instead, 29,4% (218 thousand tonnes) is produced by construction and demolition operations and mostly consists of track ballast (90 thousand tonnes; Figure 2.4.2).

Overall, 76,1% of exported non-hazardous waste is destined for material recovery (over 2 million tonnes), 14,8% for energy recovery and 9,1% for disposal.
The largest quantity, amounting to 821 thousand tonnes, is sent to Germany, which receives mainly hazardous waste (512 thousand tonnes), from waste treatment plants (287 thousand tonnes) and from construction and demolition operations (175 thousand tonnes).

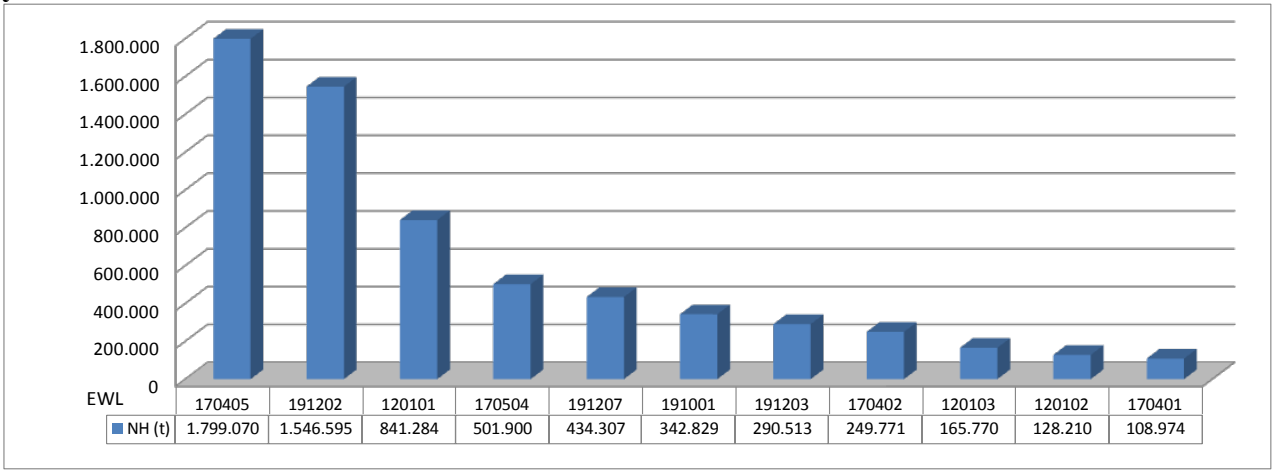
Figure 2.4.2 – Main types of hazardous waste from economic activities exported (tonnes), year 2019



EWL 190204*: premixed wastes containing at least one hazardous waste; **EWL 190304***: wastes marked as hazardous partially stabilised; **EWL 191211***: other wastes from mechanical treatment of waste; **EWL 170507***: track ballast; **EWL 190205***: sludges from physical-chemical treatments; **EWL 190105***: filter cake from gas treatment; **EWL 170503***: soil and stones; **EWL 160601***: lead batteries; **EWL 190209***: solid combustible wastes; **EWL 191301***: solid wastes from soil remediation; **EWL 100207***: solid wastes from gas treatment; **EWL 170605***: construction materials containing asbestos.
Source: ISPRA

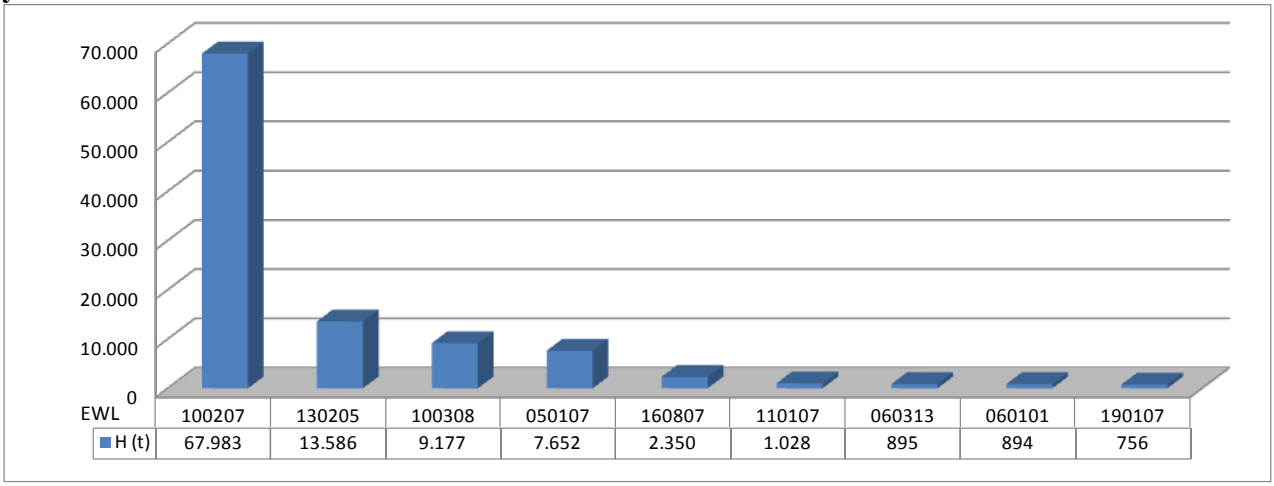
About 7,1 million tonnes of EAW are **imported** and consists almost exclusively of non-hazardous waste.
A rate of 41,3% of the total non-hazardous EAW imported are construction and demolition waste (2,9 million tonnes), mainly iron and steel waste (1,8 million tonnes). Wastes produced from waste treatment plants represents 39,6% (2,9 million tonnes), with ferrous metals predominating (1,5 million tonnes). These wastes are destined for recovery in industrial plants located in Friuli-Venezia Giulia and Lombardia.
Imported **hazardous** EAW mainly include wastes produced by thermal processes (73,1% of the total), mostly consisting of solid wastes produced from gas treatment (68 thousand tonnes), recovered in Sardegna at a metallurgical industrial site (Figure 2.4.4).
A rate of 60,2% of hazardous waste is destined for disposal operations, 25,4% for material recovery and 14,4% for energy recovery.
The largest quantity of imported waste comes from Germany, about 2 million tonnes, 96,5% of which is metal waste. Significant quantities of EAW also come from France (over 1,1 million tonnes) and Switzerland (1 million tonnes) and Austria (744 thousand tonnes). Metal and wood wastes are mainly imported from France, soil and stones destined for environmental restoration in Lombardia are primarily imported from Switzerland.

