ISPRA
Istituto Superiore per la Protezione e la Ricerca Ambientale

Sistema Nazionale per la Protezione dell'Ambiente

Report on Waste from Economic Activities 2022

Summary data

RAPPORTI
368 bis/2022

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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.

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CHAPTER 1

GENERATION OF WASTE FROM ECONOMIC ACTIVITIES

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CHAPTER 2

MANAGEMENT OF WASTE FROM ECONOMIC ACTIVITIES

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CHAPTER 3

MONITORING OF SPECIFIC WASTE FLOWS

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1. 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 2020 and are extracted from the declarations submitted in 2021. 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 2020, the total amount of EAW generated nationally has been almost 147 million tonnes. Between 2019 and 2020 waste generation decreased of 4,5%, approximately 7 million tonnes.
As with municipal waste, the data on waste generated by production activities (industrial, commercial, handicraft, service, waste treatment and environmental remediation) were also strongly influenced by the Covid-19 health emergency that affected the national socio-economic scenario in 2020.
2020 was a year marked by a significant drop in domestic consumption, due to trade closures and restrictive measures taken, as well as disruptions in supply chains, particularly in the supply of raw materials and semi-finished goods, which affected manufacturing production.

Non-hazardous wastes, representing 93,3% of the total wastes generated, decreased by almost 6,7 million tonnes (- 4,6%), while hazardous wastes by 300 thousand tonnes (- 3%).
The construction sector has been significantly affected by the pandemic crisis, both due to the closure of construction sites, especially public works, and the reduction of building maintenance or new construction for housing, commercial and non-residential buildings: non-hazardous waste from construction and demolition operations, estimated by ISPRA, decreased by 5,2%, corresponding to more than 3,5 million tonnes less than 2019.
The quantities of non-hazardous waste for specific production sectors estimated by ISPRA from industrial production data, are also decreasing. Furthermore, production data can be influenced not insignificantly by the possibility of reintroducing material flows into industrial cycles and utilising production residues as by-products, even in production chains other than the one of origin, encouraging industrial symbiosis and the creation of so-called 'circular districts'.

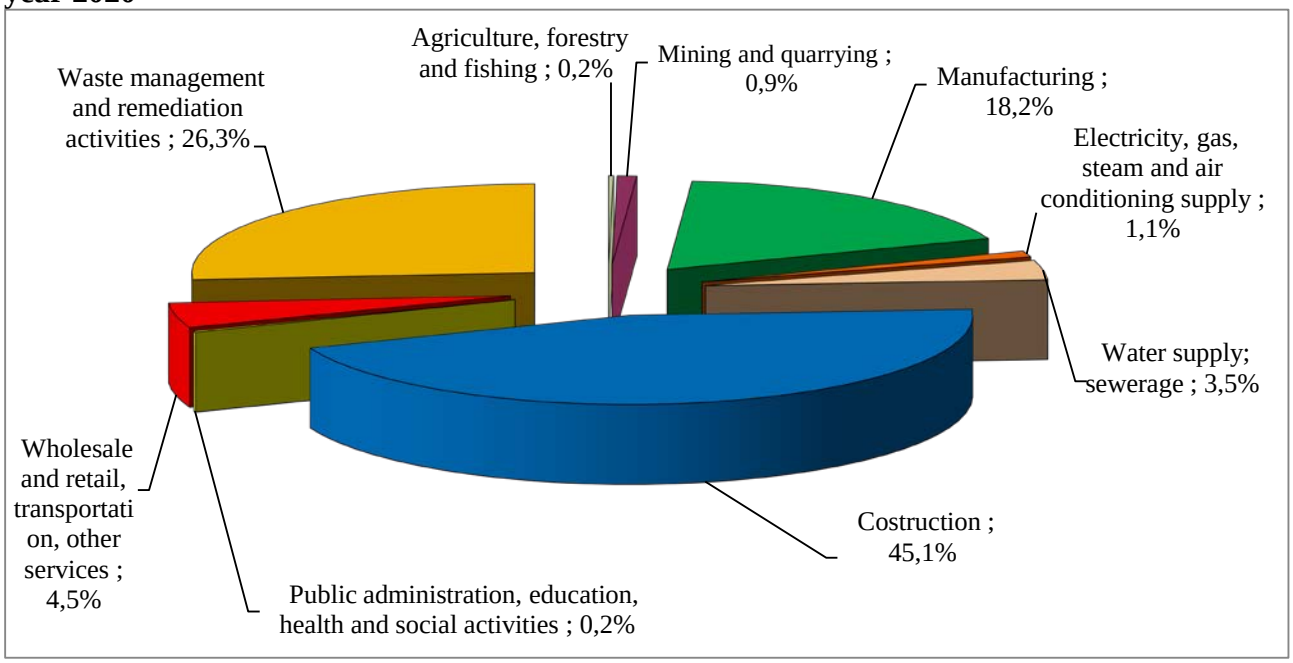
Table 1.1 – National generation of waste from economic activities, years 2018 – 2020

Type of waste	Quantity (tonnes)		
	2018	2019	2020
Non-hazardous wastes excluding construction and demolition waste	73.621.720	75.484.906	72.342.320
Construction and demolition wastes	59.812.827	68.334.771	64.793.200
Total of non-hazardous wastes (NH)	**133.434.547**	**143.819.677**	**137.135.520**
Hazardous wastes excluding end-of-life vehicles	8.622.066	8.616.601	8.381.523
End-of-life vehicles	1.423.089	1.538.046	1.466.693
Total of hazardous wastes (H)	**10.045.155**	**10.154.647**	**9.848.216**
Total of wastes from economic activities	**143.479.702**	**153.974.324**	**146.983.736**

*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 45,1% of the total amount, with over 66,2 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, etc.). Waste treatment and environmental remediation activities (NACE$_{rev.2}$ Sector E - Water supply; sewerage; waste management and remediation activities) account for 26,3% of the total waste generation (38,6 million tonnes), while all manufacturing activities (NACE$_{rev.2}$ Sector C - Manufacturing) represent 18,2% (approximately 26,7 million tonnes). The other remaining economic sectors contribute, overall, to 10,5% (15,5 million tonnes) of EAW generated.

Figure 1.1 – Percentage distribution of total waste generation, by sector of economic activity, year 2020



Source: ISPRA

Percentage distribution of **non-hazardous wastes** generation between the various sectors of economic activities (Figure 1.2) reflects the distribution of the total wastes generation in consideration of the high incidence of this type of waste on the total of wastes produced (93,3% of the total quantity).

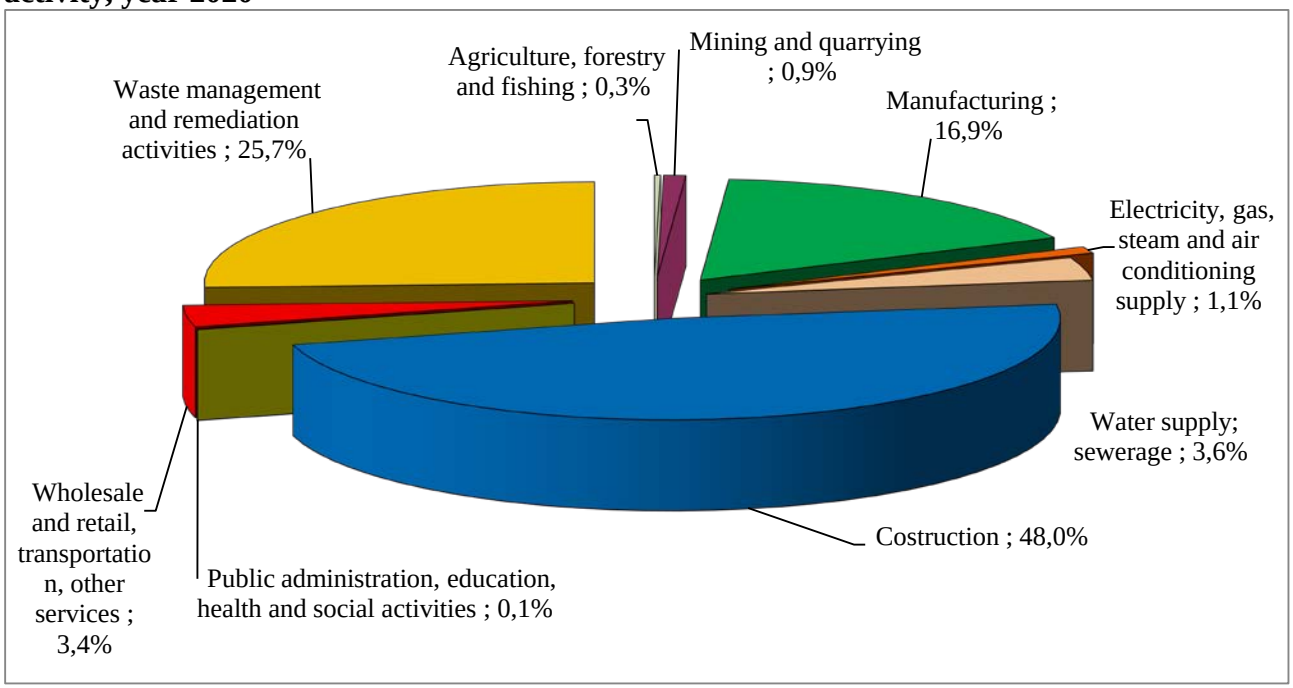
A share of 48% of the total non-hazardous wastes generated, corresponding to 65,8 million tonnes, derives from the construction and demolition activities (NACE$_{rev.2}$ Sector F), followed by activities of waste treatment and remediation (25,7% - NACE$_{rev.2}$ Sector E) and the manufacturing sector (16,9%- 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 23,2 million tonnes. The remaining sectors, together, account for 9,4% of the total amount of non-hazardous wastes generated (approximately 12,8 million tonnes).

Data analysis by type of non-hazardous waste generated shows that wastes from construction and demolition operations (LoW[2] 17) constitute 47,2% of the total, those produced by treatment of wastes and wastewater (LoW 19) correspond to 27,8%, followed by wastes produced by thermal processes

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

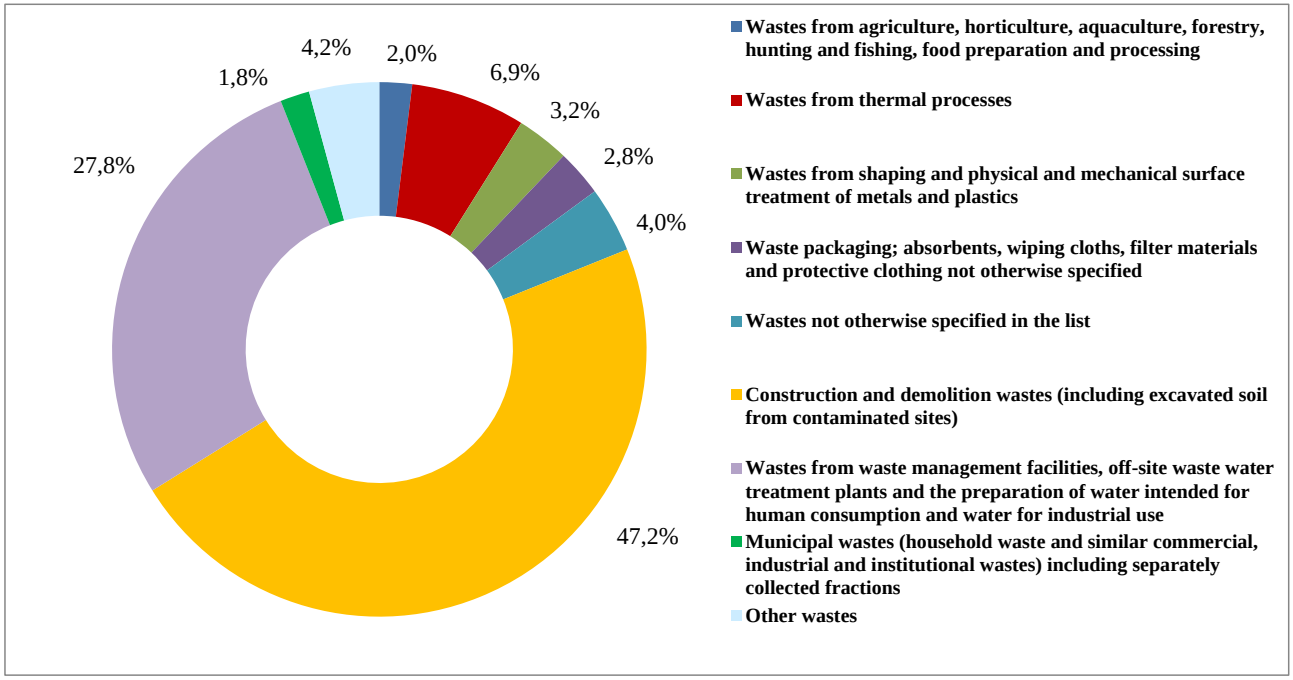
(LoW 10), representing 6,9%, and wastes not otherwise specified in the European List of Waste (LoW 16), 4% (Figure 1.3).

Figure 1.2 – Percentage distribution of non-hazardous wastes generation, by sector of economic activity, year 2020



Source: ISPRA

Figure 1.3 – Percentage distribution of non-hazardous wastes generation, by type of waste, year 2020



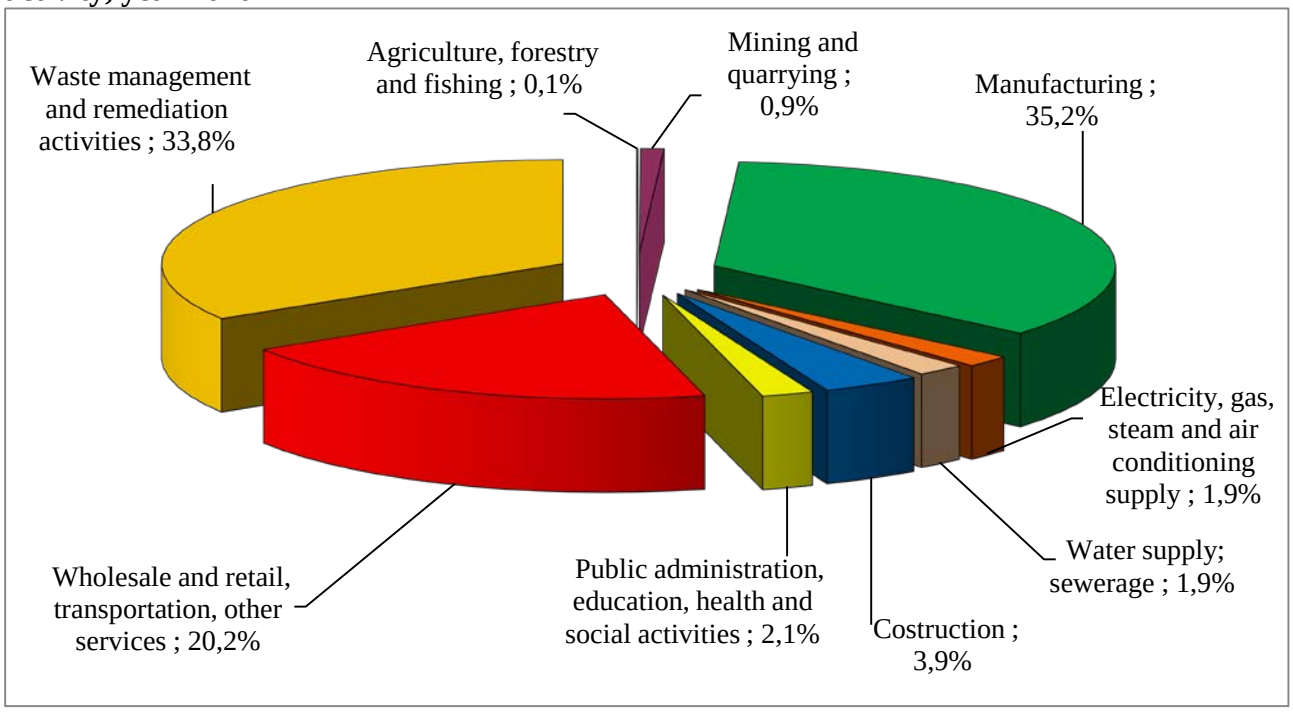
Source: ISPRA

The manufacturing sector produces 35,2% of the total **hazardous wastes**, corresponding to almost 3,5 million tonnes (Figure 1.4). Waste treatment and environmental remediation sector is accountable for 33,8% of the total hazardous wastes generated, for 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 20,2% of the total, about 2 million tonnes, of which over 1,5 million tonnes of end-of-life vehicles.

Among the manufacturing sectors, that of the 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 47,5% (over 1,6 million tonnes) of the total hazardous wastes produced by the whole manufacturing sector.
Metallurgical sector ($NACE_{rev.2}$ Sector C24 - Manufacture of basic metals), produces 865 thousand tonnes of hazardous wastes (24,9% of the whole sector), while the manufacture of metal products, excluding machinery and equipment ($NACE_{rev.2}$ Sector C25), produces 386 thousand tonnes of hazardous wastes (11,1%).

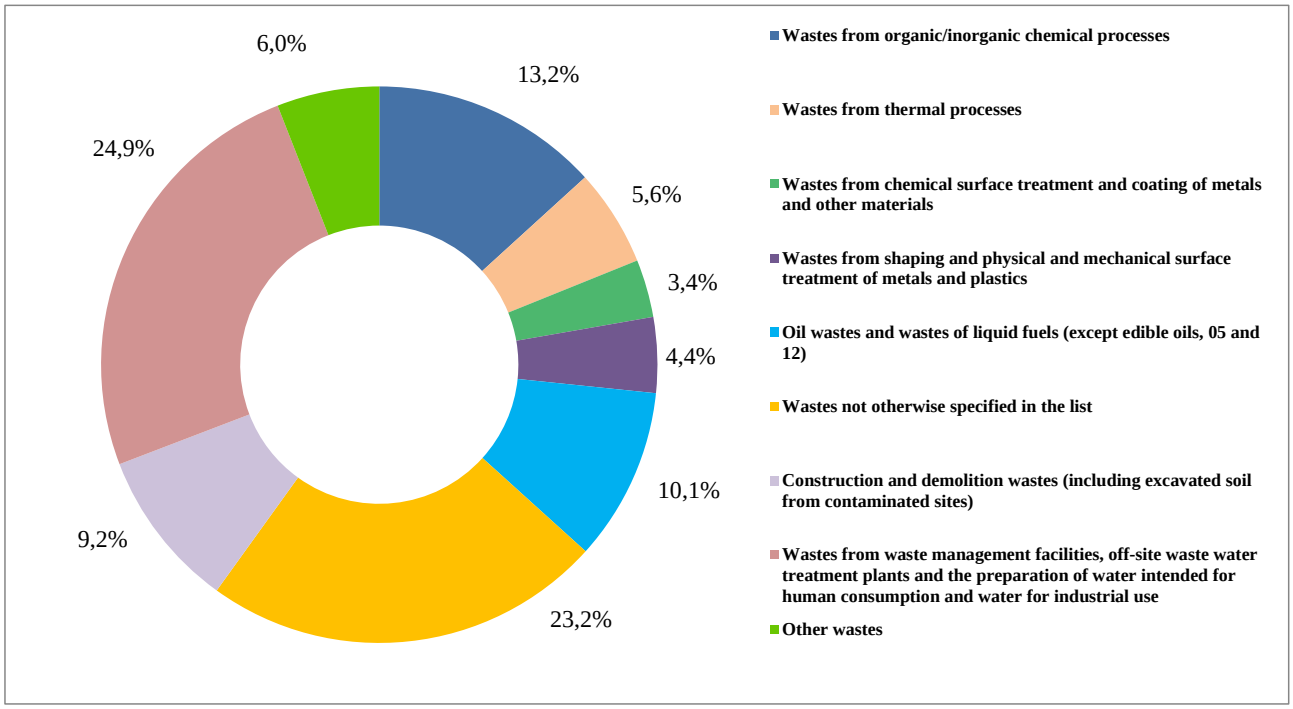
Data analysis by type of hazardous waste generated in 2020 shows that 24,9% of the total, consists of wastes produced by treatment of wastes and wastewater (LoW 19), while 23,2% are wastes not otherwise specified in the European List of Waste (LoW 16) including end-of-life vehicles (ELV), electrical and electronic equipment (WEEE), batteries and accumulators (Figure 1.5).
Wastes from inorganic and organic chemical processes (LoW 06 and LoW 07) together represent 13,2% of the total amount of hazardous waste generated, while oil wastes and wastes of liquid fuels (LoW 13) and wastes deriving from construction and demolition operations (LoW 17) are respectively 10,1% and 9,2% of the total. Wastes from thermal processes (LoW 10) correspond to 5,6% and wastes from the surface processing of metals and plastics (LoW 11) to 4,4%.