Figure 2.4.3 – Main types of non-hazardous waste from economic activities imported (tonnes), year 2019



EWL 170405: iron and steel; **EWL 191202**: ferrous metals; **EWL 120101**: ferrous metals filings and turnings; **EWL 170504**: soil and stones; **EWL 191207**: wood; **EWL 191001**: iron and steel waste; **EWL 191203**: non-ferrous metals; **EWL 170402**: Aluminium; **EWL 120103**: non-ferrous metals filings and turnings; **EWL 120102**: ferrous metals dust and particles; **EWL 170401**: copper, bronze, brass.
Source: ISPRA

Figure 2.4.4 – Main types of hazardous waste from economic activities imported (tonnes), year 2019



EWL 100207*: solid waste from gas treatment; **EWL 130205***: mineral-based non chlorinated; engine, gear and lubricating oils **EWL 100308***: salt slags from secondary production; **EWL 050107***: acid tars; **EWL 160807***: spent catalyst contaminated with hazardous substances; **EWL 110107***: pickling bases; **EWL 060313***: solid salts and solutions, containing heavy metals; **EWL 060101***: sulphuric acid and sulphurous acid; **EWL 190107***: solid wastes from gas treatment.
Source: ISPRA

MONITORING OF SPECIFIC WASTE STREAMS

3.1 Waste containing asbestos

In 2019 asbestos-containing waste produced in Italy amounted to 271 thousand tonnes, 95,7% of which consisted of construction materials, 3,4% of insulation materials, and 0,9% of metal packaging, brake pads and discarded equipment containing free asbestos.
Northern Italy produces 72,2% of the total asbestos-containing waste generated nationwide, while Central Italy and Southern Italy produce 14,5% and 13,3% respectively.
As in the previous years, Lombardia is the region with the largest amount of asbestos-containing waste with 76 thousand tonnes which represents 27,9% of the national total. (Table 3.1.1).

Table 3.1.1 - Production of waste containing asbestos by EWL code (tonnes), year 2019

REGION	150111*	160111*	160212*	170601*	170605*	TOTAL
Piemonte	43		7	664	23.630	24.345
Valle d'Aosta	0			7	100	107
Lombardia	952	1	228	2.092	72.503	75.775
Trentino-Alto Adige	55	0		116	979	1.150
Veneto	354	2	6	1.839	46.440	48.641
Friuli-Venezia Giulia	22	0	0	444	6.407	6.873
Liguria	13	0	8	275	2.237	2.533
Emilia-Romagna	150	0	20	213	36.195	36.579
Northern Italy	**1.590**	**2**	**270**	**5.650**	**188.491**	**196.002**
Toscana	111	1	4	169	14.630	14.913
Umbria	37	0		19	6.835	6.891
Marche	47	0	6	65	5.783	5.901
Lazio	63	0	6	491	11.009	11.570
Central Italy	**257**	**1**	**16**	**744**	**38.256**	**39.275**
Abruzzo	25	0	0	12	5.088	5.125
Molise	2			0	447	449
Campania	41	15	5	2.129	4.681	6.871
Puglia	25	0	134	317	6.846	7.323
Basilicata	3	0	0	10	741	754
Calabria	6		6	135	3.061	3.207
Sicilia	8	0	29	143	6.202	6.383
Sardegna	8	0	4	195	5.728	5.935
Southern Italy	**117**	**15**	**178**	**2.941**	**32.794**	**36.045**
TOTAL	**1.964**	**19**	**464**	**9.335**	**259.541**	**271.322**

EWL 150111: metal packaging containing hazardous solid porous matrix (for example. asbestos) including empty pressure containers; **EWL 160111**: brake pads containing asbestos; **EWL 160212**: discarded equipment containing free asbestos; **EWL 170601**: insulation materials containing asbestos; **EWL 170605**: construction materials containing asbestos.
Source: ISPRA

The total amount of treated asbestos-containing waste is 275 thousand tonnes and 96,9% of it is construction materials, about 267 thousand tonnes.
About 90.6% of the total asbestos-containing waste treated, 249 thousand tonnes, is destined to landfill; the remaining quantity is sent for preliminary treatment and preliminary storage (about 26 thousand tonnes).

Italy exports about 28 thousand tonnes of waste containing asbestos, which are sent almost entirely to Germany and to a lesser extent to Spain (1.691 tonnes). The exported waste is essentially made up of construction materials, 23 thousand tonnes, destined for disposal (Table 3.1.2).
Compared to the amount exported in 2018 (69 thousand tonnes), there is a decrease of 59,9%.

Table 3.1.2 – Comparison of production, treatment and export by type of waste containing asbestos (tonnes), year 2019

EWL	Waste produced	Waste treated						Export
		D1	D9	D13	D14	D15 al 31/12	Total	
150111*	1.965	-	132	108	1.064	388	1.692	770
160111*	19	1	-	2	-	5	8	-
160212*	463	98	138	10	188	61	495	27
170601*	9.335	4.082	11	387	878	996	6.354	3.959
170605*	259.542	245.169	1	2.891	3.264	15.221	266.546	22.929
TOTAL	**271.324**	**249.350**	**282**	**3.398**	**5.394**	**16.671**	**275.095**	**27.685**

D1: Deposit into or on to land (e.g. landfill, etc.); **D9**: Physical-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12 (e.g. evaporation, drying, calcination, etc.); **D13**: Blending or mixing prior to submission to any of the operations numbered D 1 to D 12, **D14:** Repackaging prior to submission to any of the operations numbered D 1 to D 13, **D15:** Storage pending any of the operations numbered D 1 to D 14 (excluding temporary storage, pending collection, on the site where the waste is produced).
Source: ISPRA

3.2 End-of-life vehicles

The analysis of the information concerning the treatment of end-of-life vehicles (ELV) shows that, between 2018 and 2019, the number of operational ELV processing plants decreased from 1.524 to 1.462, of which 635 are located in Northern Italy (44% of the total), 236 in Central Italy (16%) and 591 in Southern Italy (40%) (Table 3.2.1).
In total, almost 1,3 million tonnes of vehicles were treated in the ELV processing plants, almost 100 thousand more than in 2018 (approximately +7,6%).

Table 3.2.1 - End-of-life vehicle processing plants by geographical area, years 2017-2019

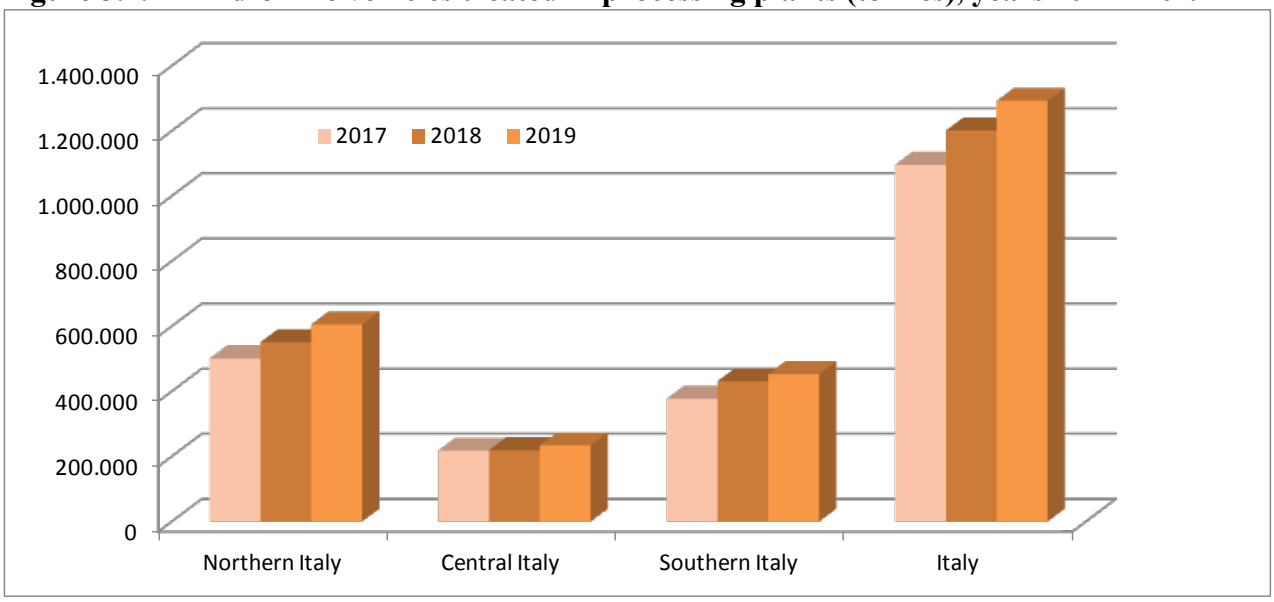
	2017		2018		2019	
	N. plants	End-of-life vehicle treated (t/y)	N. plants	End-of-life vehicle treated (t/y)	N. plants	End-of-life vehicle treated (t/y)
Northern Italy	668	501.019	653	550.970	635	605.550
Central Italy	298	217.740	281	219.423	236	234.094
Southern Italy	592	377.386	590	431.106	591	453.150
TOTAL	**1.558**	**1.096.145**	**1.524**	**1.201.499**	**1.462**	**1.292.754**

Source: ISPRA

The distribution by geographical macro-area of the quantities of processed vehicles shows a widespread increase across the country: Northern Italy presents the largest increase (+10% compared to 2018), Central Italy an increase of 7%, and Southern Italy an increase of 5% (Figure 3.2.1).
Northern Italy remains the geographical area where the most significant quantities of ELV are processed, over 605 thousand tonnes, while 234 thousand tonnes are processed in Central Italy and 453 thousand tonnes in Southern Italy.
Scrapping plants, which do not carry out safety operations but only treatment (demolition and dismantling) to promote recycling, represent an intermediate stage in the ELV management cycle. In 2019, there were 94 such plants and they received more than 67 thousand tonnes of de-polluted vehicles or vehicle components (Table 3.2.2).

The shredding plants, which represent the last link in the end-of-life vehicle management chain, are not widespread throughout the territory, but are concentrated in some territorial contexts near the industrial scrap iron recovery plants and in areas where there are more industrial plants (Table 3.2.3 and Figure 3.2.2). Almost all the material recovered in these plants is scrap metal. In 2019, 32 plants were operational, of which 19 in the North, 8 in the Centre and 5 in the South.

Figure 3.2.1 - End-of-life vehicles treated in processing plants (tonnes), years 2017 - 2019



Source: ISPRA

Table 3.2.2 – Number of end-of-life vehicle scrapping plants by geographical area and quantities recovered (tonnes), year 2019

	N. plants	R4	R12	Storage of waste pending recovery operation at 31/12
Northern Italy	55	8.264	25.829	3.542
Central Italy	25	3.508	3.699	1.971
Southern Italy	14	8.766	10.748	890
ITALY	94	20.538	40.276	6.403

R4: Recycling/reclamation of metals and metal compounds; **R12:** Exchange of waste for submission to any of the operations numbered R 1 to R 11

Source: ISPRA

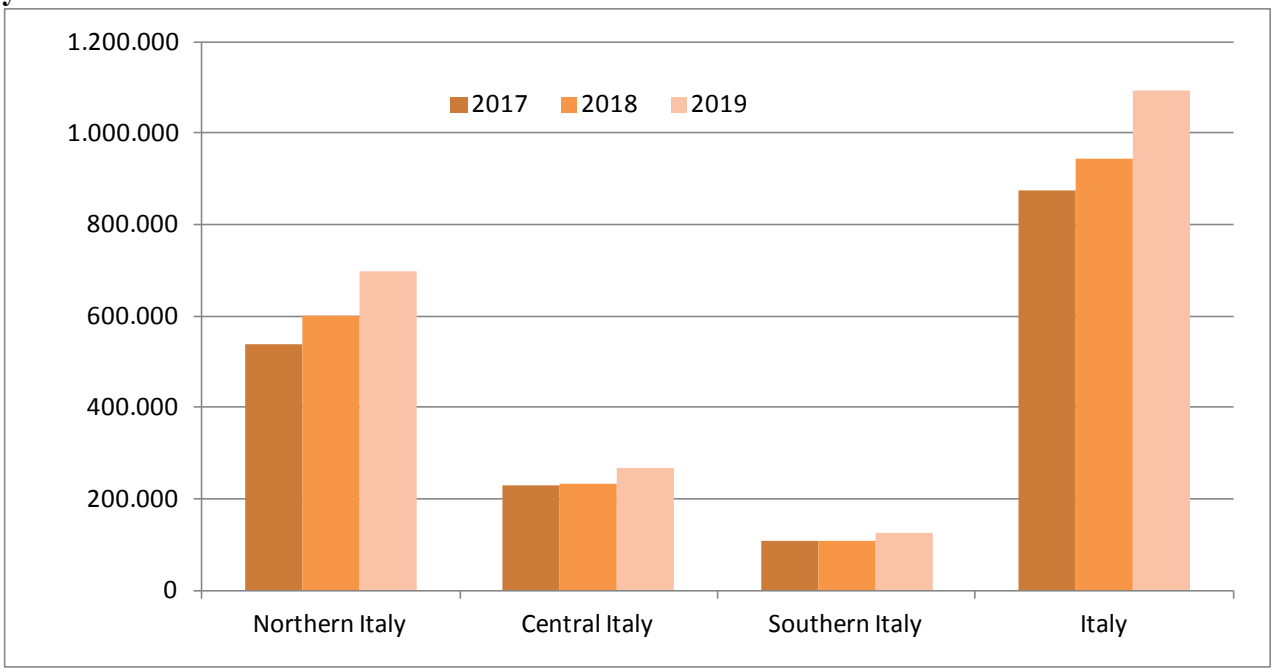
Table 3.2.3 –Number of shredding plants by geographical area and quantities recovered (tonnes), year 2019

	R4	R12	Waste stored pending recovery operation at 31/12	Waste stored pending disposal operation at 31/12
Northern Italy	679.023	5.086	13.485	20
Central Italy	260.820	3.144	4.535	0
Southern Italy	63.610	60.127	2.886	24
ITALY	1.003.453	68.357	20.906	44

R4: Recycling/reclamation of metals and metal compounds; **R12:** Exchange of waste for submission to any of the operations numbered R 1 to R 11

Source: ISPRA

Figure 3.2.2 – Amount of ELV recovered in shredding plants by geographical area (tonnes), years 2017 - 2019



Source: ISPRA

Table 3.2.4 shows the national data related to the different operations of ELV treatment. Overall, the reuse and recycling percentage is 84,2% of the average vehicle weight, slightly below the 85% target set for 2015 by art. 7 paragraph 2 of Legislative Decree no. 209/2003. Similarly, total recovery stands at 84,2%; the 95% target set by law is therefore far from being reached.