Figure 1.4 – Percentage distribution of hazardous waste generation, by sector of economic activity, year 2020



Source: ISPRA

Figure 1.5 – Percentage distribution of hazardous wastes generation, by type of waste, year 2020

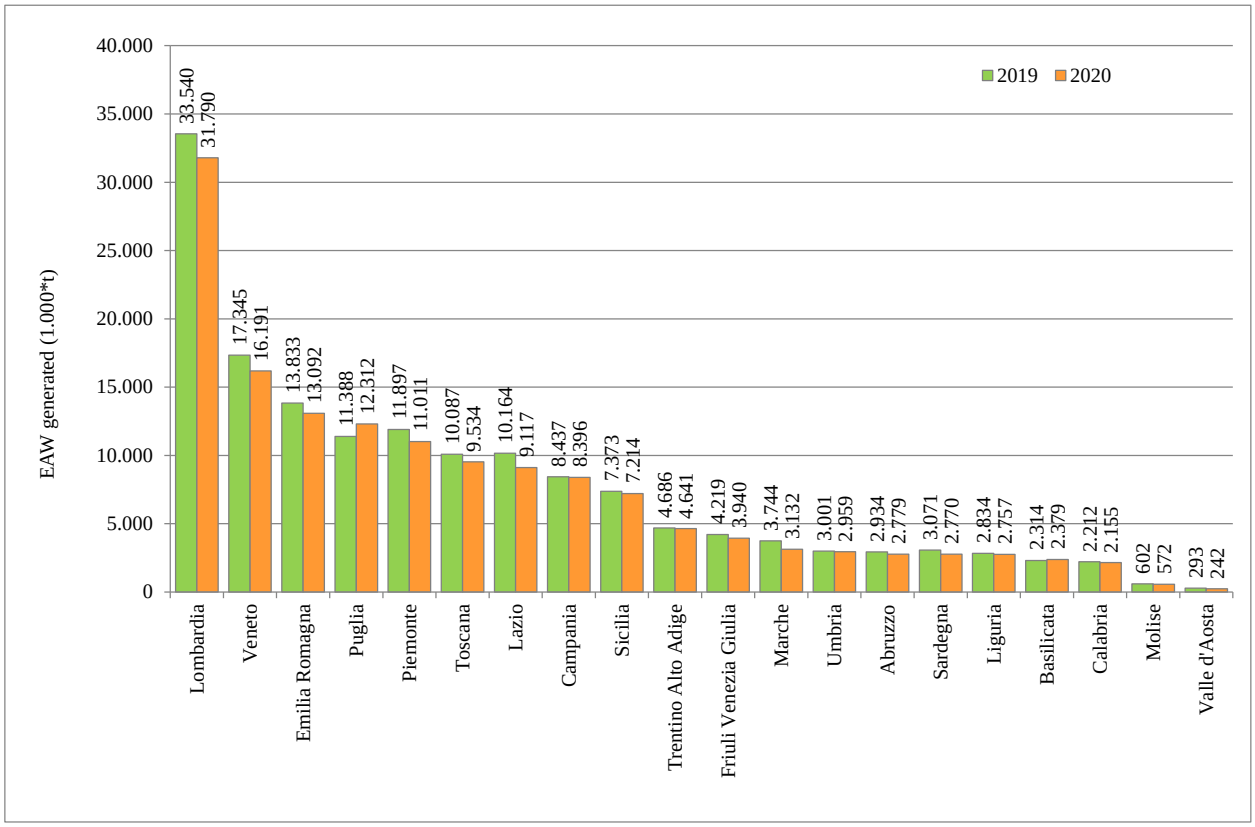


Source: ISPRA

The economic activities present on a specific territory influence the type and quantity of waste generated. At macro-area level, EAW generation is more concentrated in northern Italy where the number of industries is greater, amounting to 83,7 million tonnes (56,9% of the overall national data). Waste generation in central Italy stands at 24,7 million tonnes (16,8% of the total), while in southern Italy stands at 38,6 million tonnes (26,2%).

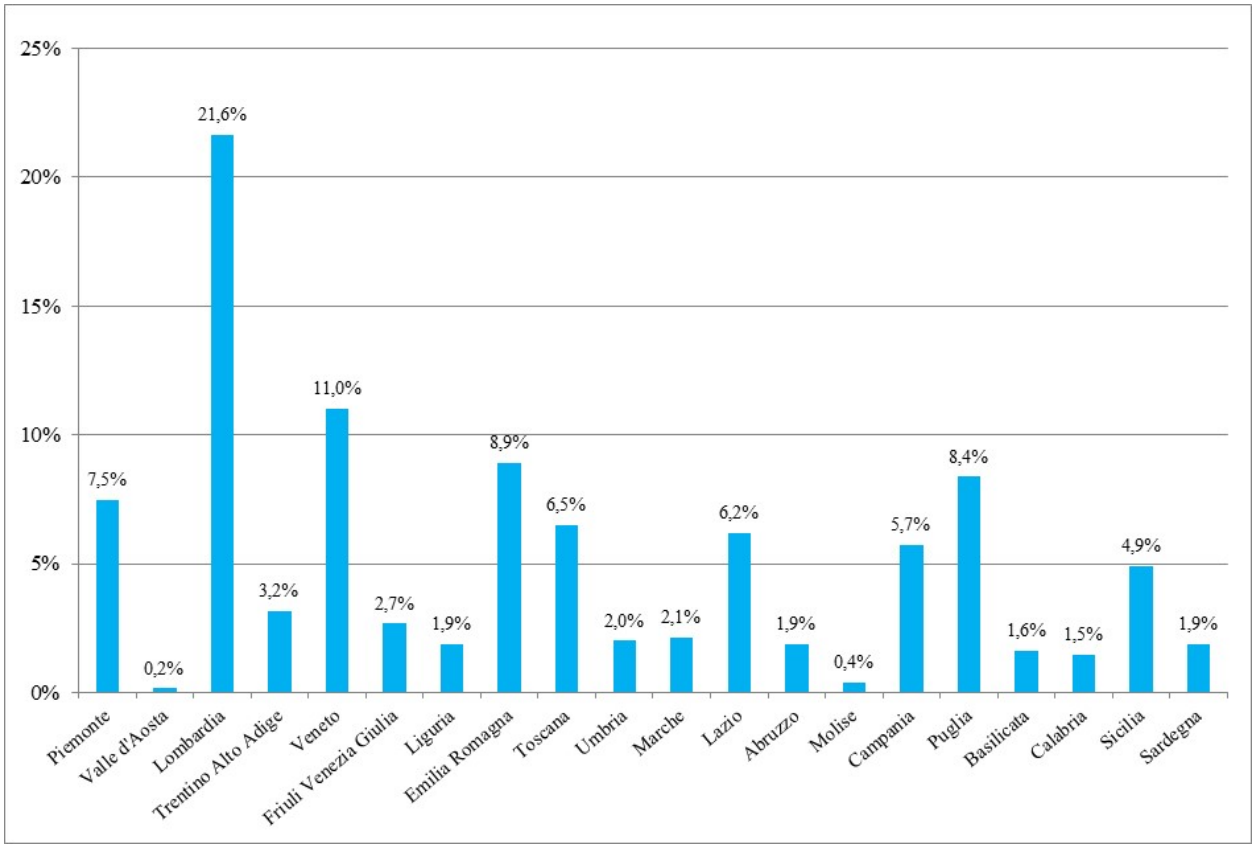
At regional level (Figures 1.6, 1.7, 1.8), Lombardia produces 38% of the total waste generated in northern Italy with 31,8 million tonnes, followed by Veneto with 16,2 million tonnes (19,4%), Emilia-Romagna with almost 13,1 million tonnes (15,6%) and Piemonte with almost 11 million tonnes (13,2%).
Among the regions of central Italy, Toscana with almost 9,5 million tonnes (38,5%), and Lazio with about 9,1 million tonnes (36,8%) have the highest amounts of waste generated in the macro-area.
In southern Italy, Puglia with an overall production of EAW of almost 12,3 million tonnes, represents 31,9% of the total of the macro-area, followed by Campania with 8,4 million tonnes (21,8%) and Sicilia (7,2 million tonnes, 18,7%).

Figure 1.6 – Total generation of waste from economic activities at regional level, years 2019 – 2020



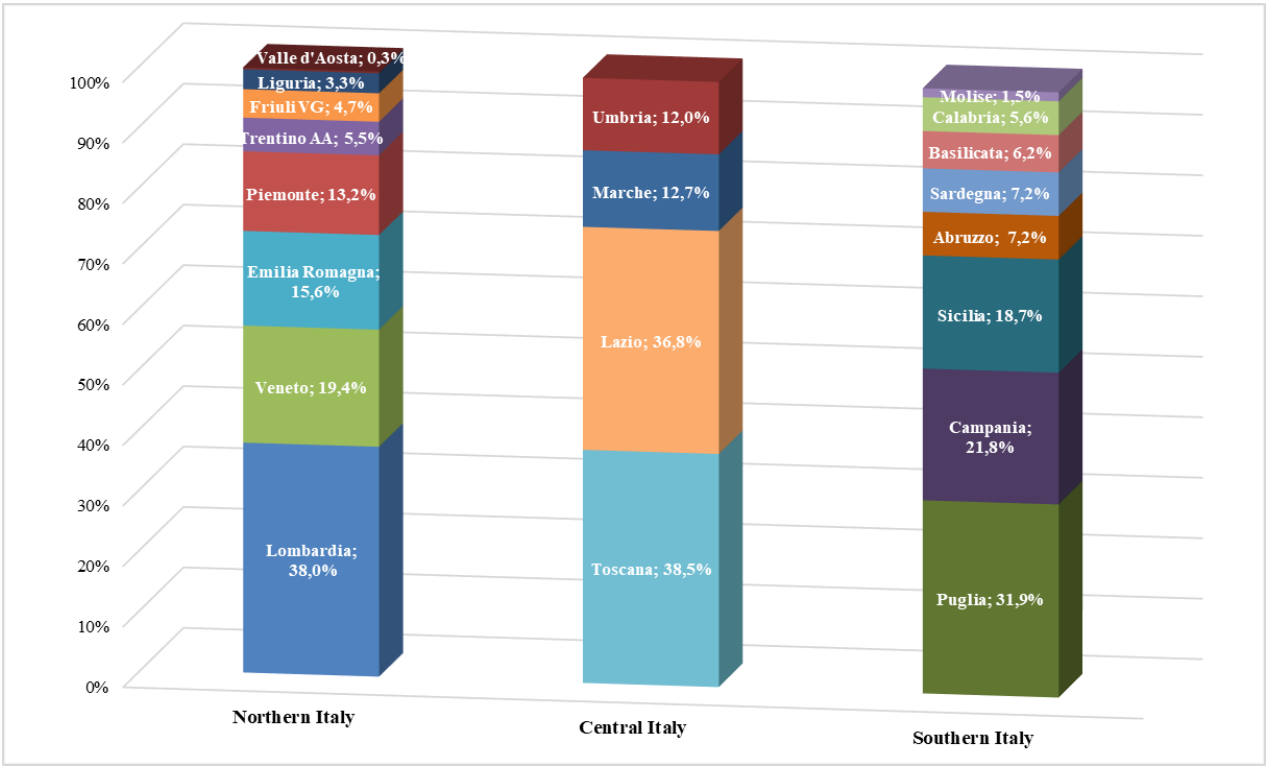
Source: ISPRA

Figure 1.7 – Incidence rates of regional waste generation related to total national value, year 2020



Source: ISPRA

Figure 1.8 – Incidence rates of regional waste generation related to total macro-area value, year 2020



Source: ISPRA

2. MANAGEMENT OF WASTE FROM ECONOMIC ACTIVITIES

The total amount of EAW managed in Italy (by recovery or disposal operations) is 159,8 million tonnes, of which 150,3 million tonnes (94,1% of the total) are non-hazardous and the remaining 9,4 million tonnes (5,9% of the total) are hazardous waste. This total amount includes 17,6 million tonnes of waste in storage at plants and producers at the date of 31/12/2020.
Compared to 2019, the total amount decreases by 2,9%; specifically, the quantities recovered *(R1 to R13)* decrease by 1,2%, while those sent for disposal *(D1 to D15)* by 9,8%.
In 2020, waste undergoing forms of recovery amounted to 131,3 million tonnes (82,1% of the total managed), while waste sent for disposal amounted to 28,5 million tonnes (17,9% of the total managed; Table 2.1).

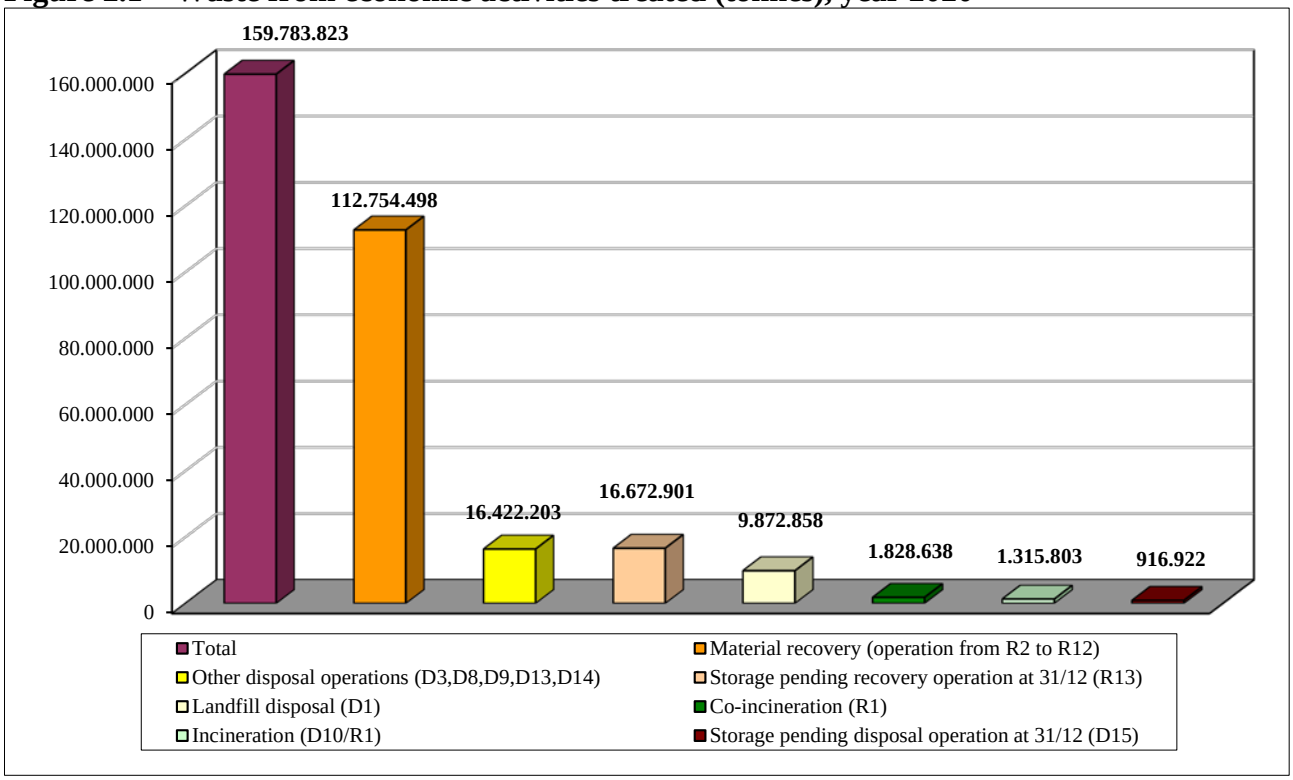
Table 2.1 - Management of hazardous and non-hazardous waste recovered and disposed of (tonnes), year 2020

	Waste recovered	Waste disposed of tonnes	Total waste treated	Variation % 2019-2020
NON-HAZARDOUS	126.830.694	23.514.194	150.344.888	-2,8%
HAZARDOUS	4.425.343	5.013.592	9.438.935	-3,7%
TOTAL	**131.256.037**	**28.527.786**	**159.783.823**	**-2,9%**

The main form of treatment is material recovery (operations *R2 to R12*) accounting for 70,6% of the total waste treated (112,8 million tonnes), followed by other disposal operations (*D3*, *D8*, *D9*, *D13*, *D14*) with 10,3% (16,4 million tonnes) and landfill disposal (*D1*) with 6,2% (9,9 million tonnes). Waste quantities sent for co-incineration[3] (*R1*; 1,8 million tonnes) and incineration (*D10/R1* 1,3 million tonnes) are marginal at 1,1% and 0,8% respectively (Figures 2.1 and 2.2).

[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.

Figure 2.1 – Waste from economic activities treated (tonnes), year 2020



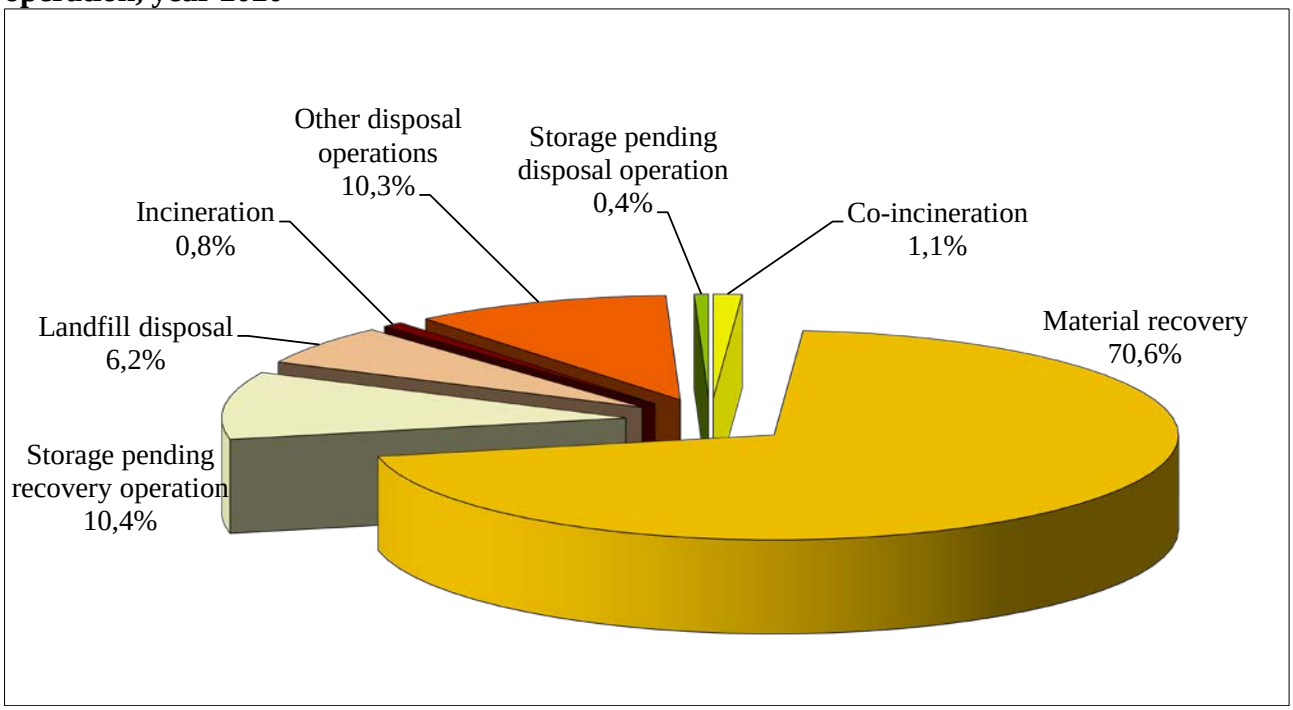
R1: Use principally as a fuel or other means to generate energy, **R2**: Solvent reclamation/regeneration, **R3**: Recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes), **R4**: Recycling/reclamation of metals and 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 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

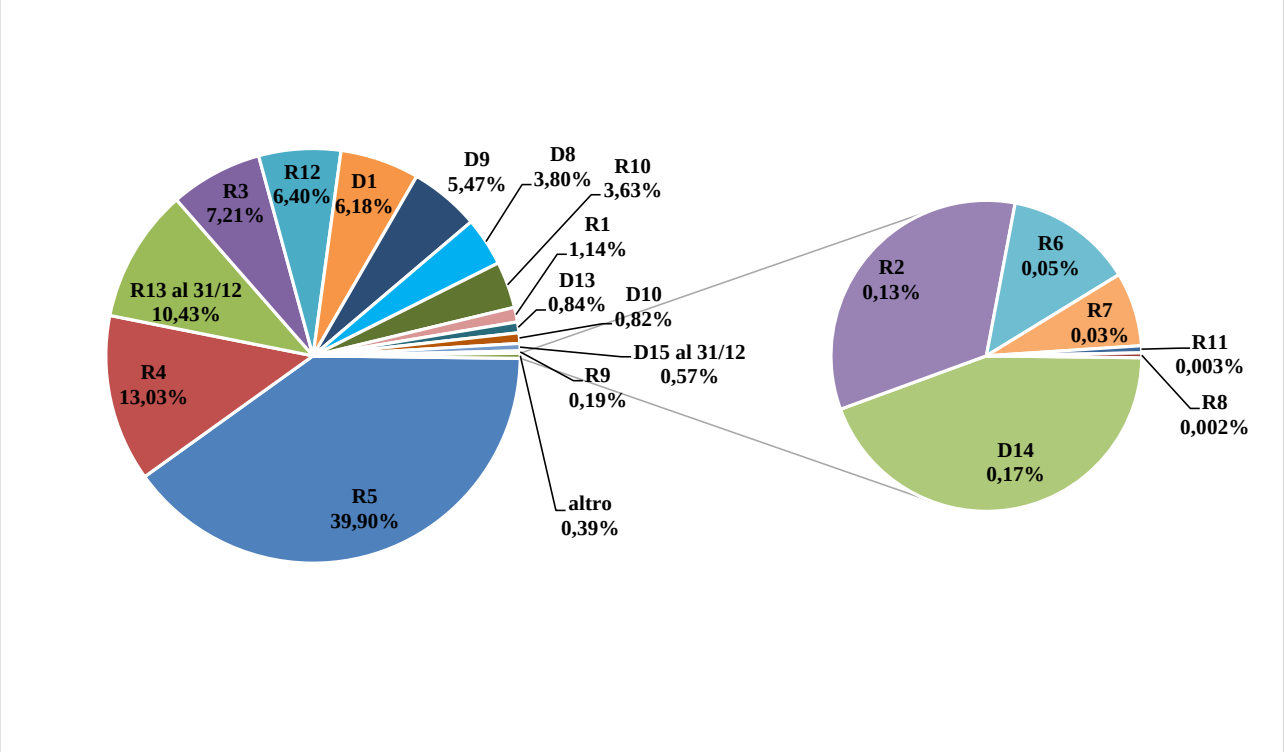
Figure 2.2 – Percentage distribution of waste from economic activities, by type of treatment operation, year 2020