The recovery percentage recorded (84,2%) shows that the absence of energy recovery plants compromises the possibility of achieving the overall recovery target.
Compared to previous years, there is a stability in the material recovery rates, which shows the difficulty of the sector in finding a valorisation network for materials with a lower market value.
The fluff produced by the shredding plants is almost entirely sent for disposal (almost 203 thousand tonnes). The difficulty in identifying valid destinations for the use of this waste is one of the major problems of the entire sector. It should be noted that proper de-pollution of vehicles would allow effective energy recovery, given the high calorific value of fluff which is essentially made up of organic materials.

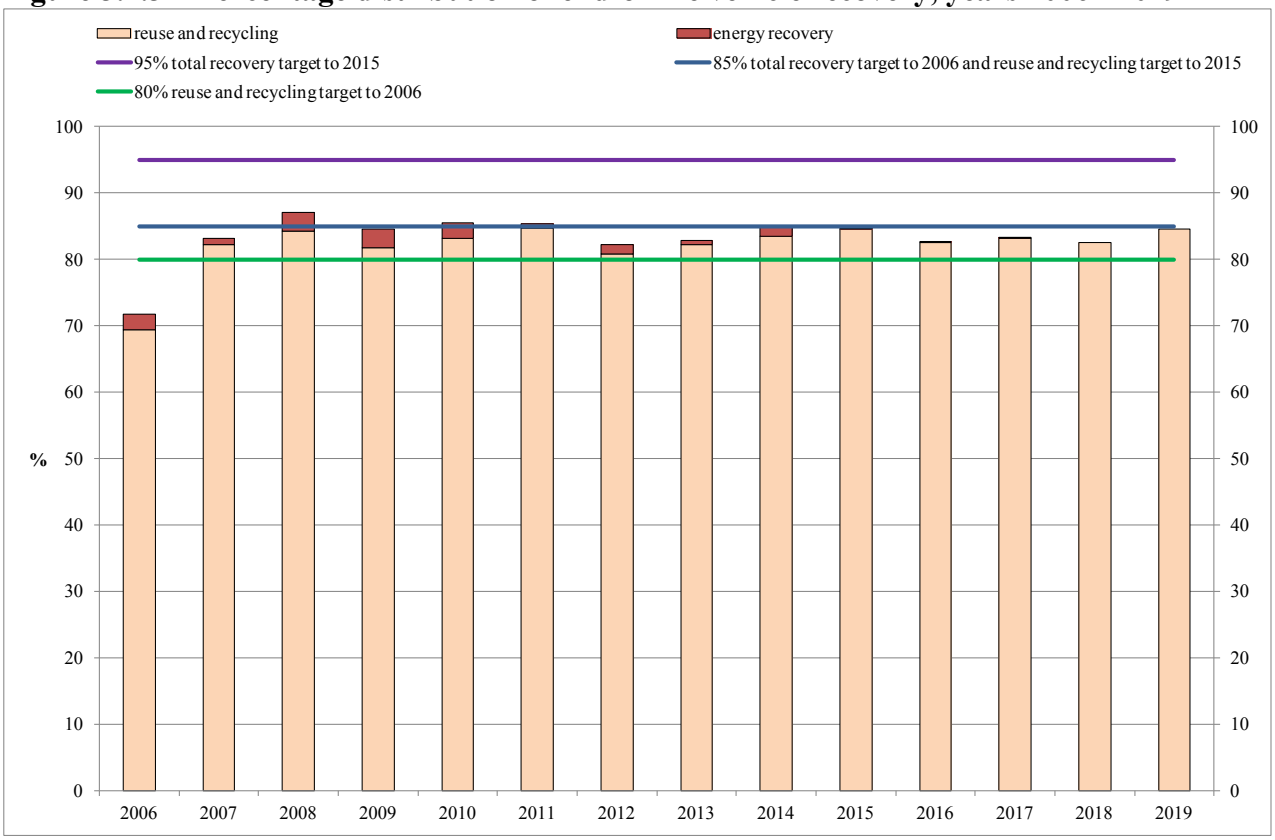
Table 3.2.4 - Destination of waste from de-pollution and demolition of end-of-life vehicles (tonnes), year 2019

Reuse (t)	Recycling (t)	Energy recovery (t)	Total recovery (t)	Disposal (t)
132.044	956.610	0	1.088.654	204.114

Source: ISPRA

The analysis of reuse, recycling and recovery rates since 2006 shows a substantial stability in the latest years, after an initial improvement, perhaps due to a positive response of sector to the new legislation and the European targets, as well as to a phase of adaptation to the reporting method. The structural deficiencies recorded have therefore been perpetuated over the years and no progress has been recorded, particularly for energy recovery, which is widely used in other Member States (Figure 3.2.3)

Figure 3.2.3 – Percentage distribution of end-of-life vehicle recovery, years 2006 - 2019

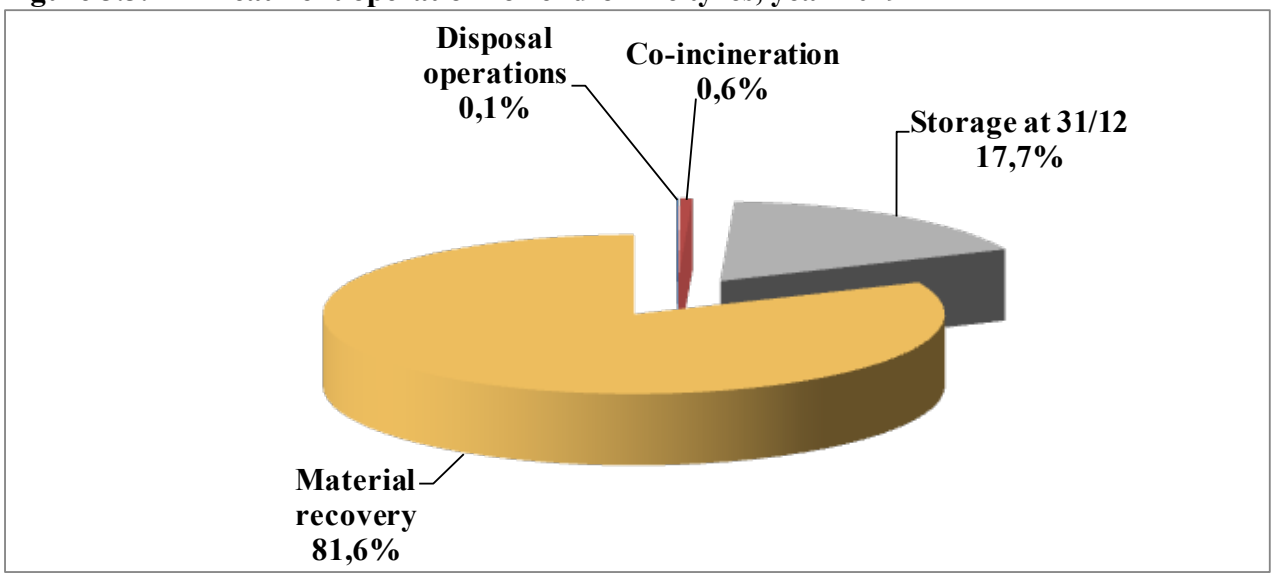


Source: ISPRA

3.3 End-of-life tyres

The treated end-of-life tyres (ELTs) are 449 thousand tonnes (+0,5% compared to 2018), mainly destined for recovery operations (over 369 thousand tonnes). Disposal involves a residual quantity of 388 tonnes (Figure 3.3.1). At the end of the year there were approximately 80 thousand tonnes in storage, equal to 17,7% of the total managed.
An analysis of the data shows that 81,6% of the ELTs, equal to 366 thousand tonnes, are destined for material recovery and 0,6%, equal to 3 thousand tonnes, are recovered in production plants to produce energy. Residual quantities of ELTs are destined for other recovery/disposal operations, specifically, 190 tonnes are incinerated with energy recovery, 88 tonnes are disposed of in landfills and 110 tonnes are destined for other forms of disposal (D9, D13 and D14).