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

Among the most used treatment operations are those aimed at waste recovery, especially the recycling/recovery of inorganic substances (*R5*) representing 39,9% (63,8 million tonnes) of the total waste treated. There is a decrease of 626 thousand tonnes (-1 %) compared to 2019. Wastes subjected to R5 operation are mostly those from C&D activities (LoW code 17; 55,4 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 2020



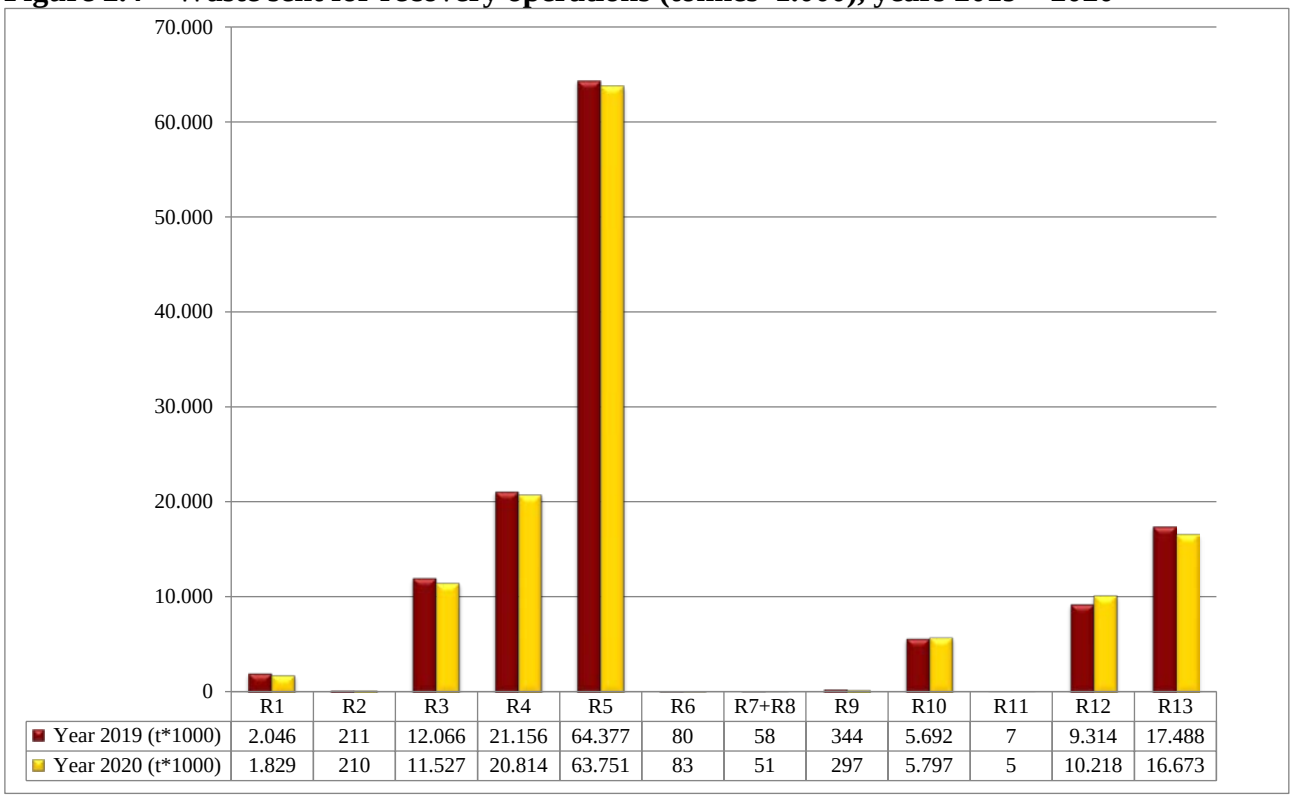
Source: ISPRA

The recovery of metals and metal compounds (*R4*) amounts to 20,8 million tonnes (13% of the total) and is mostly carried out in steel mills in northern Italy. This quantity decreases by 342 thousand tonnes (-1.6%) compared to 2019.
The recovery of organic substances (*R3*) represents 7,2% of the total (11,5 million tonnes) and mainly concerns, paper, cardboard and wood; registering a decrease, compared to 2019, of 539 thousand tonnes (-4,5%). Land treatment for the benefit of agriculture and ecology (*R10*), amounts to 5,8 million tonnes, with a slight increase (+1,8%).

Landfilling (*D1*) is the main form of disposal (6,2 % of the total managed) with 9,9 million tonnes, registering a reduction, compared to 2019, of 17,7% (2 million tonnes). Waste undergoing physical-chemical treatment (*D9*) accounts for 5,5% of the total (8,7 million tonnes); compared to 2019, the amount decreases by 1,2 million tonnes (-12,1%). The waste treated with D9 operations are predominantly aqueous liquid wastes (LoW 1610**) and landfill leachate (LoW 1907**).

The quantities of wastes sent for biological treatment (*D8*) are also significant, amounting to 3,8% of the total (6 million tonnes); compared to 2019, there is a decrease of 253 thousand tonnes (-4%). 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 2019 and 2020.

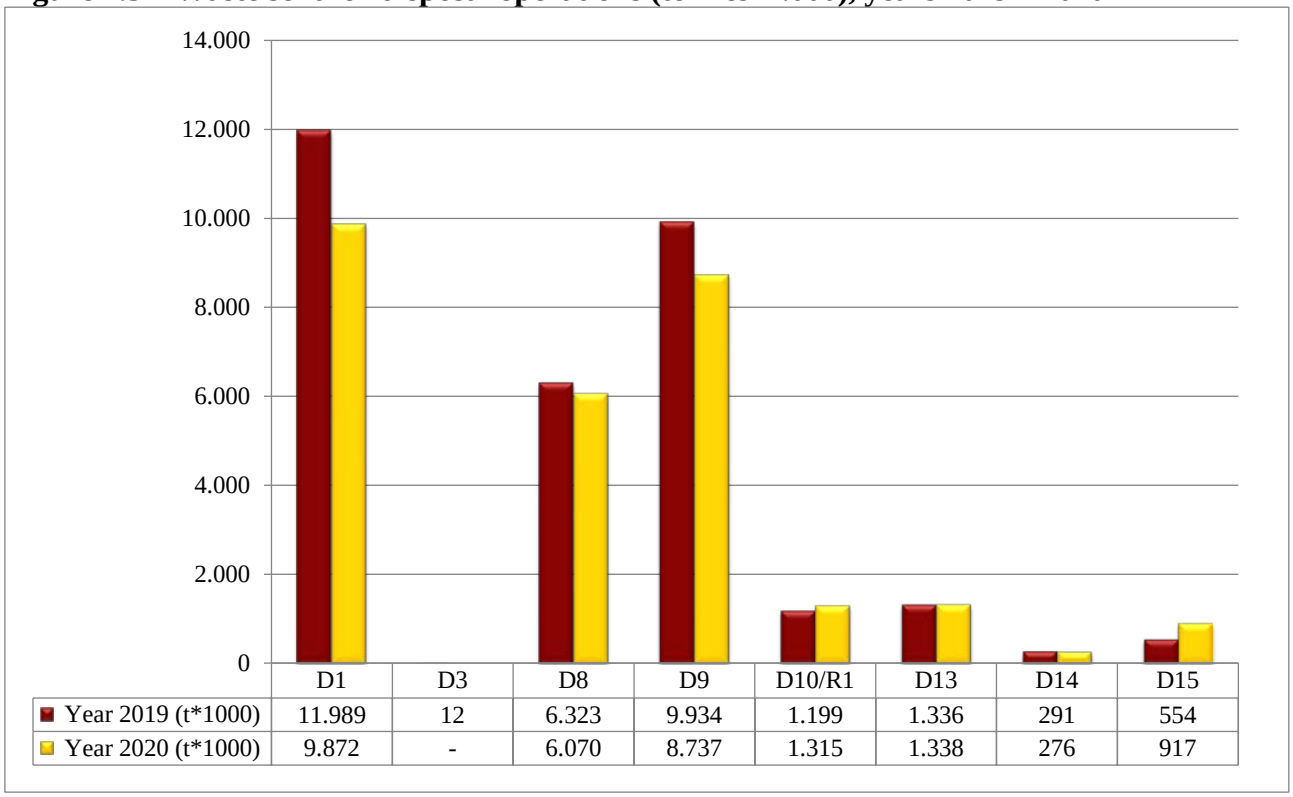
Figure 2.4 – Waste sent for recovery operations (tonnes*1.000), years 2019 – 2020



	R1	R2	R3	R4	R5	R6	R7+R8	R9	R10	R11	R12	R13
Year 2019 (t*1000)	2.046	211	12.066	21.156	64.377	80	58	344	5.692	7	9.314	17.488
Year 2020 (t*1000)	1.829	210	11.527	20.814	63.751	83	51	297	5.797	5	10.218	16.673

Source: ISPRA

Figure 2.5 – Waste sent for disposal operations (tonnes*1.000), years 2019 – 2020

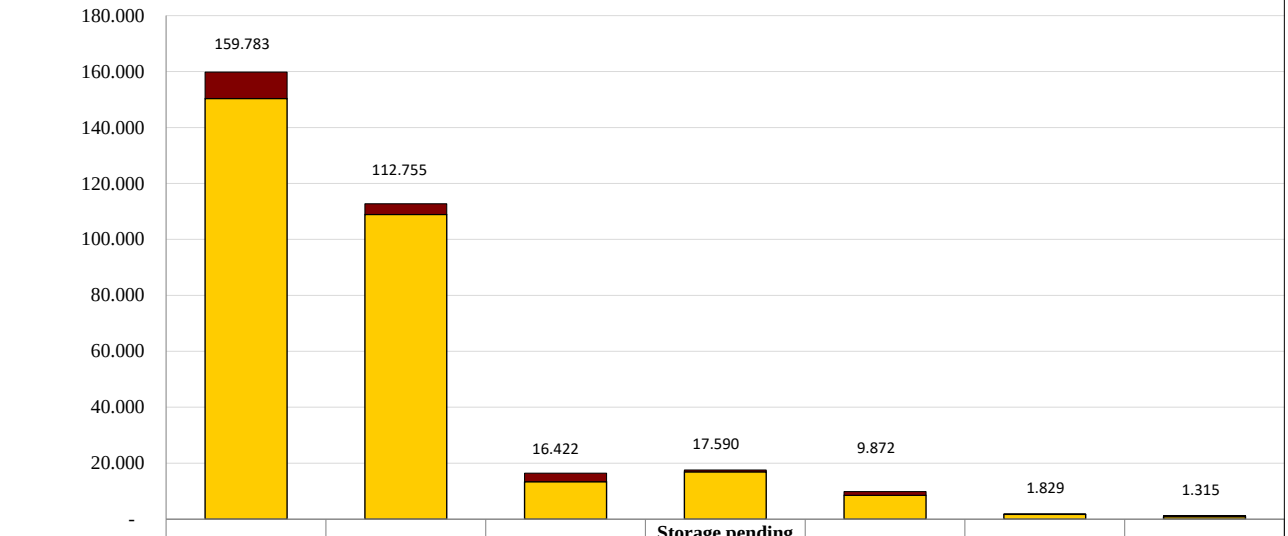


	D1	D3	D8	D9	D10/R1	D13	D14	D15
Year 2019 (t*1000)	11.989	12	6.323	9.934	1.199	1.336	291	554
Year 2020 (t*1000)	9.872	-	6.070	8.737	1.315	1.338	276	917

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 2020

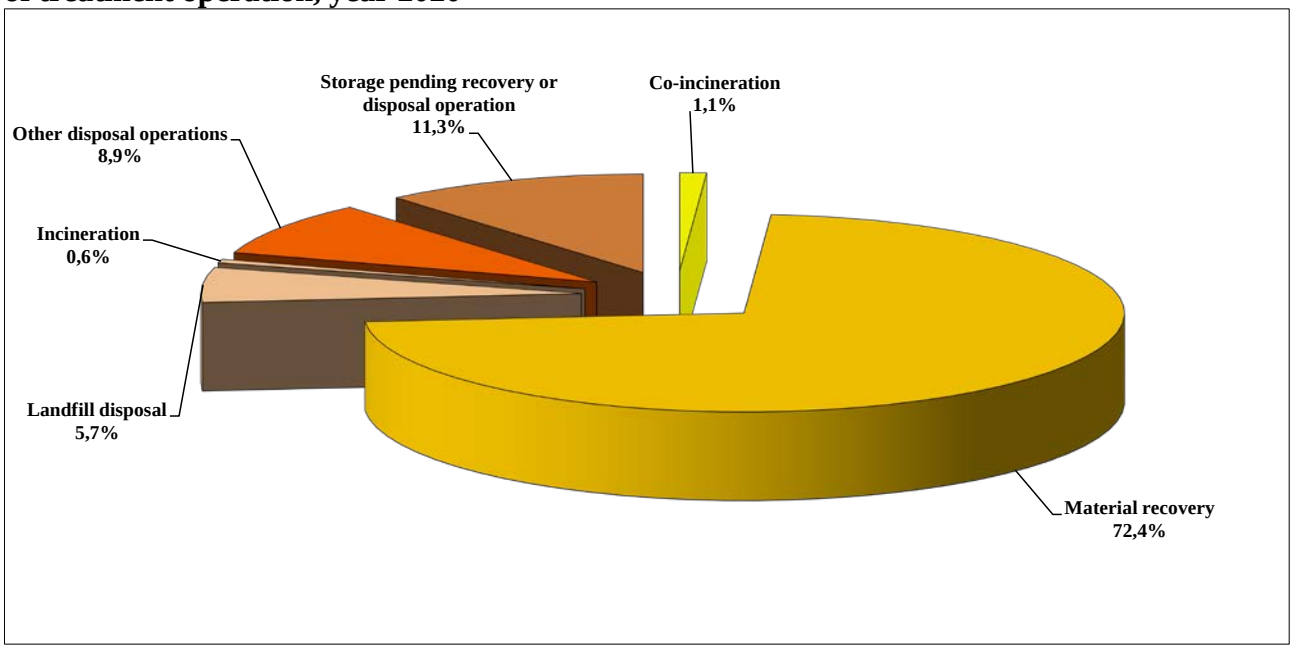


	Total	Material recovery (operation from R2 to R12)	Other disposal operations (D3,D8,D9,D13, D14)	Storage pending recovery or disposal operation (R13, D15)	Landfill (D1)	Co-incineration (R1)	Incineration (D10/R1)
Hazardous	9.439	3.872	3.066	657	1.315	113	416
Non hazardous	150.344	108.883	13.356	16.933	8.557	1.716	899

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 150,3 million tonnes, of which 126,8 million tonnes are sent for recovery operations (-1,1% compared to 2019), while 23,5 million tonnes are destined for disposal operations (-11,2% compared to 2019; Figure 2.7). Non-hazardous waste accounts for over 94% of the total waste managed, consequently the types of management correspond to those described for total waste management, confirming the prevalence of material recovery (72,4% of the total non-hazardous waste managed).
Construction and demolition waste accounts for the largest quantities recovered (Figure 2.9) while those most disposed of are waste from waste and wastewater treatment (Figure 2.10).

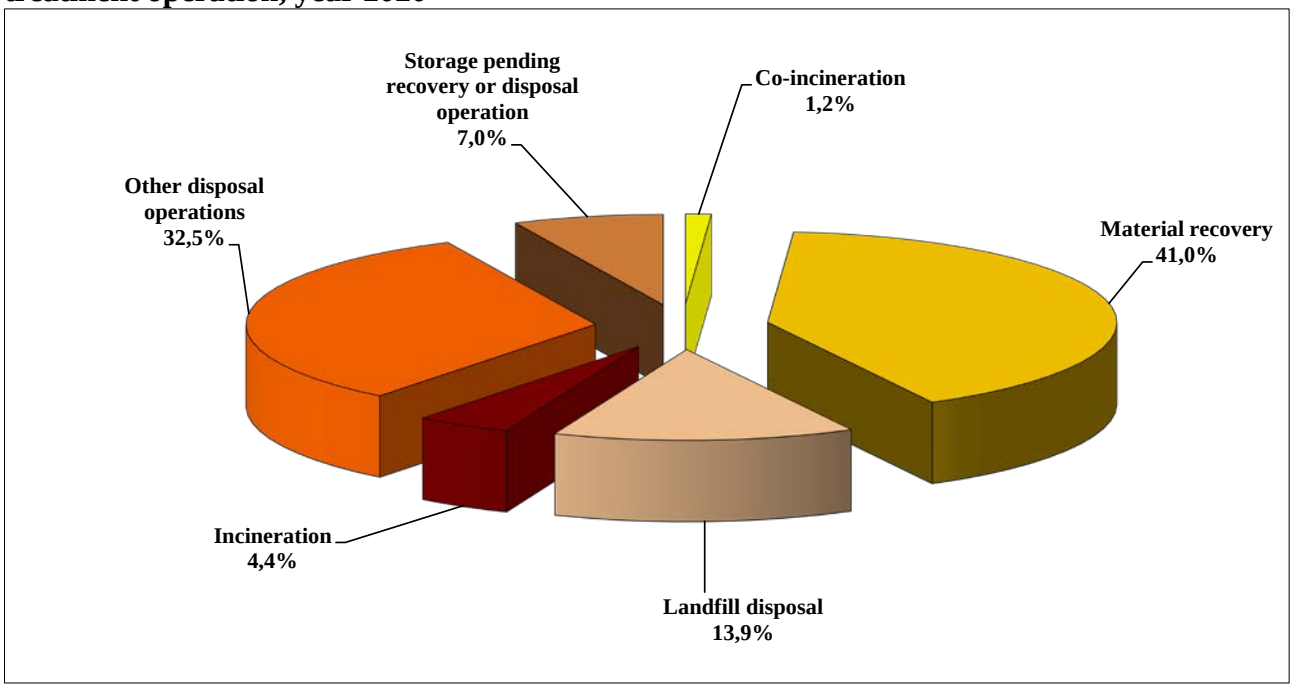
Figure 2.7 – Percentage distribution of non-hazardous waste from economic activities, by type of treatment operation, year 2020



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

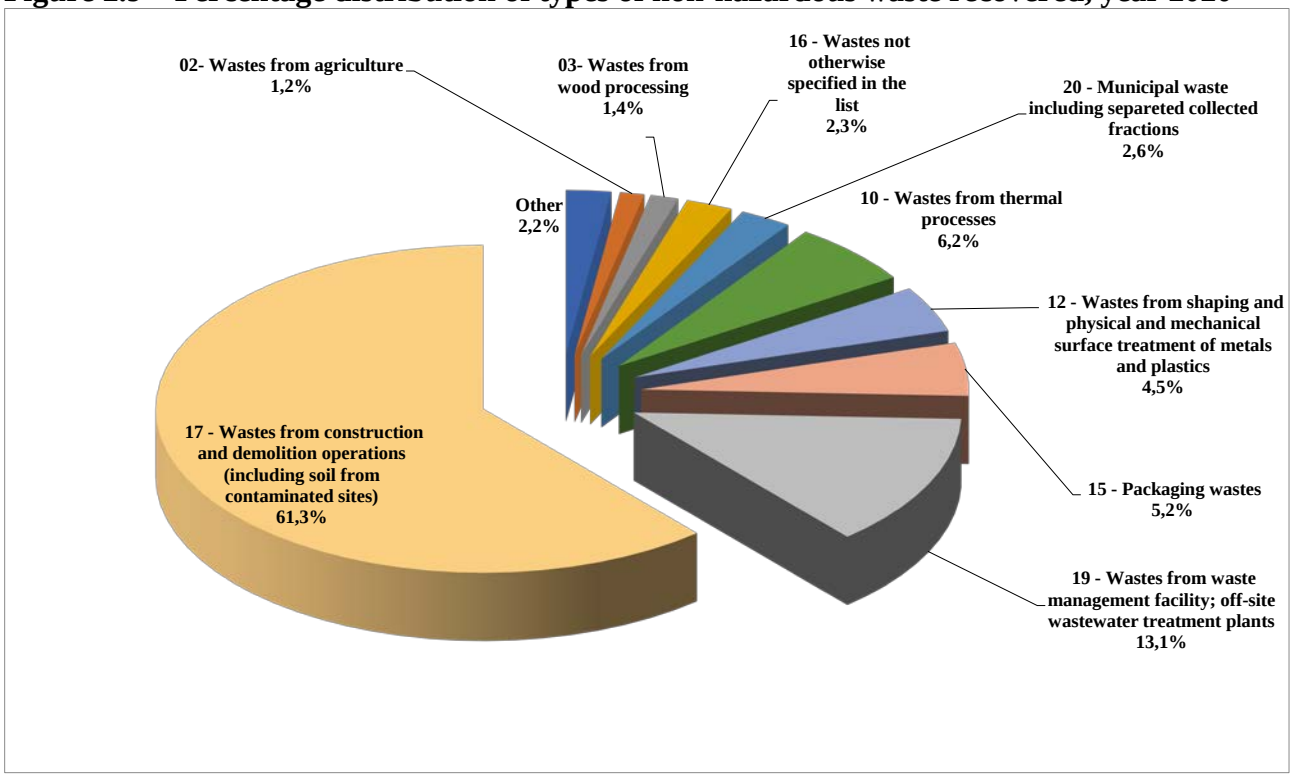
Hazardous waste treated were 9,4 million tonnes, of which 3,9 million tonnes are sent for material recovery (41% of the total hazardous waste treated). Recycling/recovery of metals or metal compounds (*R4*) amounts to 1,5 million tonnes, and waste treated with *R12* operations are 1,3 million tonnes. Overall, the quantities managed in *R4* and *R12* also include 1,3 million tonnes of end-of-life vehicles, corresponding to 47% of the total hazardous waste managed (Figure 2.12).
Intermediate disposal operations (*D8, D9, D13, D14*) involved 3 million tonnes of hazardous waste, among these, chemical-physical treatment (*D9*) is the most common operation with 2,1 million tonnes. Landfilling (*D1*), with about 1,3 million tonnes, increase by 4,4% (+55 thousand tonnes; Figure 2.8 and Figure 2.13). Figure 2.14 shows the forms of hazardous waste management. While hazardous construction and demolition waste is predominantly sent to landfill, waste not otherwise specified in Chapter 16 of the European LoW (including end-of-life vehicles) are mainly recovered.

Figure 2.8 – Percentage distribution of hazardous waste from economic activities, by type of treatment operation, year 2020



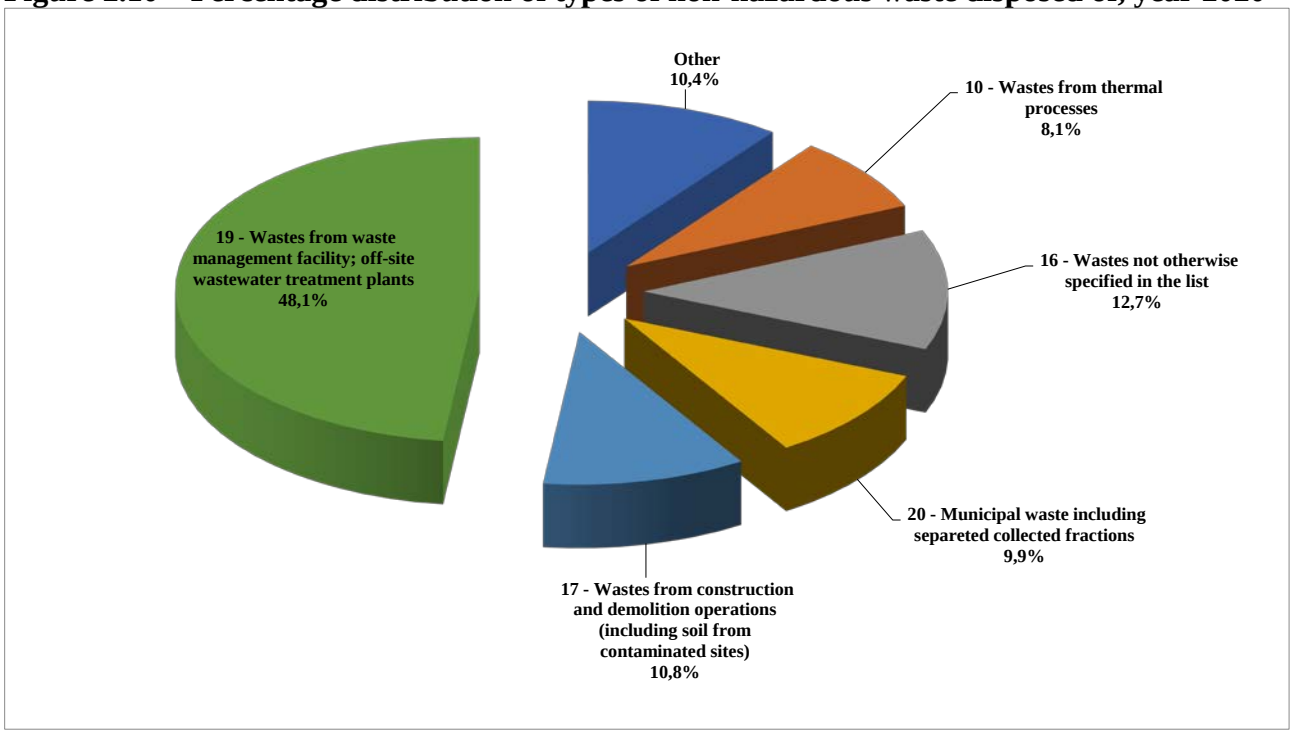
Note: Incineration includes quantities of waste treated in incineration plants with energy recovery dedicated, predominantly, to the treatment of municipal waste and classified R1 according to Annex II of Directive 2008/98/EC.
Source: ISPRA

Figure 2.9 – Percentage distribution of types of non-hazardous waste recovered, year 2020



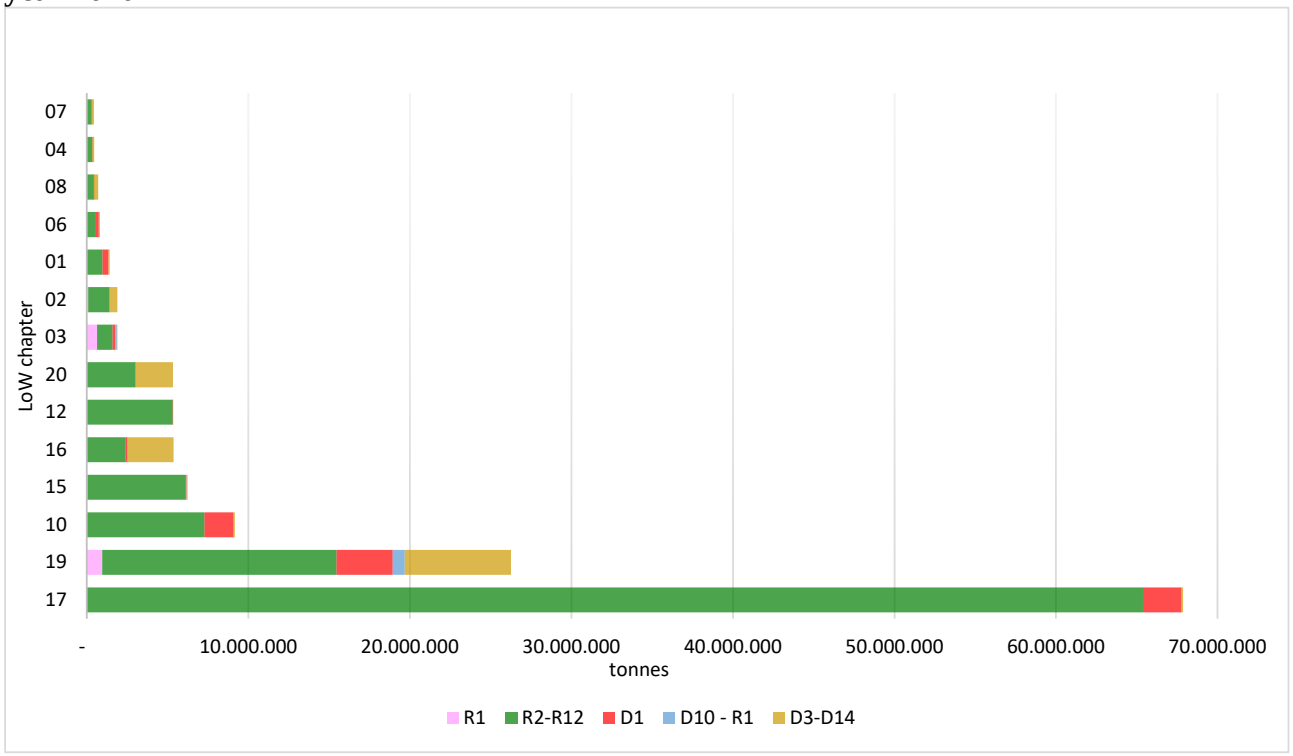
Source: ISPRA

Figure 2.10 – Percentage distribution of types of non-hazardous waste disposed of, year 2020



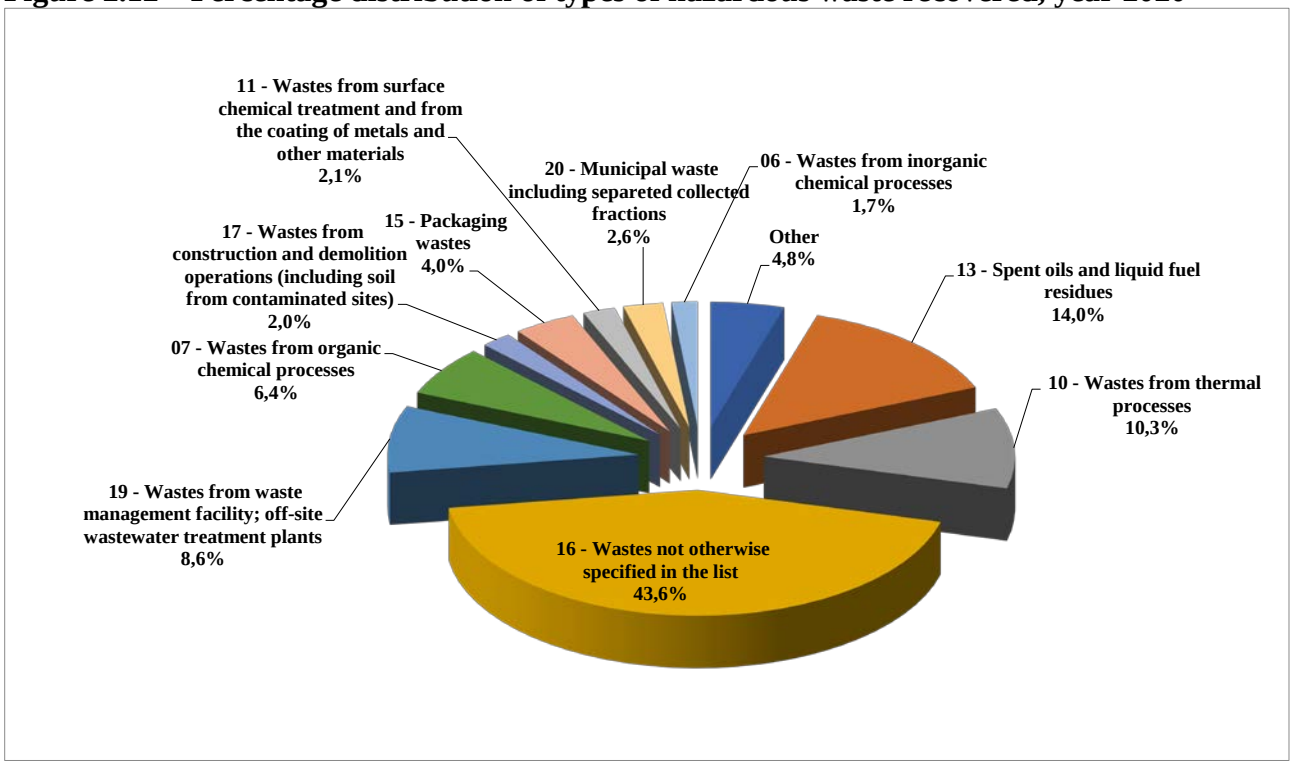
Source: ISPRA

Figure 2.11– Non-hazardous waste management methods according to the main LoW chapters, year 2020



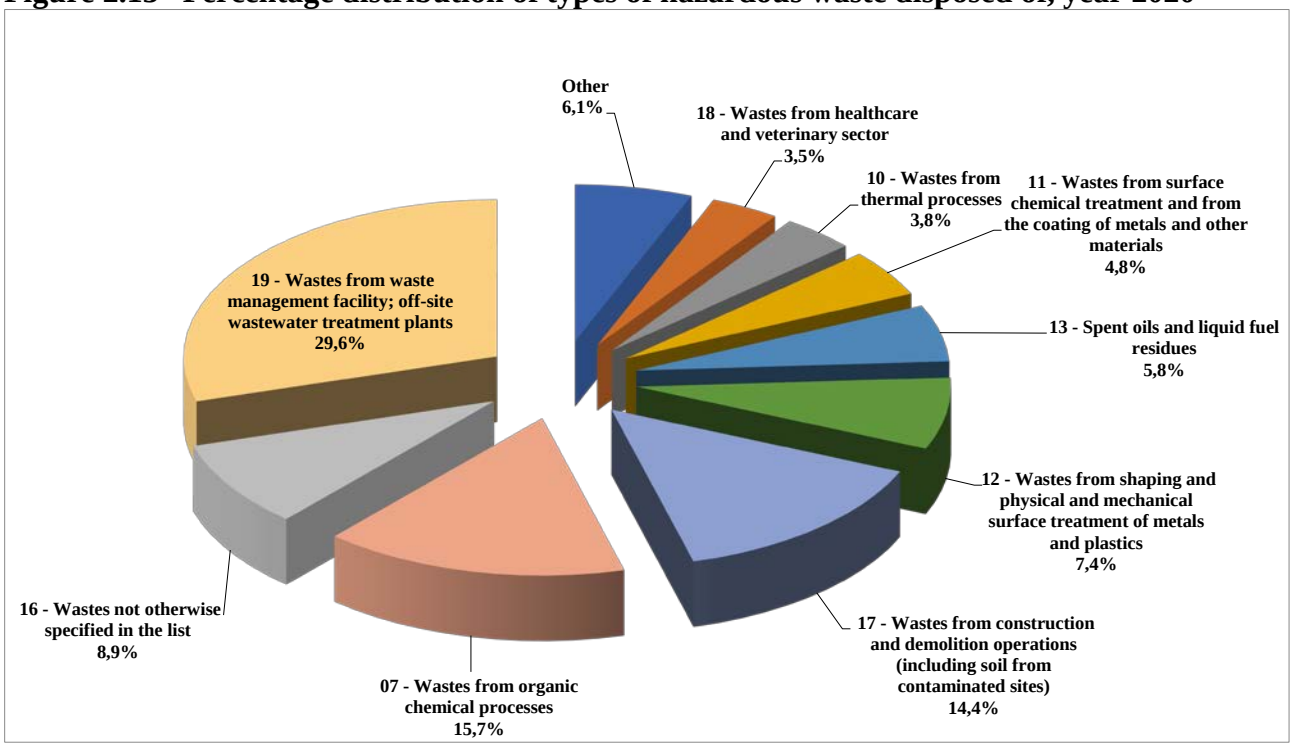
Source: ISPRA

Figure 2.12 – Percentage distribution of types of hazardous waste recovered, year 2020



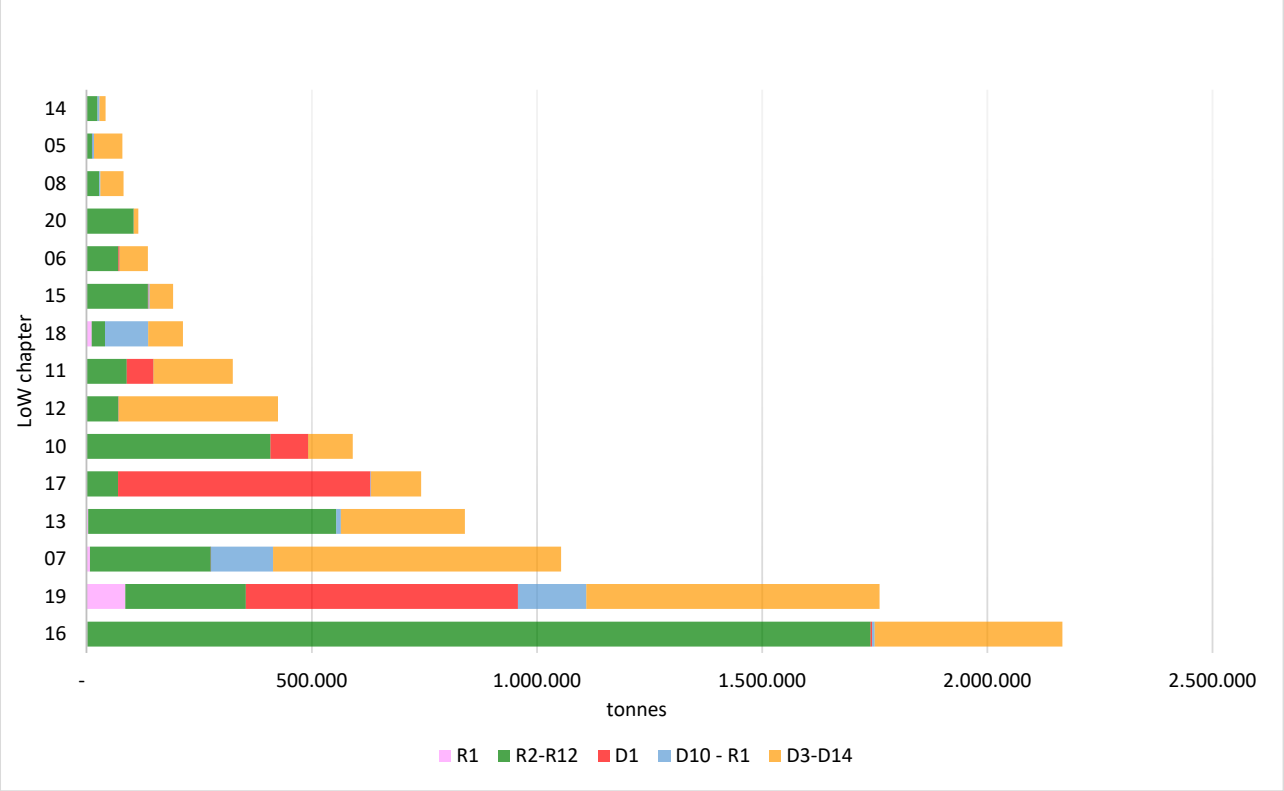
Source: ISPRA

Figure 2.13– Percentage distribution of types of hazardous waste disposed of, year 2020



Source: ISPRA

Figure 2.14 –Hazardous waste management methods according to the main LoW chapters, year 2020



Source: ISPRA

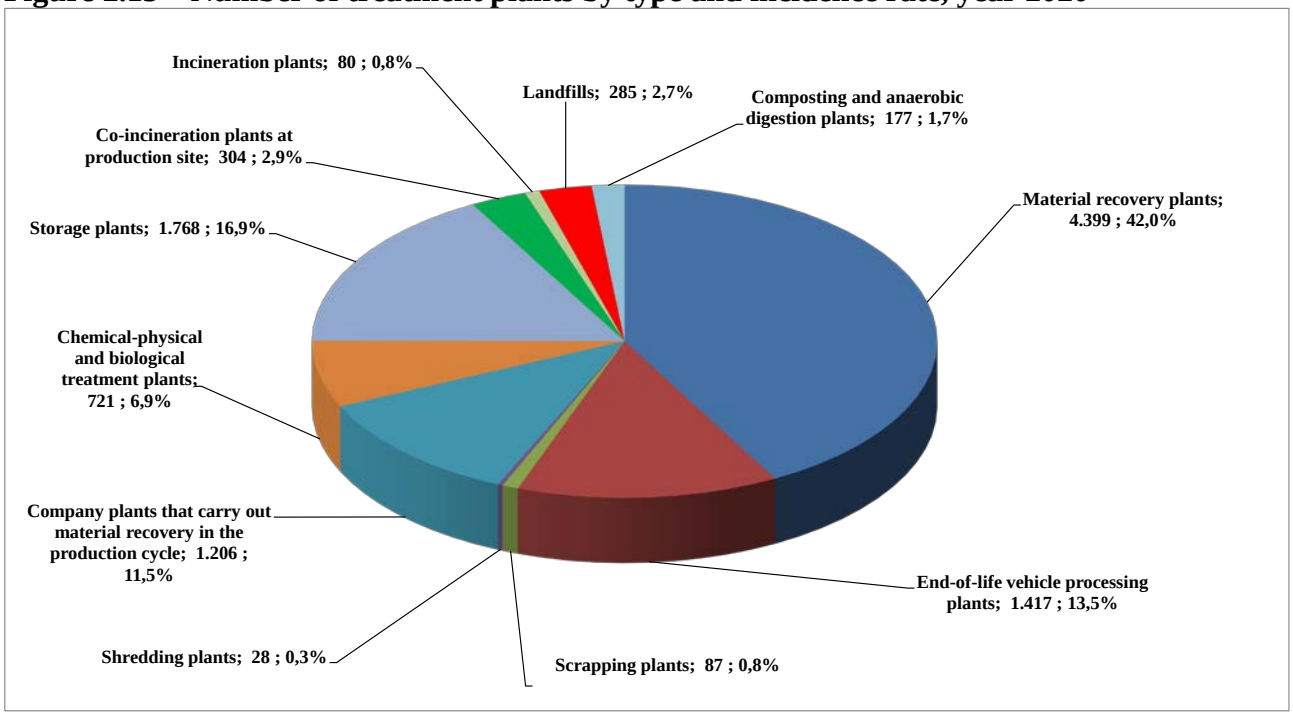
Table 2.1 and Figure 2.15 show the number of treatment plants by type and the incidence rate on the total national plants.
Material recovery plants, amounting to 4.399, represent 42% of the total. Plants exclusively dedicated to the storage of waste before recovery/disposal operations, are 1.768 (16,9% of the total); end-of-life vehicle processing plants represent 13,5% of the total, (1.417 plants); industrial plants that perform material recovery within their production cycle, amounting to 1.206, represent 11,5%of the total.