Figure 3.3.1 – Treatment operation for end-of-life tyres, year 2019



Source: ISPRA

A significant amount of ELTs is exported abroad, more than 104 thousand tonnes; of which 66 thousand tonnes are sent for material recovery (63,7% of the total exported) and 38 thousand tonnes are recovered as waste-to-energy (36,1% of the total exported). A marginal portion, amounting to 225 tonnes, is subjected to disposal operations (0,2% of the total exported).
Germany and India each receive about 25 thousand tonnes destined to material recovery.

3.4 Sludge from treatment of urban and industrial wastewater and from the agro-food sector

The quantity of sludge from urban wastewater treatment (EWL code 190805) generated on the national territory amounts to slightly more than 3,4 million tonnes, while those from industrial wastewater treatment, biological treatment and other treatment amounts respectively to 225 thousand tonnes (EWL code 190812) and 623 thousand tonnes (EWL code 190813* and 190814), totalling more than 848 thousand tonnes (Table 3.4.1). Generation of sludge from urban wastewater treatment increases by 8,9% compared to 2018, when about 3,13 million tonnes were generated. The generation of industrial sludge also increases compared to 2018, recording a growth of 1,3% for EWL code 190812, 13,7% for EWL code 190813* and 13,1% for EWL code 190814.

Table 3.4.1 – Generation of sludge from treatment of urban and industrial wastewater, year 2019

Region	Sludges from treatment of urban wastewater (EWL code 190805)	Sludges from biological treatment of industrial wastewater (EWL code 190812)	Sludges containing hazardous substances from other treatment of industrial wastewater (EWL code 190813*)	Sludges from other treatment of industrial wastewater (EWL code 190814)
	Tonnes			
Piemonte	301.897	9.368	6.363	35.439
Valle D'Aosta	4.470	0	150	41
Lombardia	466.295	31.581	11.907	87.893
Trentino-Alto Adige	140.393	1.655	54	3.455
Veneto	399.958	18.355	5.442	71.144
Friuli-Venezia Giulia	82.618	12.282	775	876
Liguria	41.926	353	644	19.196
Emilia-Romagna	439.492	5.610	2.799	77.776
Northern Italy	**1.877.049**	**79.204**	**28.134**	**295.820**
Toscana	303.135	93.538	7.622	55.578
Umbria	43.380	141	12.322	4.325
Marche	79.357	1.744	439	6.645
Lazio	409.997	21.323	2.447	69.070
Central Italy	**835.869**	**116.746**	**22.830**	**135.618**
Abruzzo	60.862	1.344	1.994	1.288
Molise	3.004	7.557	0	839
Campania	180.099	6.231	6.419	25.804
Puglia	299.814	3.108	221	45.614
Basilicata	4.391	5.569	2.000	1.707
Calabria	34.072	1.512	3.748	20.440
Sicilia	30.575	939	5.711	20.876
Sardegna	90.668	3.057	2.629	1.711
Southern Italy	**703.485**	**29.317**	**22.722**	**118.279**
TOTAL 2019	**3.416.403**	**225.267**	**73.686**	**549.717**
TOTAL 2018	**3.137.372**	**222.361**	**64.797**	**486.097**

Source: ISPRA

Sludges from treatment of urban wastewater subjected to recovery/disposal operations are over 3,1 million tonnes, showing an increase of 7,4% compared to 2018 (Table 3.4.2). An additional 100 thousand tonnes are also destined abroad. Quantities of sludge generated may not be comparable with those of sludge subjected to recovery/disposal operations as the latter may have been declared as dry weight. Among the disposal operations, which represent 55,9% of the total treated, the largest quantity is sent to biological treatment (D8), about 1 million tonnes, while 41,2% are sent to

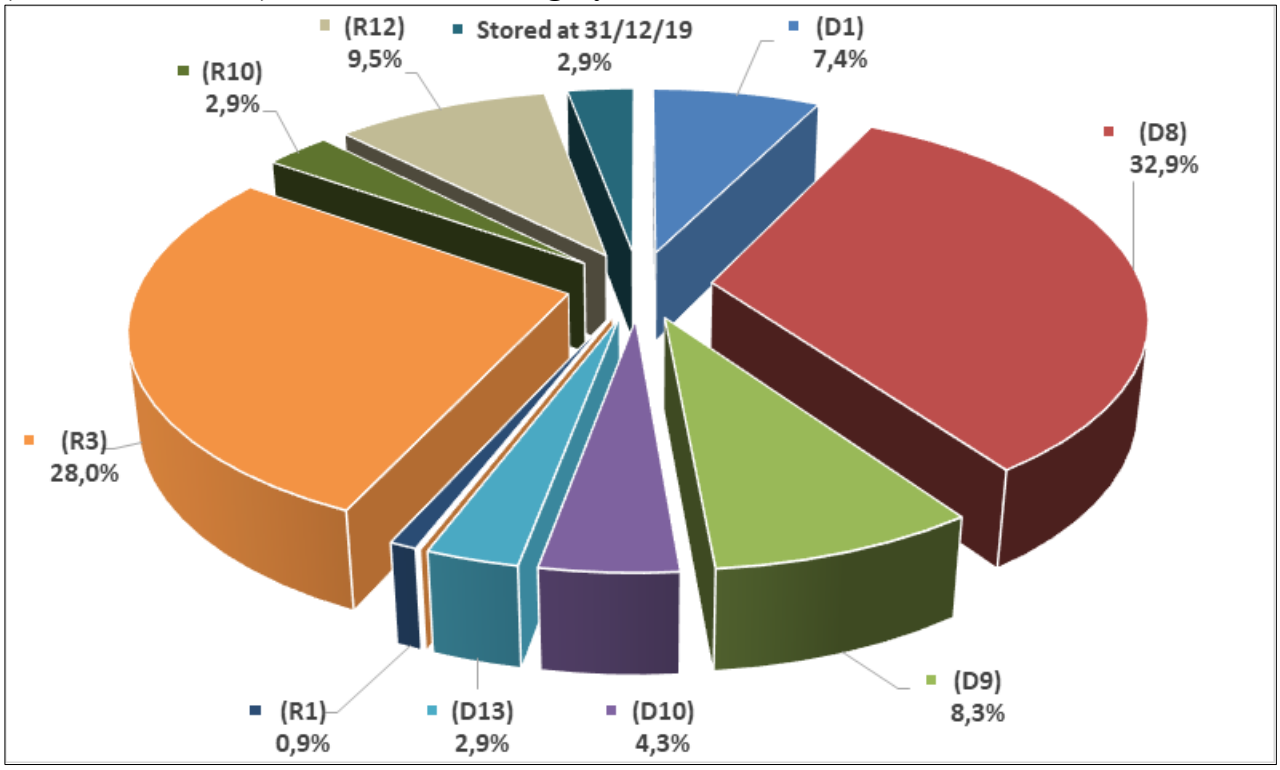
recovery operations. The predominant recovery operation is the recycling/recovery of organic substances not used as solvents (R3), which represents 28% of the total sludge treated (Figure 3.4.1). Although disposal is the predominant form of treatment, there was an increase of 10,4% in the percentage of recovered sludge, compared to 2018