Table 2.1 – Number of plants grouped by type and by macro area, year 2020

Type of plant	Northern Italy	Central Italy	Southern Italy	Italy
Material recovery plants	2.501	736	1.162	4.399
End-of-life vehicle processing plants	626	212	579	1.417
Scrapping plants	47	29	11	87
Shredding plants	16	7	5	28
Industry plants that carry out material recovery in their production cycle	744	212	250	1.206
Chemical-physical and biological treatment and reconditioning plants	406	198	117	721
Storage plants	1.035	312	421	1.768
Co-incineration plants at production sites	199	64	41	304
Incineration plants	47	7	26	80
Landfill	157	46	82	285
Composting and anaerobic digestion plants *	110	27	40	177
Total	**5.888**	**1.850**	**2.734**	**10.472**

* 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 2.15 – Number of treatment plants by type and incidence rate, year 2020



Source: ISPRA

2.1 Co-incineration of waste from economic activities

In Italy, there are 305 production plants that co-incinerate wastes, of which 254 process more than 100 tonnes/year of waste, the remaining 51 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 1,8 million tonnes and shows a decrease of 218 thousand tonnes compared to the year 2019 (-10,6%), attributable to the shutdown of production activities due to the Covid-19 health crisis.
The largest quantity of hazardous waste is recovered in northern Italy (73% of the total), followed by southern (14%) and central Italy (13%). As for the regions with the largest quantities, in Lombardia about 501 thousand tonnes of hazardous waste (27,4% of the total) were co-incinerated, followed by Emilia-Romagna with over 322 thousand tonnes (17,6%), Veneto with over 209 thousand tonnes (11,5%), Umbria with 160 thousand tonnes (8,7%), Friuli-Venezia Giulia with almost 150 thousand tonnes (8,2%), Piemonte with 89 thousand tonnes (4,9%) and Puglia with 87 thousand tonnes (4,7%) (Table 2.1.1).

Table 2.1.1 - Waste from economic activities co-incinerated (tonnes), year 2020

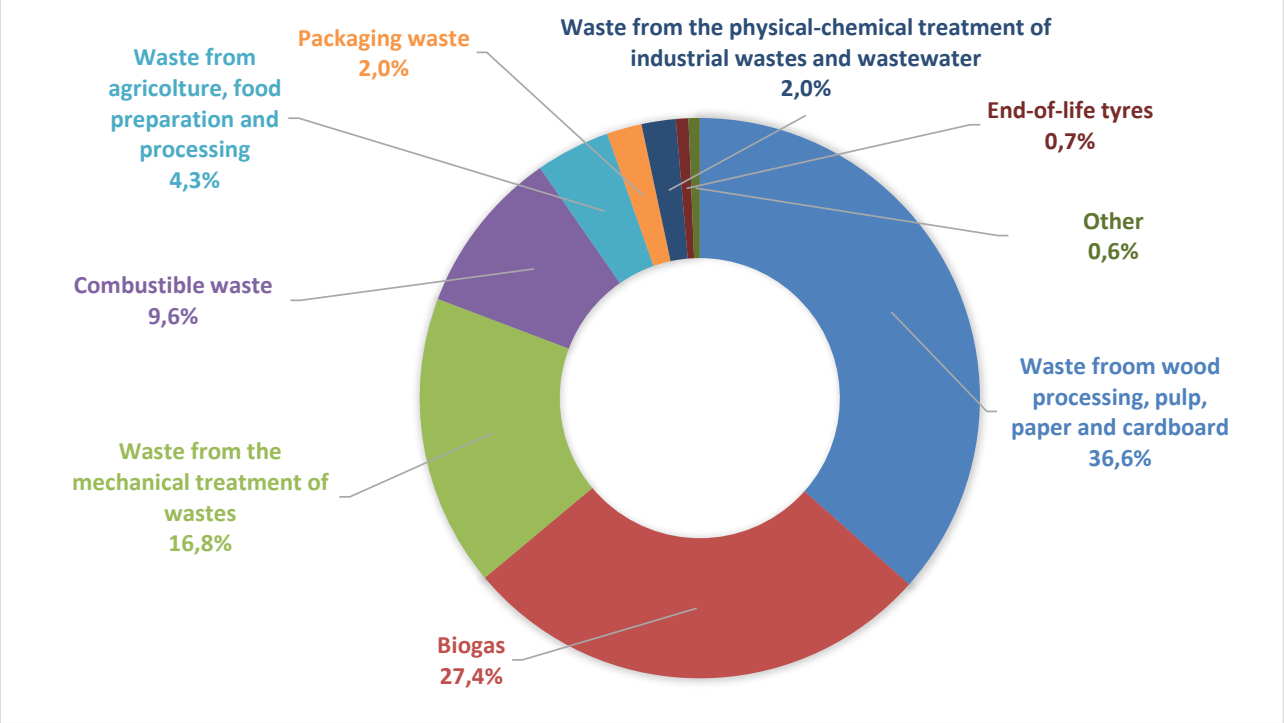
Region	N. of plants	Hazardous waste	Non-hazardous waste	Total waste	(%) on total of co-incinerated wastes
Piemonte	35	7.113	82.056	89.169	4,9
Lombardia	57	13.872	487.400	501.272	27,4
Trentino-Alto Adige	5	0	27.973	27.973	1,5
Veneto	43	0	209.409	209.409	11,5
Friuli-Venezia Giulia	17	21.215	128.374	149.589	8,2
Liguria	3	0	34.930	34.930	1,9
Emilia-Romagna	39	38.826	283.361	322.187	17,6
Northern Italy	**199**	**81.026**	**1.253.503**	**1.334.529**	**73**
Toscana	16	0	30.237	30.237	1,7
Umbria	13	**0**	159.675	159.675	8,7
Marche	28	0	32.562	32.562	1,8
Lazio	8	0	15.413	15.413	0,8
Central Italy	**65**	**0**	**237.887**	**237.887**	**13**
Abruzzo	2	0	708	708	0
Molise	4	0	17.854	17.854	1
Campania	3	0	5.718	5.718	0,3
Puglia	16	0	86.583	86.583	4,7
Basilicata	2	0	30.907	30.907	1,7
Calabria	5	24.830	21.509	46.339	2,5
Sicilia	6	2.984	56.777	59.761	3,3
Sardegna	3	3.694	4.658	8.352	0,5
Southern Italy	**41**	**31.508**	**224.714**	**256.222**	**14**
TOTAL	**305**	**112.534**	**1.716.104**	**1.828.638**	**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 (LoW 03**), with almost 628 thousand tonnes (36,6%), biogas (LoW 190699), with over 469 thousand tonnes (27,4%) and wastes from mechanical treatment of waste (LoW 1912**), with near 289 thousand tonnes (16,8%).
The largest amount of co-incinerated hazardous waste (Figure 2.1.2) comes from the following types of waste: wastes from physical/chemical treatments of waste (LoW 1902**) and wastes from

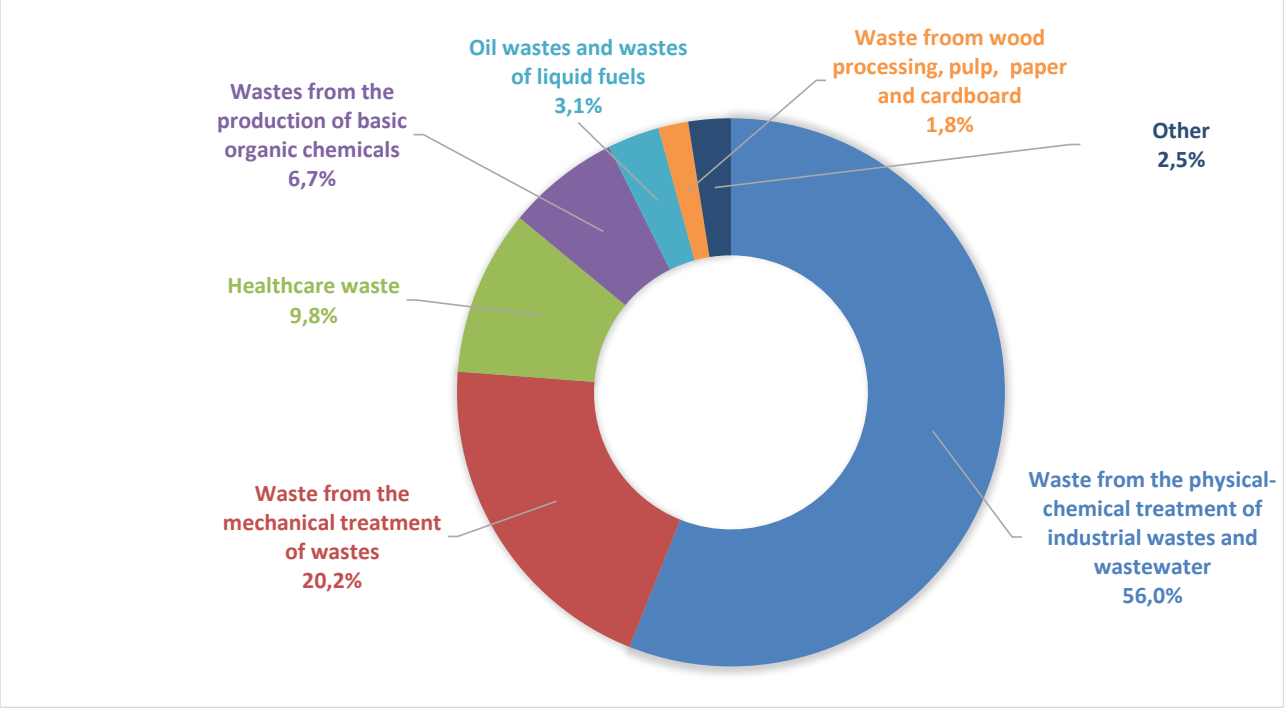
wastewater treatment plants (LoW 1908**), with almost 63 thousand tonnes (56%), waste from the mechanical treatment of waste (LoW 1912**), with about 23 thousand tonnes (20,2%).

Figure 2.1.1 - Percentage distribution of types of non-hazardous waste sent for co-incineration, year 2020



Source: ISPRA

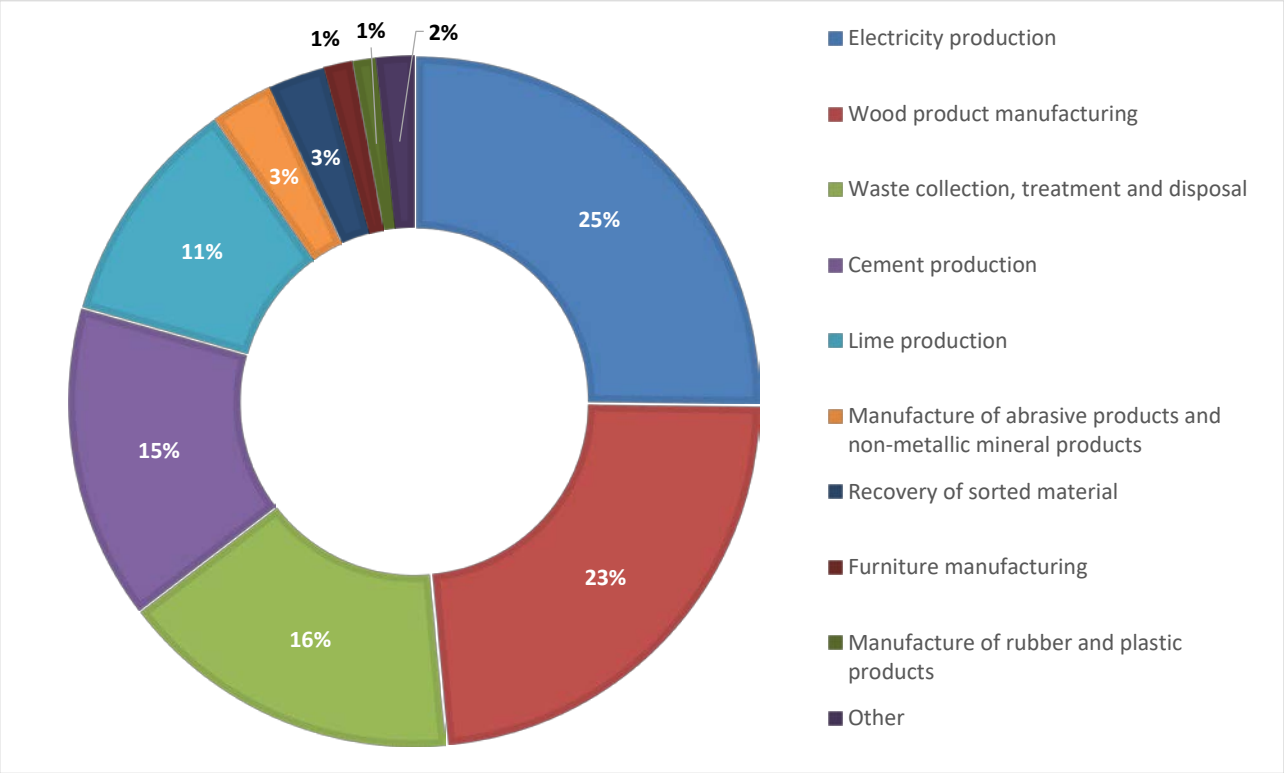
Figure 2.1.2 - Percentage distribution of types of hazardous waste sent for co-incineration, year 2020



Source: ISPRA

The industrial sectors that in 2020 used the largest quantities of waste as a substitute for conventional fuels were: the electricity production sector ($NACE_{REV.2}$ Sector D.35), with almost 461 thousand tonnes (25,2%), followed by the wood products manufacturing sector ($NACE_{REV.2}$ Sector C.16), with 427 thousand tonnes (23,3%), the waste collection, treatment and disposal sector with ($NACE_{REV.2}$ Section E.38) over 294 thousand tonnes (16,1%), the cement production sector ($NACE_{REV.2}$ Sector C.23.51), with 270 thousand tonnes (14,8%), and the lime production sector ($NACE_{REV.2}$ Sector C.23.52) with about 197 thousand tonnes (10,8%; Figure 2.1.3).

Figure 2.1.3 – Percentage distribution of co-incinerated waste, by industrial sector, (tonnes) anno 2020



Source: ISPRA

2.2 Incineration of waste from economic activities

In 2020 approximately 1,3 million tonnes of EAW were incinerated, of which 899 thousand tonnes (68,4% of the total) were non-hazardous and 416 thousand tonnes (31,6% of the total) were hazardous. These quantities are treated both in incineration plants dedicated to EAW and plants dedicated, for the most part, to the treatment of municipal waste and authorised by the competent authorities as disposal plants (*D10*) and/or as energy recovery plants (*R1*) (pursuant Note 4 of Annex C of Legislative Decree 152/06). Specifically, 812 thousand tonnes were incinerated with the *R1* recovery operation and almost 507 thousand tonnes with *D10* operation.
Compared to 2019, there was an increase of 9,7% in the amount of EAW incinerated, equal to 117 thousand tonnes.
There are 80 operative incineration plants treating EAW, 47 are located in northern Italy, 7 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 the North (87,4% of the total with almost 1,1 million tonnes), then the South with 11,6% (152 thousand tonnes) and Centre with 1% (14 thousand tonnes).

Table 2.2.1 - Number of plants and amount of waste from economic activities incinerated (tonnes), year 2020

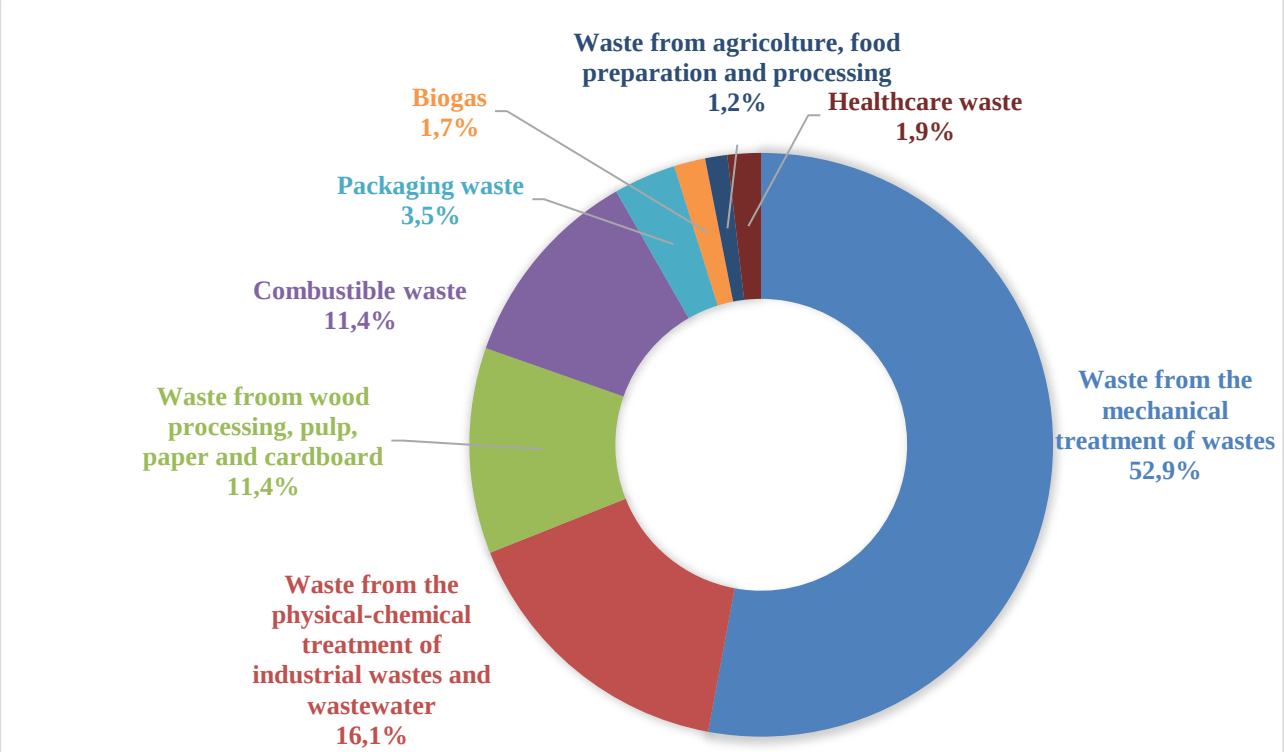
Region	Number of Plants	Hazardous waste	Non-hazardous waste	Total	% on total of wastes incinerated
Piemonte	3	1.441	58.288	59.729	4,5
Lombardia	25	173.591	521.701	695.292	52,8
Trentino-Alto Adige	2	0	30.532	30.532	2,3
Veneto	5	45.678	14.372	60.050	4,6
Friuli-Venezia Giulia	2	0	48.639	48.639	3,7
Emilia-Romagna	10	77.599	177.973	255.572	19,4
Northern Italy	**47**	**298.309**	**851.505**	**1.149.814**	**87,4**
Toscana	6	4.717	6.422	11.139	0,8
Lazio	1	2.624	0	2.624	0,2
Central Italy	**7**	**7.341**	**6.422**	**13.763**	**1**
Abruzzo	3	17.706	162	17.868	1,4
Molise	3	4.627	3.106	7.733	0,6
Campania	2	14.832	68	14.900	1,1
Puglia	8	6.316	8.130	14.446	1,1
Basilicata	1	24.514	18.514	43.028	3,3
Calabria	3	2.793	4.858	7.651	0,6
Sicilia	4	34.712	3.130	37.842	2,9
Sardegna	2	5.287	3.471	8.758	0,7
Southern Italy	**26**	**110.787**	**41.439**	**152.226**	**11,6**
TOTAL	**80**	**416.437**	**899.366**	**1.315.803**	**100**

Source: ISPRA

The largest quantity of non-hazardous waste incinerated (Figure 2.2.1) are: wastes from the mechanical treatment of waste (LoW 1912**), with a quantity of almost 476 thousand tonnes (52,9%), wastes from physical/chemical treatments of waste (LoW 1902**) and wastes from wastewater treatment plants (LoW 1908**), with over 144 thousand tonnes (16,1%), waste from wood processing, paper and related products (LoW 03**) with almost 103 thousand tonnes (11,4%) and combustible waste (LoW 191210) with over 102 thousand tonnes (11,4%).
As for hazardous waste, incineration mainly concerns wastes from physical/chemical treatments of waste (LoW 1902**) and wastes from wastewater treatment plants (LoW 1908**) with 104 thousand tonnes (25%), wastes from the production of basic organic chemicals (LoW 07**) with almost 102 thousand tonnes (24,4%), wastes from the healthcare sector (LoW 18**) with 95 thousand tonnes

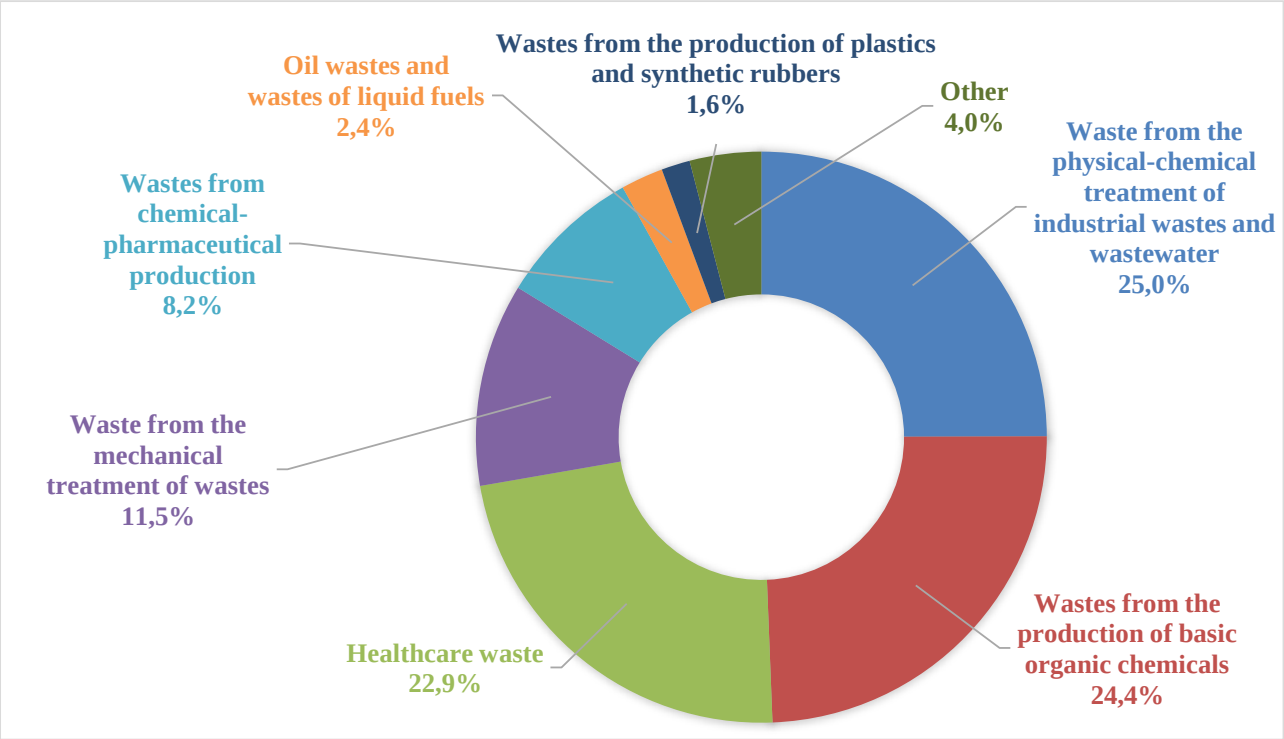
(22,9%) and wastes from the mechanical treatment of waste (LoW 1912**) with 48 thousand tonnes (11,5%) (Figure 2.2.2).

Figure 2.2.1 - Percentage distribution of types of non-hazardous waste sent for incineration, year 2020



Source: ISPRA

Figure 2.2.2 - Percentage distribution of types of hazardous waste sent for incineration, year 2020

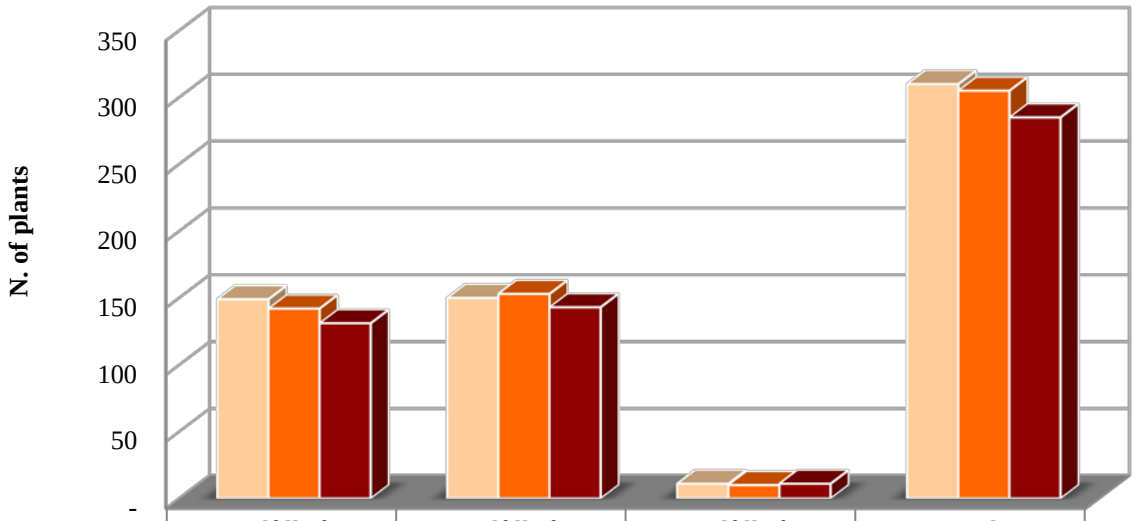


Source: ISPRA

2.3 Landfill disposal of waste from economic activities

The total number of operational landfills is 285; 131 are landfills for inert waste (46% of the total operating plants), 143 are landfills for non-hazardous waste (50% of the total), and 11 are landfills for hazardous waste (4% of the total).
The analysis of the three-year period 2018 - 2020 shows a progressive decrease in the total number of operational landfills from 310 in 2018, to 305 in 2019, to 285 in 2020 (Figure 2.3.1).

Figure 2.3.1 - Number of landfills for the disposal of waste from economic activities, divided by landfill categories, years 2018 - 2020



	Landfills for inert waste	Landfills for non-hazardous waste	Landfills for hazardous waste	Total
Year 2018	149	150	11	310
Year 2019	142	153	10	305
Year 2020	131	143	11	285

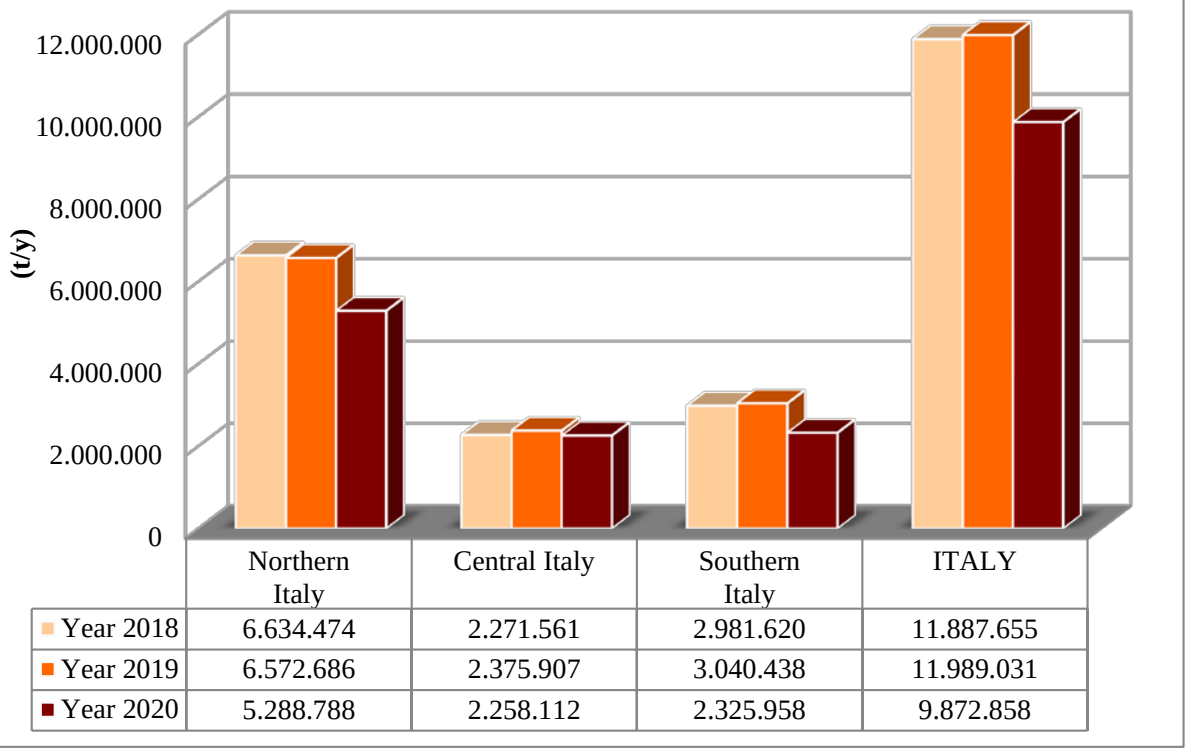
Source: ISPRA

Most of the landfills are in northern Italy where there are 157 plants; 46 landfills are in central Italy and 82 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 9,9 million tonnes, 6,2% of the quantity of EAW managed at national level (approximately 159,8 million tonnes). Compared to 2019, there is a decrease of 2 million tonnes (-17,7%).
The analysis of the amount of EAW disposed of in the different landfill categories, shows the following distribution: approximately 3,6 million tonnes are allocated in landfills for inert wastes (36,4% of total waste disposed of), 5,3 million tonnes in landfills for non-hazardous wastes (53,7%), and 975 thousand tonnes in landfills for hazardous waste (9,9%).

Landfill in northern Italy dispose of 53,6% of the total waste, near 5,3 million tonnes of waste with a decrease of about 1,3 million tonnes (-19,5%), compared to 2019. Landfill in central Italy dispose of 22,9% with a 5% decrease (-118 thousand tonnes); the amount of waste landfilled went, in fact, from 2,4 million tonnes in 2019 to about 2,3 million tonnes in 2020. In southern Italy, 23,5% of the national total is disposed of, with a decrease of 23,5% (-714 thousand tonnes), (Figure 2.3.2).

Figure 2.3.2 - Disposal in landfills of waste from economic activities, by geographical macro-area (tonnes), years 2018 - 2020



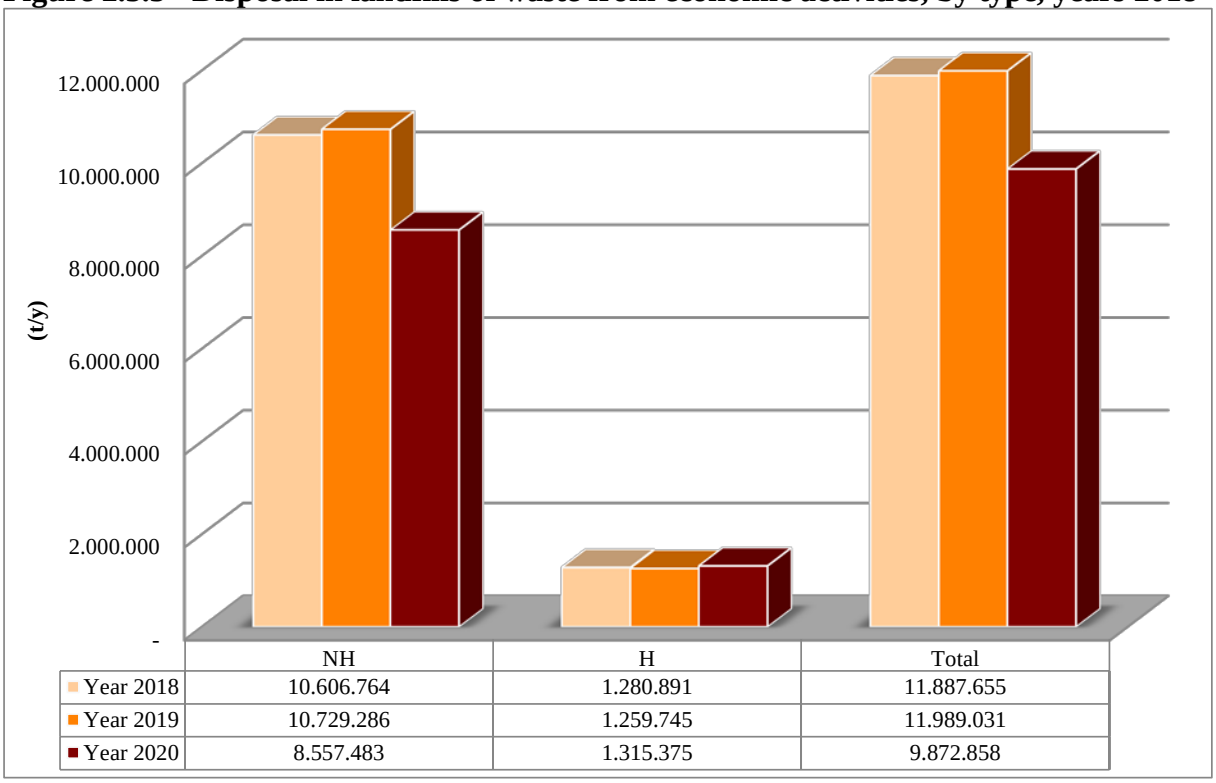
	Northern Italy	Central Italy	Southern Italy	ITALY
Year 2018	6.634.474	2.271.561	2.981.620	11.887.655
Year 2019	6.572.686	2.375.907	3.040.438	11.989.031
Year 2020	5.288.788	2.258.112	2.325.958	9.872.858

Source: ISPRA

The amount of non-hazardous waste disposed of in landfills is 8,6 million tonnes representing 86,7% of the total waste disposed of at national level; over 1,3 million tonnes are, instead, hazardous waste (13,3% of the total, Figure 2.3.3). Non-hazardous waste disposed of in landfills decreased by approximately 2,2 million tonnes (- 20,2%), from 10,7 million tonnes in 2019 to 8,6 million tonnes in 2020. In the same period hazardous waste increase of near 56 thousand tonnes (+4,4%).

The region where the largest quantities of waste are disposed of is Lombardia (2,5 million tonnes equal to 47,4% of northern Italy and 25,4% of the national total), followed by Sardegna (1 million tonnes, 43,5% of the southern Italy and 10,3% of the national total), Veneto (967 thousand tonnes, 18,3% of northern Italy and 9,8% of the national total) and Toscana (931 thousand tonnes, 41,2% of central Italy and 9,4% of the national total). (Table 2.3.1).

Figure 2.3.3 - Disposal in landfills of waste from economic activities, by type, years 2018 - 2020



	NH	H	Total
Year 2018	10.606.764	1.280.891	11.887.655
Year 2019	10.729.286	1.259.745	11.989.031
Year 2020	8.557.483	1.315.375	9.872.858

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

The main types of waste disposed of in landfills are wastes produced by waste treatment operations (LoW 19), wastes from construction and demolition operations (LoW 17) and wastes produced by thermal processes (LoW 10). The prevalence of waste identified with LoW 19 in landfill disposal represents a 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 18 dedicated landfills and amounts to 391 thousand tonnes, representing 4% of the total landfilled and 29,7% of the share of hazardous waste. About 88,8% is disposed of in northern Italy (347 thousand tonnes), 3% in central Italy (12 thousand tonnes), and 8,2% in southern Italy (32 thousand tonnes). These wastes are almost entirely made up of construction materials containing asbestos (LoW code170605*), with a total amount of 387 thousand tonnes (98,9% of the total landfilled).

Table 2.3.1 - Waste disposal in landfills, by region, by landfill category and type of waste (tonnes), year 2020

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	150.640	0	150.640	225.265	7.760	233.025	3.573	176.662	180.235	379.478	184.422	563.900
Valle d'Aosta	31.831	0	31.831	48.790	74	48.864	0	0	0	80.621	74	80.695
Lombardia	1.687.298	0	1.687.298	481.535	171.477	653.012	84.400	81.824	166.224	2.253.233	253.301	2.506.534
Trentino-Alto Adige	13.586	0	13.586	55.975	3	55.978	0	0	0	69.561	3	69.564
Veneto	402.381	0	402.381	518.167	46.565	564.732	0	0	0	920.548	46.565	967.113
Friuli-Venezia Giulia	111.848	0	111.848	52.973	229.242	282.215	0	0	0	164.821	229.242	394.063
Liguria	148.976	0	148.976	266.373	0	266.373	0	0	0	415.349	0	415.349
Emilia-Romagna	0	0	0	272.889	18.681	291.570	0	0	0	272.889	18.681	291.570
Northern Italy	**2.546.560**	**0**	**2.546.560**	**1.921.967**	**473.802**	**2.395.769**	**87.973**	**258.486**	**346.459**	**4.556.500**	**732.288**	**5.288.788**
Toscana	0	0	0	839.069	12.295	851.364	11.061	68.874	79.935	850.130	81.169	931.299
Umbria	0	0	0	67.193	0	67.193	293.700	67.952	361.652	360.893	67.952	428.845
Marche	0	0	0	150.432	0	150.432	0	39.364	39.364	150.432	39.364	189.796
Lazio	593.408	0	593.408	34.758	0	34.758	80.006	0	80.006	708.172	0	708.172
Central Italy	**593.408**	**0**	**593.408**	**1.091.452**	**12.295**	**1.103.747**	**384.767**	**176.190**	**560.957**	**2.069.627**	**188.485**	**2.258.112**
Abruzzo	0	0	0	266	13.822	14.088	0	0	0	266	13.822	14.088
Molise	11	0	11	13.884	0	13.884	0	0	0	13.895	0	13.895
Campania	0	0	0	0	0	0	0	0	0	0	0	0
Puglia	158.735	0	158.735	720.004	0	720.004	3.729	277	4.006	882.468	277	882.745
Basilicata	8.690	0	8.690	33.183	13.255	46.438	0	0	0	41.873	13.255	55.128
Calabria	0	0	0	23.431	0	23.431	77	63.479	63.556	23.508	63.479	86.987
Sicilia	14.019	0	14.019	227.014	19.475	246.489	0	0	0	241.033	19.475	260.508
Sardegna	270.725	0	270.725	457.588	284.294	741.882	0	0	0	728.313	284.294	1.012.607
Southern Italy	**452.180**	**0**	**452.180**	**1.475.370**	**330.846**	**1.806.216**	**3.806**	**63.756**	**67.562**	**1.931.356**	**394.602**	**2.325.958**
TOTAL	**3.592.148**	**0**	**3.592.148**	**4.488.789**	**816.943**	**5.305.732**	**476.546**	**498.432**	**974.978**	**8.557.483**	**1.315.375**	**9.872.858**

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

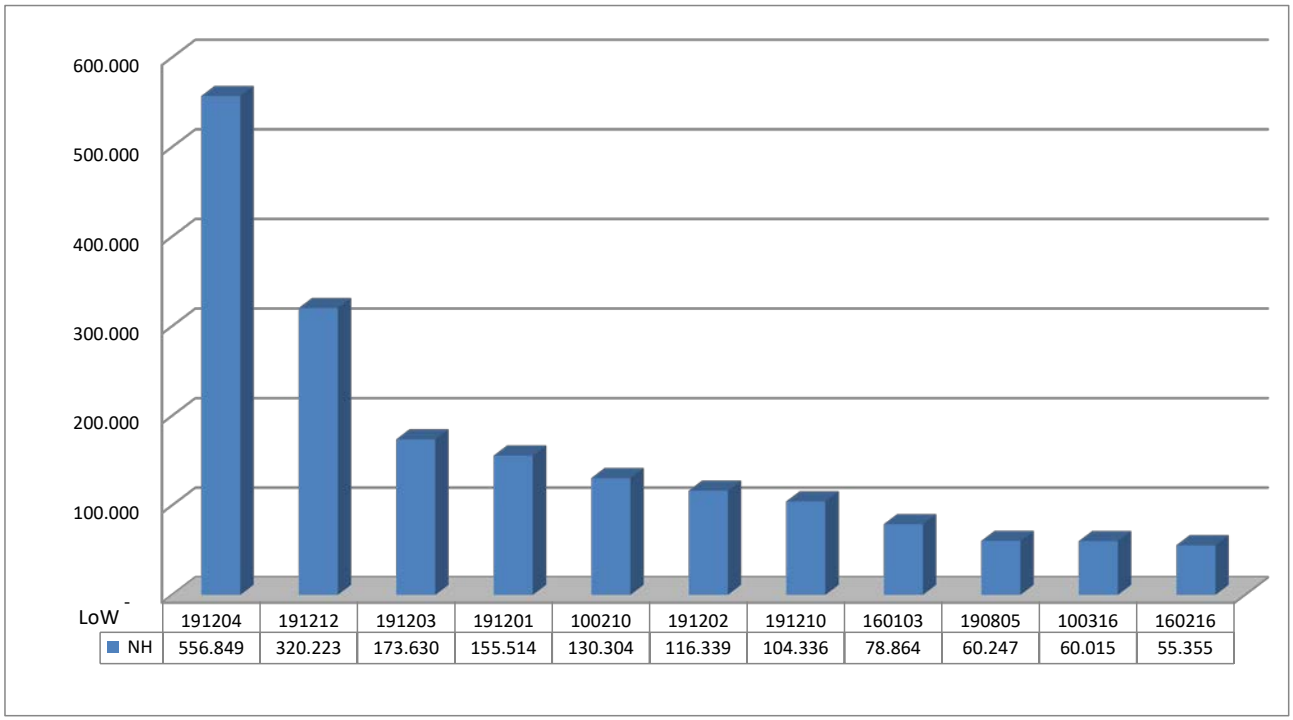
Source: ISPRA

2.4 Import and export of waste from economic activities

The total amount of exported EAW is over 3,6 million tonnes, while the imported amount is over 6,7 million tonnes. Exported waste (2,4 million tonnes) consists for 66% of non-hazardous waste and for the remaining 34% (1,2 million tonnes) of hazardous waste.
Compared to 2019, the total quantity exported shows a 7,8% decrease exclusively concerning non-hazardous EAW; hazardous waste, on the other hand, increase by 3,3% (40 thousand tonnes).

The most **exported non-hazardous waste** (67,5% of non-hazardous waste) amounting to 1,6 million tonnes is produced by waste treatment plants. Specifically, 557 thousand tonnes are plastic and rubber, exported mainly to Turkiye and Austria, 320 thousand tonnes of mixed waste from waste treatment, exported mainly to Germany and Poland, about 174 thousand tonnes of non-ferrous metals exported mainly to Germany and China, and 156 thousand tonnes of paper and cardboard, exported mainly to Austria and Germany (Figure 2.4.1).