Table 3.4.2 – Treatment of sludge from urban wastewater, 190805 (tonnes), years 2016 - 2019

Disposal/recovery operation (All. B e C Dlgs. 152/2006)	Quantity (t/y)			
	2016	2017	2018	2019
Deposit into or on to land (e.g., landfill, etc.) (D1)	377.573	341.516	261.323	231.839
Biological treatment (D8)	890.072	828.152	950.666	1.028.890
Physical-chemical treatment (D9)	147.085	187.652	244.888	261.247
Incineration on land (D10)	95.435	119.752	137.159	135.147
Blending or mixing prior to submission to any of the operations numbered D 1 to D 12 (D13)	42.460	27.921	41.493	90.824
Repackaging prior to submission to any of the operations numbered D 1 to D 13 (D14)	786	661	7.066	2.140
A) Total disposal (D1-D14)	**1.553.411**	**1.505.654**	**1.642.595**	**1.750.087**
Use principally as a fuel or other means to generate energy (R1)	23.633	23.466	24.440	26.895
Recycling/reclamation of organic substances which are not used as solvents (R3)	792.734	990.109	820.121	875.373
Recycling/reclamation of other inorganic materials (R5)	1.160	3.830	1.348	215
Land treatment resulting in benefit to agriculture or ecological improvement (R10)	120.916	84.892	75.867	90.323
Exchange of waste for submission to any of the operations numbered R 1 to R 11(R12)	337.238	314.869	245.449	296.163
B) Total recovered (R1-R12)	**1.275.681**	**1.417.166**	**1.167.225**	**1.288.969**
C) Total Stored at 31/12 (R13/D15)	**94.997**	**51.083**	**105.644**	**91.421**
Total Treated (A+B+C)	**2.924.089**	**2.973.903**	**2.915.464**	**3.130.477**

Source: ISPRA

Figure 3.4.1 – Percentage distribution of treatment operations for urban wastewater sludge (EWL code 190805) to total treated sludge, year 2019



D1: Deposit into or on to land (e.g. landfill, etc.), **D8:** Biological treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12, **D9:** Physical-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12 (e.g. evaporation, drying, calcination, etc.), **D10:** Incineration on land, **D13:** Blending or mixing prior to submission to any of the operations numbered D 1 to D 12, **D14:** Repackaging prior to submission to any of the operations numbered D 1 to D 13
R1: Use principally as a fuel or other means to generate energy, **R3**: Recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes), **R10:** Land treatment resulting in benefit to agriculture or ecological improvement, **R12:** Exchange of waste for submission to any of the operations numbered R 1 to R 11.
Source: ISPRA

Sludge from treatment (biological and other) of industrial wastewater (Table 3.4.3) subjected to recovery/disposal operations are approximately 854 thousand tonnes. Disposal operations prevail over recovery operations with a percentage equal to 71,3% of the total. Recovery operations, on the other hand, account for 25,4%. The prevailing operation for sludge from industrial wastewater is landfilling, representing approximately 34,4% of the total treated with over 293 thousand tonnes; it is followed by chemical and physical treatment with over 221 thousand tonnes. The prevailing recovery operation is the recycling/recovery of inorganic substances with over 121 thousand tonnes, equal to 14,2 % of the total treated.

Table 3.4.3 – Recovery/disposal of sludges from treatment of industrial wastewater (tonnes), year 2019

Disposal/recovery operation	EWL code 190812	EWL code 190813*	EWL code 190814	Total of industrial sludges
	Tonnes			
Deposit into or on to land (e.g., landfill, etc.) (D1)	34.840	15.870	243.062	293.772
Biological treatment (D8)	8.161	98	27.310	35.569
Physical-chemical treatment (D9)	42.518	45.755	133.705	221.978
Incineration on land (D10)	1.352	1.877	4.519	7.748
Blending or mixing prior to submission to any of the operations numbered D 1 to D 12 (D13)	25.322	2.914	18.382	46.618
Repackaging prior to submission to any of the operations numbered D 1 to D 13 (D14)	424	1.428	1.082	2.934
A) Total disposal (D1-D14)	**112.617**	**67.942**	**428.060**	**608.619**
Use principally as a fuel or other means to generate energy (R1)	220	0	0	220
Recycling/reclamation of organic substances which are not used as solvents (R3)	93.361	0	28.106	121.467
Recycling/reclamation of metals and metal compounds (R4)	0	732	9.939	10.671
Recycling/reclamation of other inorganic materials (R5)	3.802	287	34.967	39.056
Exchange of waste for submission to any of the operations numbered R 1 to R 11(R12)	5.589	1.270	38.975	45.834
B) Total recovered (R1-R12)	**102.972**	**2.289**	**111.987**	**217.248**
C) Total Stored at 31/12 (R13/D15)	**1.670**	**1.956**	**24.532**	**28.158**
Total Treated (A+B+C)	**217.259**	**72.187**	**564.579**	**854.025**

EWL code 190812: sludges from biological treatment of industrial wastewater other than those mentioned in 19 08 11; **EWL code 190813***: sludges containing hazardous substances from other treatment of industrial wastewater; **EWL code 190814**: sludges from other treatment of industrial wastewater other than those mentioned in 190813.

Source: ISPRA

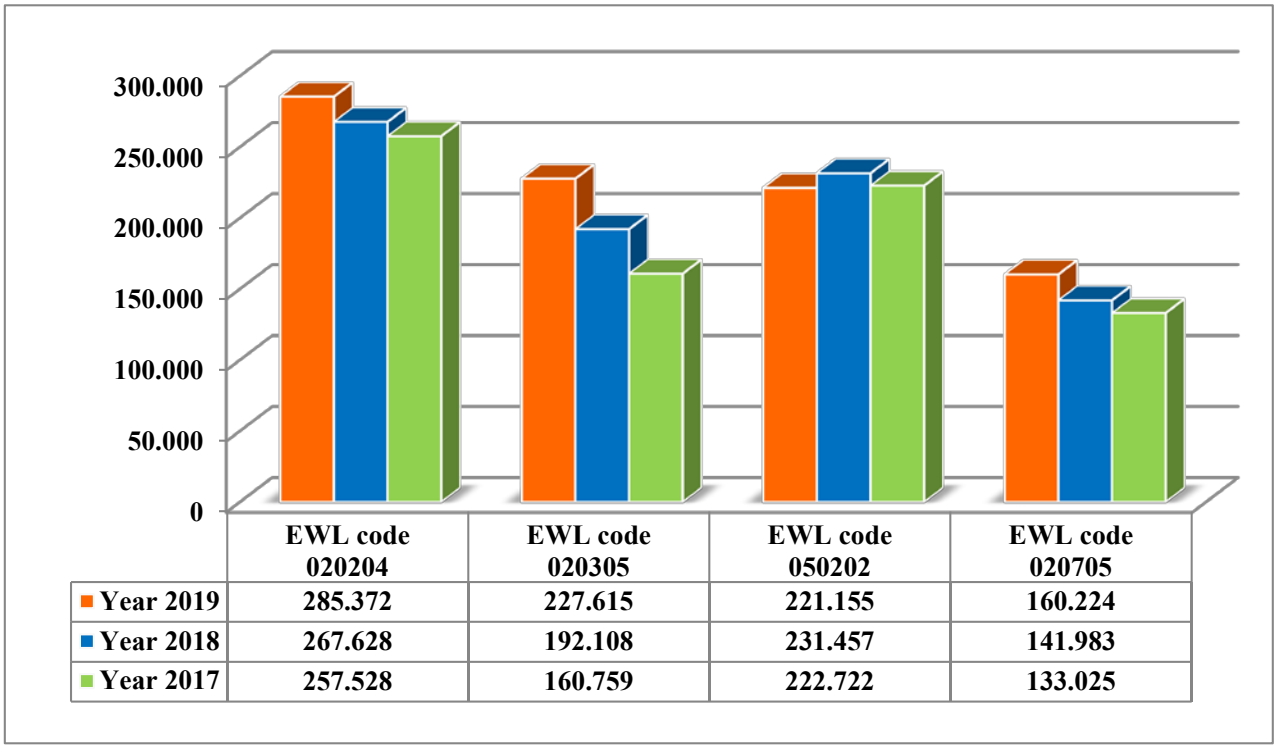
Sludges from wastewater treatment of the agro-food sector, unlike those from urban and industrial wastewater, are mostly recovered rather than disposed of. On average, recovery operations represent about 73% of the agro-food sludge treatment and recycling/recovery of organic substances (R3) is the prevailing operation (Table 3.4.4). Figure 3.4.2 shows a general increase in the quantity treated compared to 2018.

Table 3.4.4 - Recovery/disposal of sludges from treatment of wastewater of the agro-food sector, year 2019

Disposal/recovery operation	EWL code 020204	EWL code 020305	EWL code 020502	EWL code 020705
	Tonnes			
Deposit into or on to land (e.g., landfill, etc.) (D1)	1	3214	65	7
Biological treatment (D8)	31.003	12.681	57.786	27.420
Physical-chemical treatment (D9)	7.073	8.408	9.052	9.434
Incineration on land (D10)	7	0	852	5
Blending or mixing prior to submission to any of the operations numbered D 1 to D 12 (D13)	279	545	14	161
Repackaging prior to submission to any of the operations numbered D 1 to D 13 (D14)	0	2	0	58
A) Total disposal (D1-D14)	**38.363**	**24.850**	**67.769**	**37.085**
Use principally as a fuel or other means to generate energy (R1)	0	124	0	0
Recycling/reclamation of organic substances which are not used as solvents (R3)	213.188	98.902	130.742	51.030
Land treatment resulting in benefit to agriculture or ecological improvement (R10)	14.697	80.129	12.262	52.879
Exchange of waste for submission to any of the operations numbered R 1 to R 11(R12)	2.179	2.290	1.448	2.043
B) Total recovered (R1-R12)	**230.064**	**181.445**	**144.452**	**105.952**
C) Total Stored at 31/12 (R13/D15)	**16.945**	**21.320**	**8.934**	**17.187**
Total Treated (A+B+C)	**285.372**	**227.615**	**221.155**	**160.224**

EWL 020204: sludges from on-site effluent treatment from the preparation and processing of meat, fish and other foods of animal origin; **EWL 020305**: sludges from on-site effluent treatment from fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing; conserve production; yeast and yeast extract production, molasses preparation and fermentation **EWL 020502** sludges from on-site effluent treatment from the dairy products industry; **EWL 020705** sludges from on-site effluent treatment from the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa).
Source: ISPRA

Figure 3.4.2 – Trend of sludges from treatment of wastewater of the agro-food sector, EWL code 020204, EWL code 020305, EWL code 050202, EWL code 020705 (tonnes), years 2017 – 2019



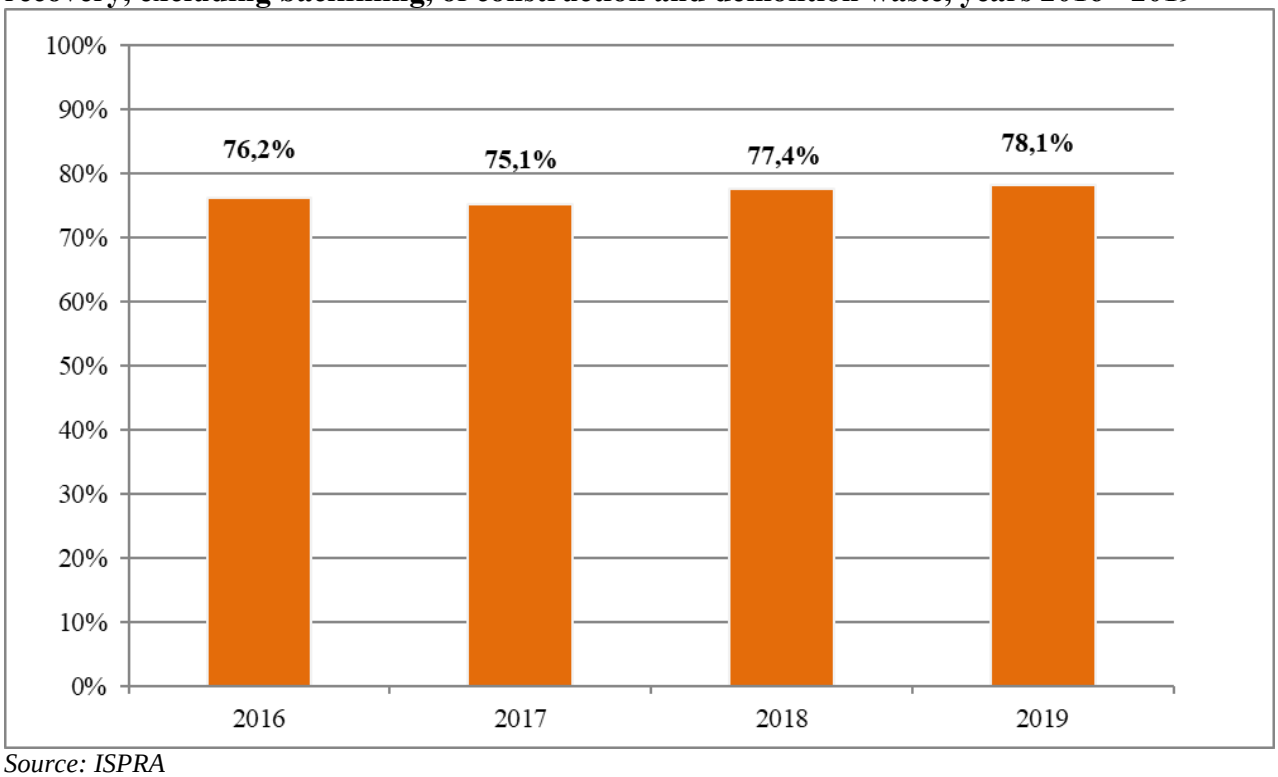
	EWL code 020204	EWL code 020305	EWL code 050202	EWL code 020705
Year 2019	285.372	227.615	221.155	160.224
Year 2018	267.628	192.108	231.457	141.983
Year 2017	257.528	160.759	222.722	133.025