Figure 2.4.1 - Main types of non-hazardous waste from economic activities exported (tonnes), 2020



LoW	191204	191212	191203	191201	100210	191202	191210	160103	190805	100316	160216
NH	556.849	320.223	173.630	155.514	130.304	116.339	104.336	78.864	60.247	60.015	55.355

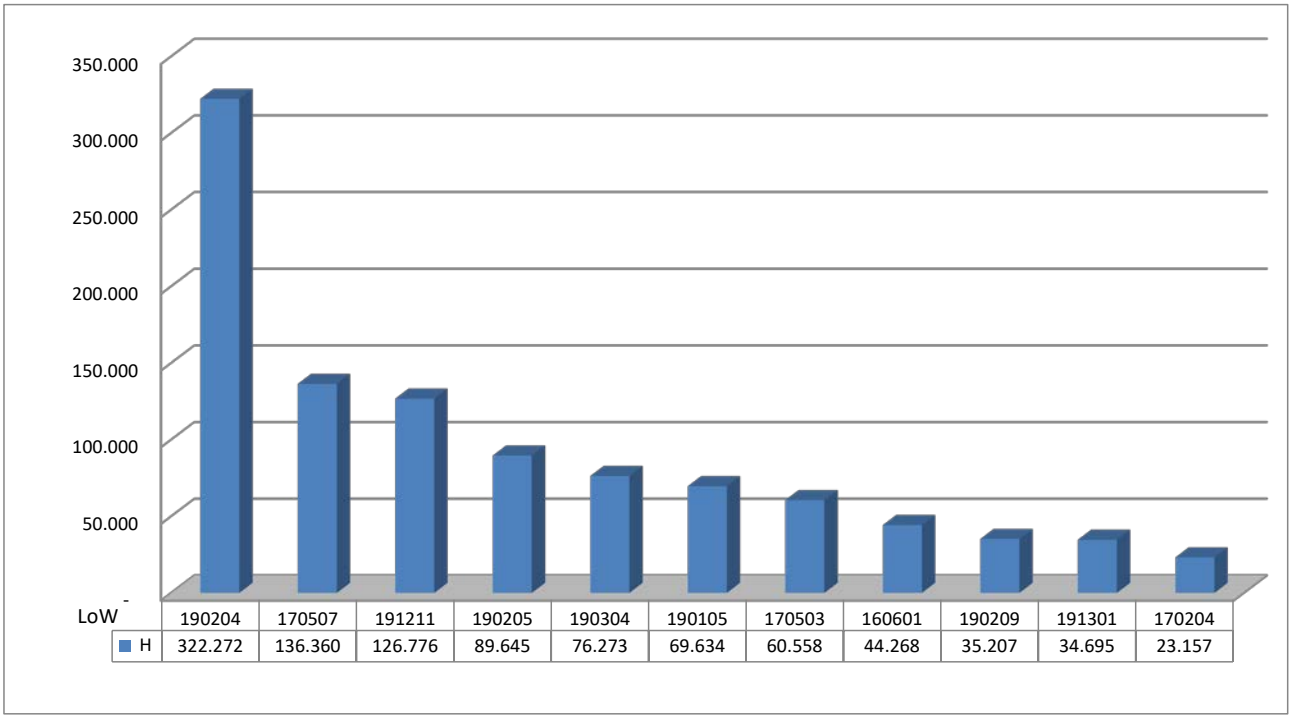
LoW 191204: plastic and rubber; **LoW 191212**: other wastes from mechanical treatment of waste; **LoW 191201**: paper and cardboard; **LoW 191203**: non-ferrous metals; **LoW 100210**: mill scales; **LoW 191210**: combustible waste; **LoW 190805**: sludge from treatment of urban wastewater; **LoW 160103**: end-of-life tyres; **LoW 191202**: ferrous metal; **LoW 100316**: skimmings. **LoW 160216**: components removed from discarded WEEE
Source: ISPRA

About 67,7% of the **exported hazardous waste**, 837 thousand tonnes, is generated by waste treatment plants; among these, premixed wastes composed of at least one hazardous waste are prevalent, with more than 322 thousand tonnes, followed by wastes from treatment of waste, with 127 thousand tonnes. An amount of 245 thousand tonnes (19,8%) is waste deriving from construction and demolition operations and mostly consists of track ballast (136 thousand tonnes; Figure 2.4.2).

Overall, 76,1% of exported non-hazardous waste is destined for material recovery (1,8 million tonnes), 18,5% for energy recovery and 5,4% for disposal.

The largest quantity exported, amounting to 817 thousand tonnes, is sent to Germany, which receives mainly hazardous waste for a total of 555 thousand tonnes, of which 299 thousand tonnes from waste treatment plants and 208 thousand tonnes from construction and demolition operations.

Figure 2.4.2 – Main types of hazardous waste from economic activities exported (tonnes), year 2020



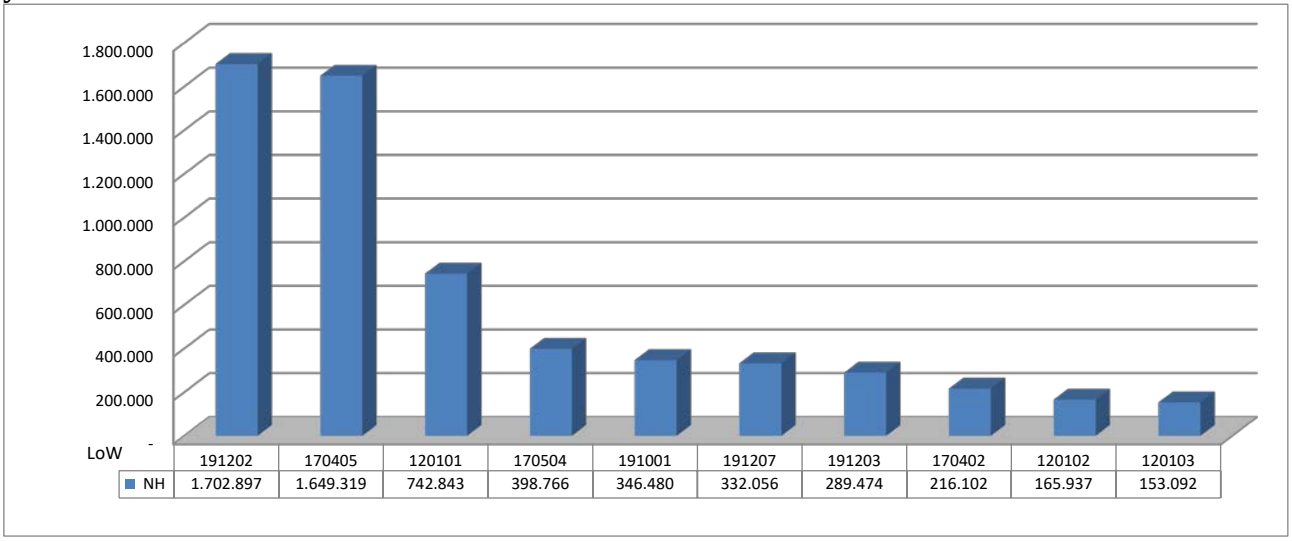
LoW	190204	170507	191211	190205	190304	190105	170503	160601	190209	191301	170204
H	322.272	136.360	126.776	89.645	76.273	69.634	60.558	44.268	35.207	34.695	23.157

LoW 190204*: premixed wastes containing at least one hazardous waste; **LoW 190304***: wastes marked as hazardous partially stabilised; **LoW 191211***: other wastes from mechanical treatment of waste; **LoW 170507***: track ballast; **LoW 190205***: sludges from physical-chemical treatments; **LoW 190105***: filter cake from gas treatment; **LoW 170503***: soil and stones; **LoW 160601***: lead batteries; **LoW 190209***: solid combustible wastes; **LoW 191301***: solid wastes from soil remediation; **LoW 170204*:** glass, plastic and wood.
Source: ISPRA

About 6,7 million tonnes of EAW are **imported** and consists almost exclusively of non-hazardous waste.
A rate of 38,6% of the total non-hazardous EAW imported are construction and demolition waste (2,6 million tonnes), mainly iron and steel waste (1,6 million tonnes). Wastes produced from waste treatment plants represents 42% (2,8 million tonnes), with ferrous metals predominating (1,6 million tonnes). These wastes are destined for recovery in industrial plants located in Friuli-Venezia Giulia, Lombardia and Veneto.
Wastes produced by thermal processes represent 73,4% of the total imported **hazardous** EAW and are mainly consisting of solid wastes produced from gas treatment (59 thousand tonnes), recovered in Sardegna at a metallurgical industrial site (Figure 2.4.4).

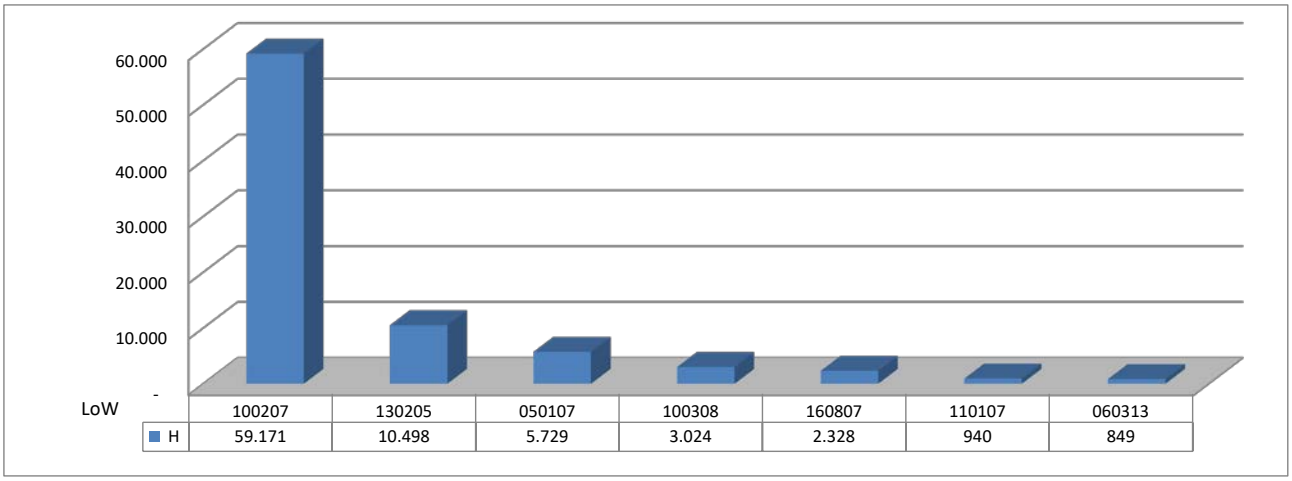
Overall, 96,5% of EAW waste imported is destined for material recovery and 3,4% for disposal operations.
The largest quantity of imported waste comes from Germany, about 2 million tonnes, 96,1% of which is metal waste. Significant quantities of EAW also come from France (939 thousand tonnes), Switzerland (926 thousand tonnes) and Austria (733 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 2020



LoW 170405: iron and steel; **LoW 191202**: ferrous metals; **LoW 120101**: ferrous metals filings and turnings; **LoW 170504**: soil and stones; **LoW 191207**: wood; **LoW 191001**: iron and steel waste; **LoW 191203**: non-ferrous metals; **LoW 170402**: Aluminium; **LoW 120103**: non-ferrous metals filings and turnings; **LoW 120102**: ferrous metals dust and particles; **LoW 120103**: filings and shavings of non-ferrous materials.
Source: ISPRA

Figure 2.4.4 – Main types of hazardous waste from economic activities imported (tonnes), year 2020



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

3. MONITORING OF SPECIFIC WASTE STREAMS

3.1 Waste containing asbestos

In 2020 asbestos-containing waste produced in Italy amounted to 386 thousand tonnes, 97,6% of which consisted of construction materials, 1,9% of insulation materials, and 0,5% of metal packaging, brake pads and discarded equipment containing free asbestos.
Northern Italy produces 83,4% of the total asbestos-containing waste generated nationwide, while Central Italy and Southern Italy produce 9,2% and 7,5% respectively.
Friuli Venezia Giulia is the region with the largest amount of asbestos-containing waste produced in 2020 with 158 thousand tonnes which represents 40,8% of the national total. (Table 3.1.1).

Table 3.1.1 - Production of waste containing asbestos by LoW code (tonnes), year 2020

REGION	150111*	160111*	160212*	170601*	170605*	TOTAL
Piemonte	66	-	8	607	18.162	18.843
Valle d'Aosta	-	-	-	-	42	42
Lombardia	591	10	18	2.450	61.892	64.961
Trentino-Alto Adige	53	-	2	76	883	1.014
Veneto	443	2	22	1.436	46.287	48.190
Friuli-Venezia Giulia	26	-	11	152	157.467	157.656
Liguria	15		187	639	1.868	2.709
Emilia-Romagna	148	2	4	196	28.269	28.619
Northern Italy	**1.342**	**14**	**252**	**5.556**	**314.870**	**322.034**
Toscana	103	-	1	203	13.333	13.640
Umbria	33	-	-	35	7.281	7.349
Marche	45	-	-	71	4.745	4.861
Lazio	63	1	2	491	9.030	9.587
Central Italy	**244**	**1**	**3**	**800**	**34.389**	**35.437**
Abruzzo	24	-	-	64	4.014	4.102
Molise	2	-	-	-	817	819
Campania	72	1	10	64	3.583	3.730
Puglia	30	-	10	122	6.904	7.066
Basilicata	3	-	-	49	1.060	1.112
Calabria	8	-	15	266	1.926	2.215
Sicilia	20	1	23	77	4.878	4.999
Sardegna	9	1	-	151	4.592	4.753
Southern Italy	**168**	**3**	**58**	**793**	**27.774**	**28.796**
TOTAL	**1.754**	**18**	**313**	**7.149**	**377.033**	**386.267**

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

The total amount of asbestos-containing waste managed is 416 thousand tonnes and 98% of it are construction materials, about 408 thousand tonnes.
The predominant form of management is landfill, where, in fact, 94% of this waste (391 thousand tonnes) is disposed of. The remaining quantity is sent for preliminary treatment and preliminary storage (about 25 thousand tonnes).

Italy exported in 2020 about 8 thousand tonnes of waste containing asbestos, which are sent almost entirely to Germany (6.438 tonne) and to a lesser extent to Spain (1.650 tonnes) and France (192 tonnes). The exported waste is essentially made up of construction materials, over 6 thousand tonnes, destined for disposal (Table 3.1.2).

Table 3.1.2 – Comparison of production, treatment and export by type of waste containing asbestos (tonnes), year 2020

LoW	Waste produced	Waste managed						Export
		D1	D9	D13	D14	D15 al 31/12	Total	
150111*	1.754	-	285	108	1.019	457	1.869	-
160111*	18	-	-	3	15	9	27	-
160212*	313	31	5	33	17	40	126	13
170601*	7.149	4.089	-	1.025	573	789	6.476	1.944
170605*	377.033	386.750	51	1.724	4.044	14.960	407.529	6.323
TOTAL	**386.267**	**390.870**	**341**	**2.893**	**5.668**	**16.255**	**416.027**	**8.280**

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 D1 to D12 (e.g. evaporation, drying, calcination, etc.); **D13**: Blending or mixing prior to submission to any of the operations numbered D1 to D12, **D14:** Repackaging prior to submission to any of the operations numbered D1 to D13, **D15:** Storage pending any of the operations numbered D1 to D14 (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 collected on the treatment of end-of-life vehicles showed that, between 2019 and 2020, the number of operational ELV processing plants decreased from 1.462 to 1.417, of which 626 are in northern Italy (44% of the total), 212 in central Italy (15%) and 579 in southern Italy (41%) (Table 3.2.1).
In total, over 1,2 million tonnes of vehicles were treated in the ELV processing plants, about 75 thousand less than in 2019 (-5,8%).

Table 3.2.1 - End-of-life vehicle processing plants by geographical area, years 2018-2020

	2018		2019		2020	
	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	653	550.970	635	605.550	626	575.791
Central Italy	281	219.423	236	234.094	212	215.242
Southern Italy	590	431.106	591	453.150	579	426.482
TOTAL	**1.524**	**1.201.499**	**1.462**	**1.292.754**	**1.417**	**1.217.515**

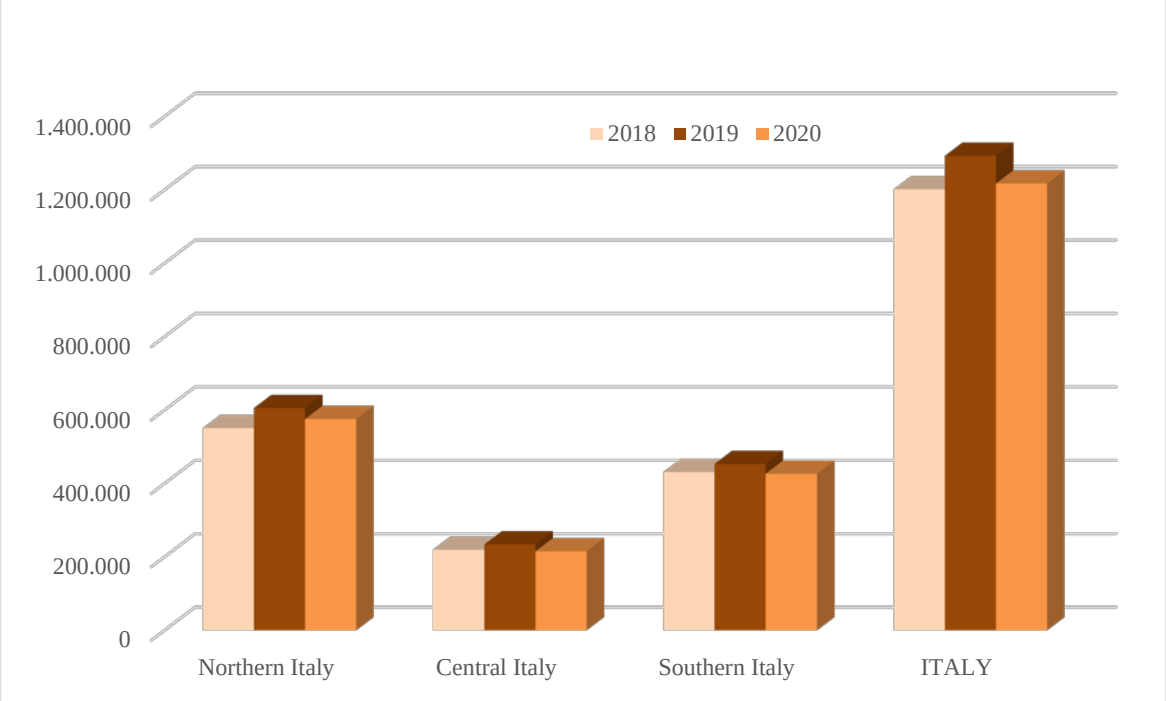
Source: ISPRA

The distribution by geographical macro-area of the quantities of processed vehicles shows a widespread decrease across the country: with -8%, compared to 2019, central Italy presents the largest decrease, in northern Italy the decrease is - 5%, while in the South is -6% (Figure 3.2.1).
The North is still the geographical area where the most significant quantities of ELV are processed, near 576 thousand tonnes, while 215 thousand tonnes are processed in central Italy and 426 thousand tonnes in the South.

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 2020, there were 87 active plants and they received 85 thousand tonnes of de-polluted vehicles or vehicle components (Table 3.2.5).

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 3.2.6 and Figure 3.2.2). Almost all the material recovered in these plants is scrap metal. In 2020, 28 plants were operational, of which 16 in the North, 7 in the Centre and 5 in the South.

Figure 3.2.1 - End-of-life vehicles treated in processing plants (tonnes), years 2018 - 2020



Source: ISPRA

Table 3.2.2 – Number of end-of-life vehicle scrapping plants by geographical area and quantities recovered (tonnes), year 2020

	N. plants	R4	R12	Storage of waste pending recovery operation at 31/12
Northern Italy	47	7.133	25.188	4.347
Central Italy	29	4.243	6.329	2.989
Southern Italy	11	15.594	18.076	986
TOTAL	**87**	**26.970**	**49.593**	**8.323**

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

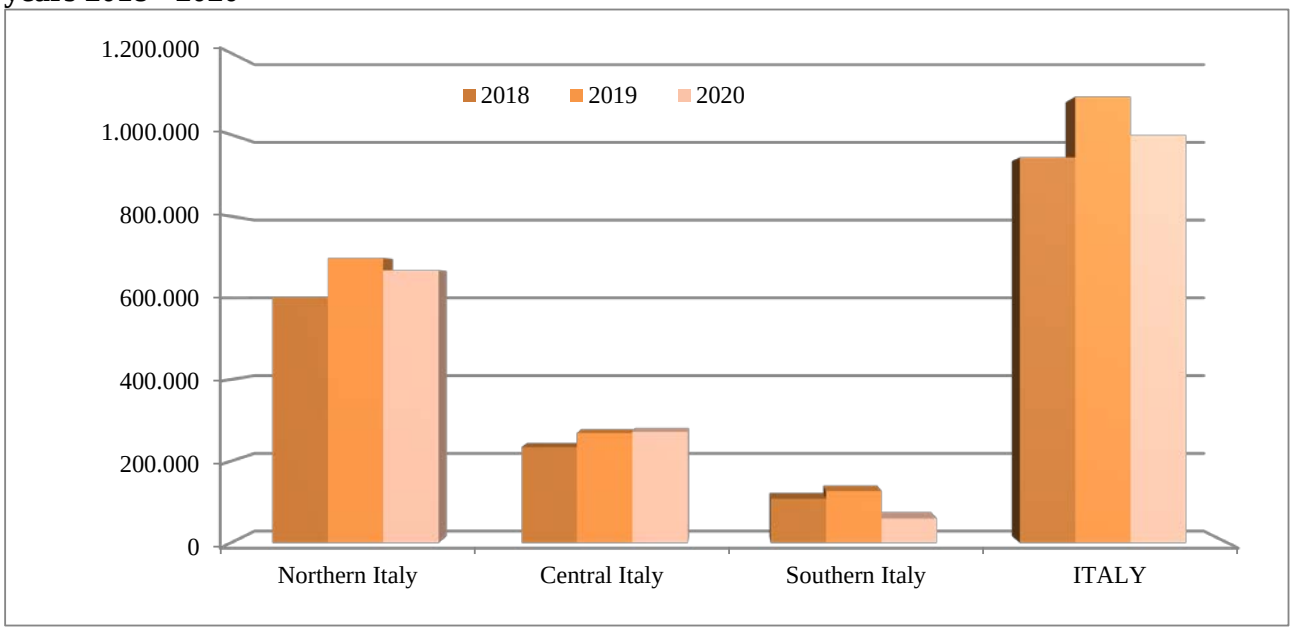
Table 3.2.3 –Number of shredding plants by geographical area and quantities recovered (tonnes), year 2020

	R4	R12	Waste stored pending recovery operation at 31/12	Storage of waste pending disposal operation at 31/12
Northern Italy	654.492	675	12.009	32
Central Italy	259.875	3.610	8.709	0
Southern Italy	57.761	0	1.744	0
TOTAL	**972.128**	**4.285**	**22.462**	**32**

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 2018 - 2020



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 84,7% 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 84,7%; with the 95% target set by law far from being reached.