Source: ISPRA

3.5 Construction and demolition wastes

Waste from construction and demolition operations is a specific waste stream monitored by the European Commission. In Article 11 of Directive 2008/98/EC on waste, the Commission set a target of 70% preparation for reuse, recycling and other material recovery by 2020, including backfilling operations using waste as a substitute for other materials. By 31st December 2024, the Commission will assess the introduction of targets on preparing for re-use and recycling of construction and demolition waste.
The calculation methods to be adopted by Member States in order to certify compliance with the targets have been identified in Decision 2011/753/EC, which defines in Annex III the recovery rate for construction and demolition waste as the ratio between the "*recovered amount of construction and demolition waste*" and the "*total amount of construction and demolition waste*".
The national production of construction and demolition waste, excluding soil and stones and dredging spoil (EWL 1705**), stands at approximately 52,1 million tonnes (+13,6% compared to 2018, corresponding to more than 6,2 million tonnes), while total material recovery reaches 40,7 million tonnes (+14,6% corresponding to almost 5,2 million tonnes). The percentage of recovery of demolition and construction waste is 78,1% in 2019, therefore above the 70% target set by Directive 2008/98/EC for 2020 (Figure 3.5.1).
The amount of waste used as backfilling stands at approximately 171 thousand tonnes.

Figure 3.5.1 – Trends in the rate of preparation for re-use, recycling and other material recovery, excluding backfilling, of construction and demolition waste, years 2016 - 2019

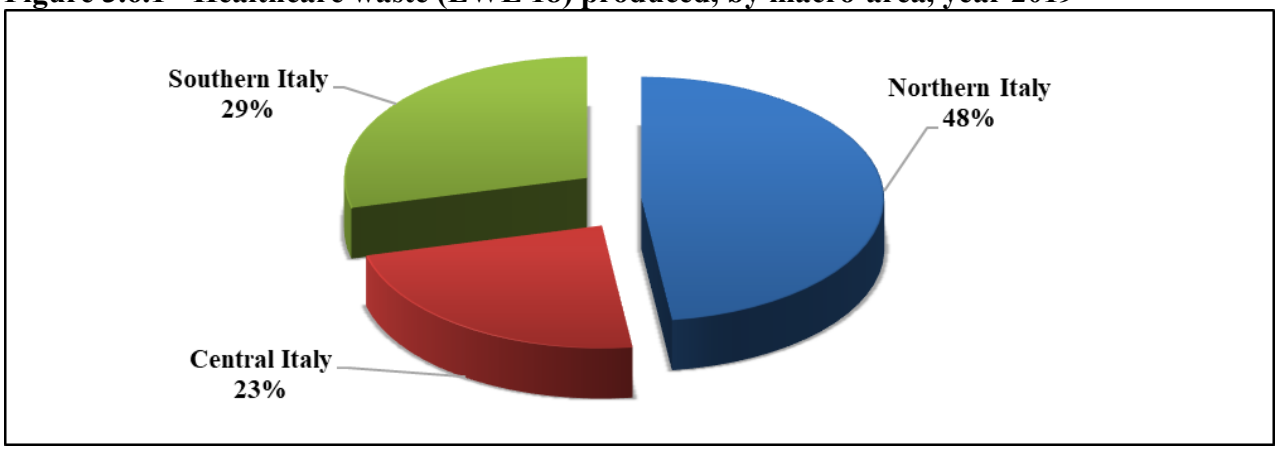


Source: ISPRA

3.6 Wastes from human or animal health care and/or related research (EWL 18)

Wastes from human or animal health care and/or related research, in short healthcare waste, (EWL 18) produced in Italy amounts to about 200 thousand tonnes, of which about 25 thousand tonnes are non-hazardous and almost 175 thousand tonnes are hazardous wastes. With regard to hazardous healthcare waste, the summary data referring to the macro-areas (Figure 3.6.1) shows that production in Northern Italy is 48% of the total with almost 84 thousand tonnes. The figure varies considerably in Central Italy where production is about 40,3 thousand tonnes (23% of the total) and in the South where about 50,6 thousand tonnes are produced, 29% of the total.

Figure 3.6.1 - Healthcare waste (EWL 18) produced, by macro-area, year 2019



Source: ISPRA

Most of the hazardous waste produced consists of wastes whose collection and disposal is subject to special requirements in order to prevent infection (EWL code 180103*), amounting to 142 thousand tonnes.

The healthcare waste treated are about 217 thousand tonnes, of which just over 31 thousand tonnes are non-hazardous wastes and about 186 thousand tonnes are hazardous wastes. Incidence rates of the different hazardous waste treatment operations in relation to the total treated show that the most used are waste disposal operations, accounting for about 86% of the total. In particular, incineration (D10) prevails, with 49,3% of the total treated and physical-chemical treatment with 26,7% of the total.

Wastes whose collection and disposal are subjected to special requirements in order to prevent infection (EWL code 180103*) accounts for 79,7% (just over 148.thousand tonnes) of the total hazardous healthcare waste treated.
The analysis focus on the two main forms of treatment for hazardous healthcare waste: sterilisation and incineration. Table 3.6.1 shows that about 75 thousand tonnes of hazardous healthcare waste are treated at sterilisation plants, while just over 95 thousand tonnes are sent for incineration. Overall, the amount of hazardous healthcare waste incinerated or sterilised was 170,3 thousand tonnes, of which about 80% (or 136,6 thousand tonnes) was hazardous healthcare waste with infectious risks (EWL code 180103*).

There are 16 sterilisation plants operating on the national territory, with a total treatment capacity of approximately 122 thousand tonnes. Wastes treated with sterilisation are subsequently sent to waste-to-energy plant or landfill.
There are 26 plants authorised to incinerate this category of waste, two of which did not treat waste with EWL code 180103* in 2019. The authorised capacity for this type of treatment amounts to 222 thousand tonnes.

Table 3.6.1 – Amount of hazardous healthcare waste incinerated or sterilised (tonnes), year 2019

Treatment	Number of plants	Authorised capacity (tonnes)	Amount of hazardous healthcare waste treated (tonnes)	Amount of waste with EWL code 180103* treated (tonnes)
Incineration	26*	222.000	95.394	89.774
Sterilization	16**	122.000	75.002	46.865
Total	42	344.000	170.396	136.639

* Two facilities did not treat wastes whose collection and disposal is subject to special requirements in order to prevent infection (EWL Code 180103*).
** This figure includes two facilities located in port areas and one facility equipped with two sterilisers.
Source: ISPRA

RAPPORTI
345 bis/2021