The recovery percentage recorded (84,7%) shows that the absence of energy recovery plants compromises the possibility of achieving the overall recovery target.
As seen in 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.
Fluff produced by the shredding plants (183 thousand tonnes) is almost entirely sent for disposal. The difficulty of finding valid uses for this waste is one of the biggest problems of the entire supply chain. It should be emphasised that proper de-pollution of vehicles, given the high calorific value that characterises fluff (consisting essentially of organic materials), would also enable its effective energy recovery.

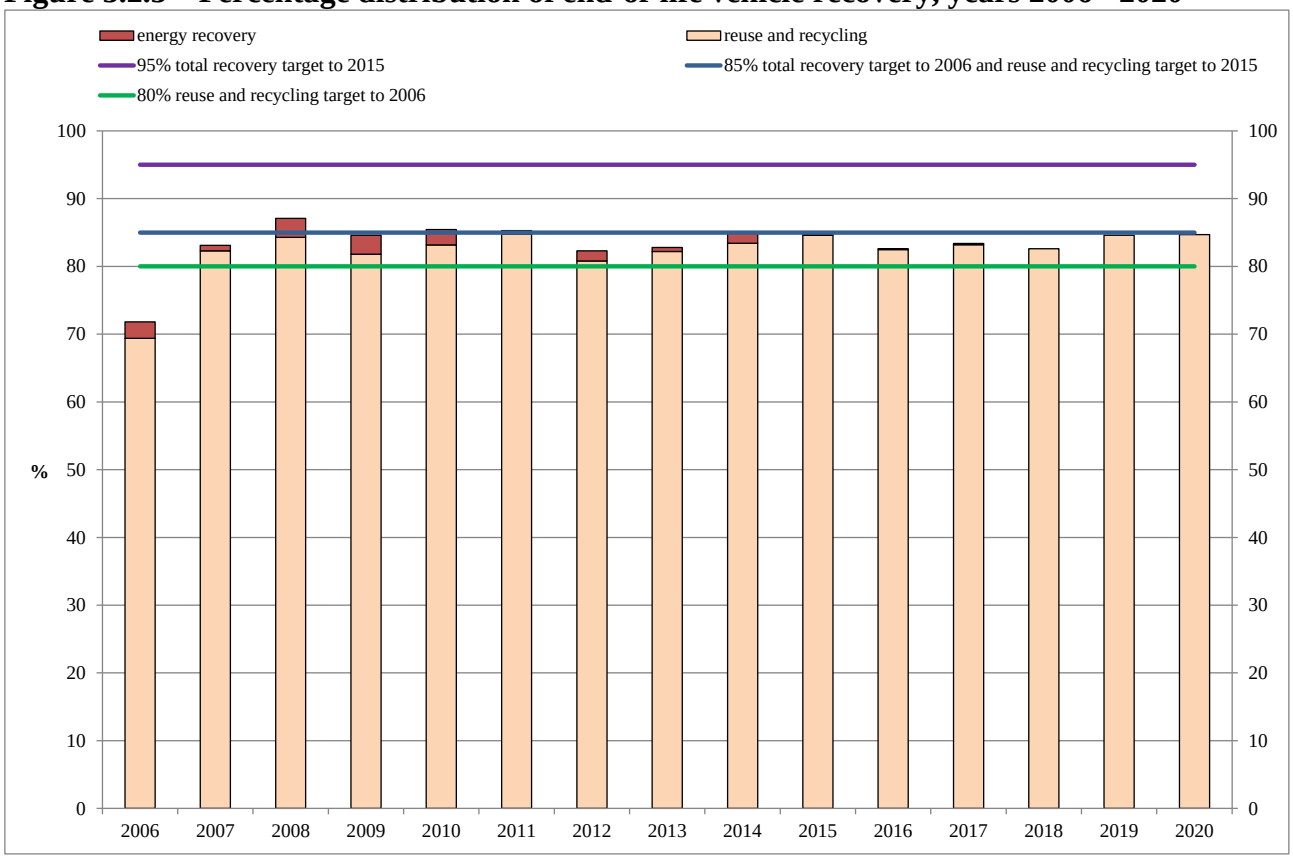
Table 3.2.4 - Destination of waste from de-pollution and demolition of end-of-life vehicles (tonnes), year 2020

Reuse (t)	Recycling (t)	Energy recovery (t)	Total recovery (t)	Disposal (t)
149.140	**963.299**	**0**	**1.112.439**	**197.756**

Source: ISPRA

The analysis of reuse, recycling and recovery rates since 2006 (first year of monitoring carried out by ISPRA) shows a substantial stability in the latest years, after an initial improvement, perhaps due to a positive response of the sector to what at the time was a new European legislation and 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 - 2020

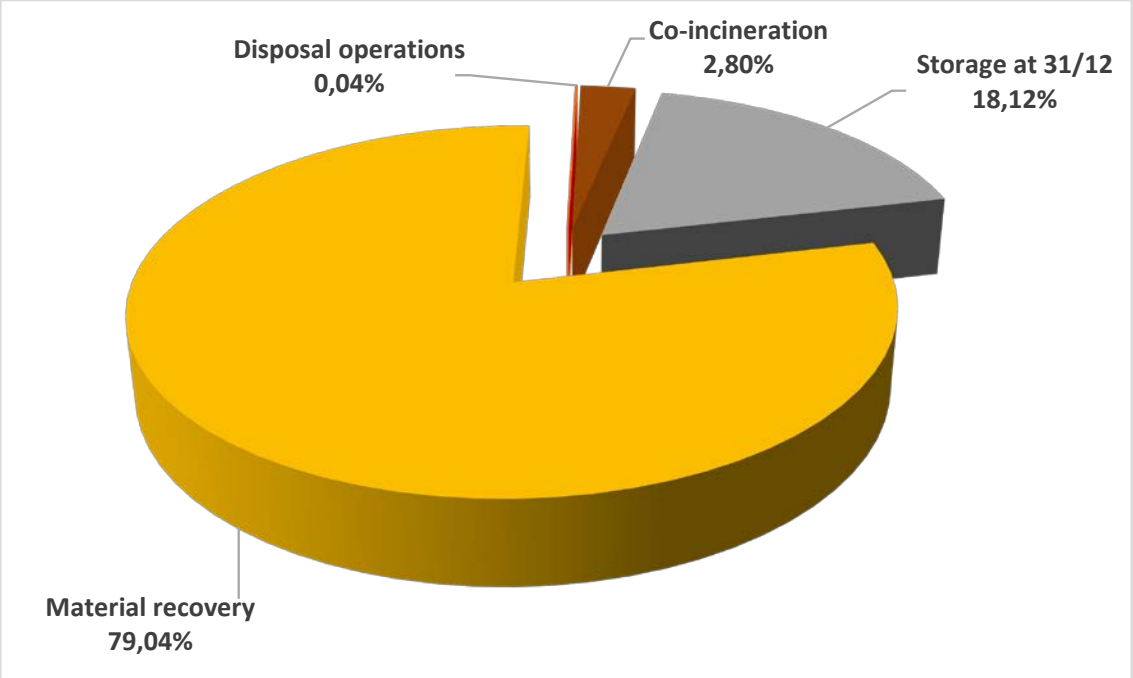


Source: ISPRA

3.3 End-of-life tyres

In Italy, 461 thousand tonnes of End-of-Life Tyres (ELTs) were produced in 2020.
The amount of ELTs managed is over 442 thousand tonnes (-1,6% compared to 2019), and the amount exported is 79 thousand tonnes. ELTs treated are mainly destined for recovery operations (over 362 thousand tonnes). Disposal involves a residual quantity of 162 tonnes (Figure 3.3.1). At the end of the year there were approximately 80 thousand tonnes in storage, equal to 18,1% of the total managed. An analysis of the data shows that 79% of the ELTs, or 349 thousand tonnes, went to material recovery and 2,8%, or 12 thousand tonnes, to production plants to generate energy.

Figure 3.3.1 – Treatment operation for end-of-life tyres, year 2020



Source: ISPRA

Of the 79 thousand tonnes exported, 41 thousand tonnes are sent for material recovery (51,9% of the total exported) and 38 thousand tonnes were recovered as waste-to-energy (47,7% of the total exported); a marginal portion, amounting to 341 tonnes, was subjected to disposal operations (0,4% of the total exported).
Turkiye and Germany receive each about 36 thousand tonnes and 23 thousand tonnes of ELTs. Quantities sent to Turkiye are mainly used for energy recovery (97,5%), while those sent to Germany are destined almost entirely to material recovery (99,4%).

3.4 Sludge from treatment of urban wastewater

The quantity of sludge from urban wastewater treatment (LoW code 190805) generated on the national territory amounts to 3,4 million tonnes, with a slightly decrease of -0,76% compared to 2019. (Table 3.4.1).

Table 3.4.1 – Generation of sludge from treatment of urban wastewater, year 2020

Region	Generation of sludges from treatment of urban wastewater (LoW code 190805) (t)		
	2018	2019	2020
Piemonte	244.636	301.897	303.653
Valle d'Aosta	4.231	4.470	4.998
Lombardia	445.245	466.295	468.784
Trentino	136.454	140.393	135.646
Veneto	381.215	399.958	409.896
Friuli Venezia Giulia	79.810	82.618	83.293
Liguria	39.864	41.926	46.859
Emilia Romagna	387.538	439.492	406.294
Nord	**1.718.993**	**1.877.049**	**1.859.423**
Toscana	291.196	303.135	288.954
Umbria	38.181	43.380	44.788
Marche	80.551	79.357	80.908
Lazio	370.212	409.997	332.347
Centro	**780.140**	**835.869**	**746.997**
Abruzzo	68.005	60.862	73.502
Molise	2.553	3.004	2.437
Campania	145.747	180.099	228.321
Puglia	280.277	299.814	2.330
Basilicata	1.754	4.391	334.526
Calabria	25.030	34.072	31.695
Sicilia	31.255	30.575	29.809
Sardegna	83.618	90.668	81.327
Sud	**638.239**	**703.485**	**783.947**
TOTALE	**3.137.372**	**3.416.403**	**3.390.368**

Source: ISPRA

Of the 3 million tonnes of sludge managed, 53,5% was sent to disposal operations and 44,1% to recovery operations (Table 3.4.2). Compared to 2019, there was a 6,7% decrease in the quantity disposed of (over 117 thousand tonnes), and a 4,3% increase in the quantity recovered (about 55 thousand tonnes) (Table 3.4.2).

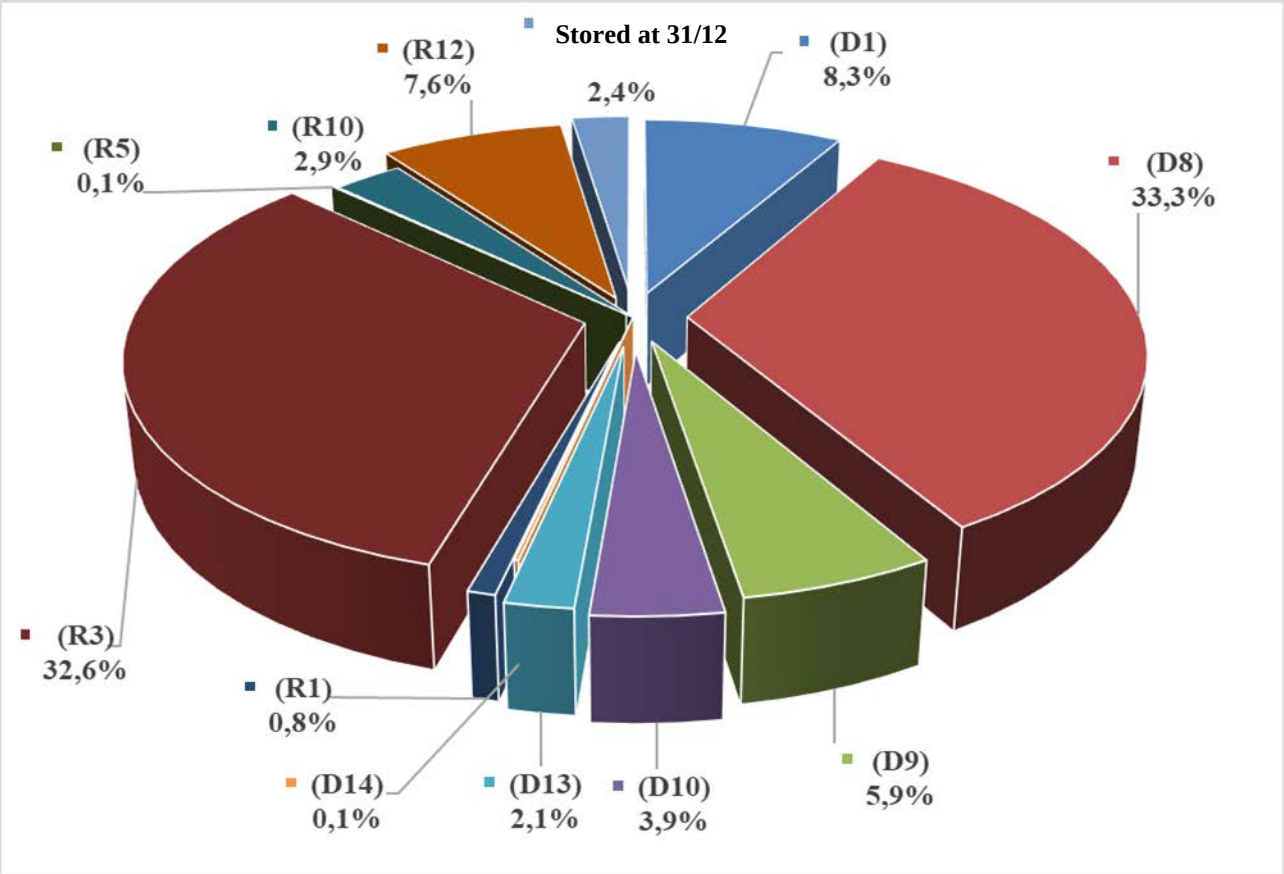
Table 3.4.2 – Treatment of sludge from urban wastewater, 190805 (tonnes), years 2018 - 2020

Disposal/recovery operation (All. B e C Dlgs. 152/2006)	Quantity (t/y)		
	2018	2019	2020
Deposit into or on to land (e.g., landfill, etc.) (D1)	261.323	231.839	253.462
Biological treatment (D8)	950.666	1.028.890	1.014.869
Physical-chemical treatment (D9)	244.888	261.247	178.515
Incineration on land (D10)	137.159	135.147	119.184
Blending or mixing prior to submission to any of the operations numbered D 1 to D 12 (D13)	41.493	90.824	62.638
Repackaging prior to submission to any of the operations numbered D 1 to D 13 (D14)	7.066	2.140	3.954
A) Total disposal (D1-D14)	**1.642.595**	**1.750.087**	**1.632.622**
Use principally as a fuel or other means to generate energy (R1)	24.440	26.895	25.593
Recycling/reclamation of organic substances which are not used as solvents (R3)	820.121	875.373	995.563
Recycling/reclamation of other inorganic materials (R5)	1.348	215	3.056
Land treatment resulting in benefit to agriculture or ecological improvement (R10)	75.867	90.323	87.367
Exchange of waste for submission to any of the operations numbered R 1 to R 11(R12)	245.449	296.163	232.593
B) Total recovered (R1-R12)	**1.167.225**	**1.288.969**	**1.344.172**
C) Total Stored at 31/12 (R13/D15)	**105.644**	**91.421**	**72.801**
Total Treated (A+B+C)	**2.915.464**	**3.130.477**	**3.049.595**

Source: ISPRA

Among the disposal operations, the largest quantity, about 1 million tonnes (33,3%), is sent to biological treatment (*D8*), followed by landfilling with 253 thousand tonnes (8,3%). The predominant recovery operation is the recycling/recovery of organic substances not used as solvents (*R3*), with over 995 thousand tonnes (32,6%) followed by *R12* with over 232 thousand tonnes (7,6%). (Figure 3.4.1).

Figure 3.4.1 – Percentage distribution of treatment operations for urban wastewater sludge (LoW code 190805), year 2020



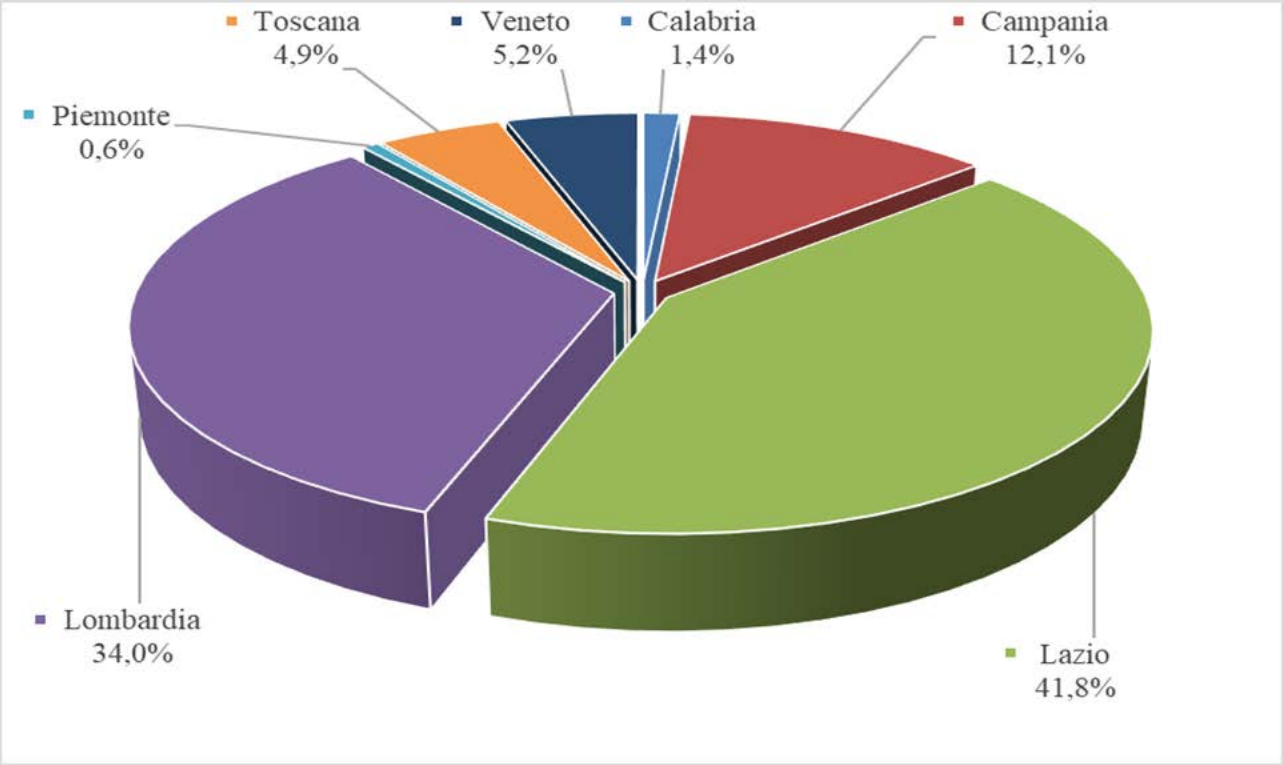
D1: Deposit into or on to land (e.g. landfill, etc.), **D8:** Biological treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12, **D9:** Physical-chemical treatment not specified elsewhere 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

Just over 60 thousand tonnes of sludge were exported abroad, mainly for incineration.

Figure 3.4.2 – Export of sludge produced by urban wastewater treatment, by region (LoW code 190805) tonnes, year 2020



Source: ISPRA

The sludge plasters, i.e., calcium and magnesium correctives obtained from the hydrolysis (and possible enzymatic attack) of sewage sludge (as defined by Legislative Decree no. 99 of 27 January 1992 implementing the directive 86/278/CEE) are more than 283 thousand tonnes, produced mainly in Lombardia, Trentino, Veneto and Lazio. By comparing the information deduced from MUD database with the information on land use from ISTAT (National Institute of Statistics), it can be deduced that defecation plasters from sludge are, in 2020, about 47,3% of the total amount of correctives produced, equal to over 600 thousand tonnes.

3.5 Construction and demolition wastes

Waste from construction and demolition operations constitutes, in absolute terms, the largest EA waste stream generated, at both European and national level. The European Commission has therefore made it a priority to monitor the flow of C&D wastes and 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. The calculation methods for monitoring the achievement of the target were identified in Decision 2011/753/EC.

The national production of construction and demolition waste, excluding soil and stones and dredging spoil (LoW 1705**), stands at approximately 50,2 million tonnes (-3,6% compared to 2019, corresponding to 1,9 million tonnes). The construction sector has, indeed, been significantly affected by the health, economic and social crisis set off by the Covid-19 pandemic, due to construction site closures and reduced maintenance of buildings or new construction.

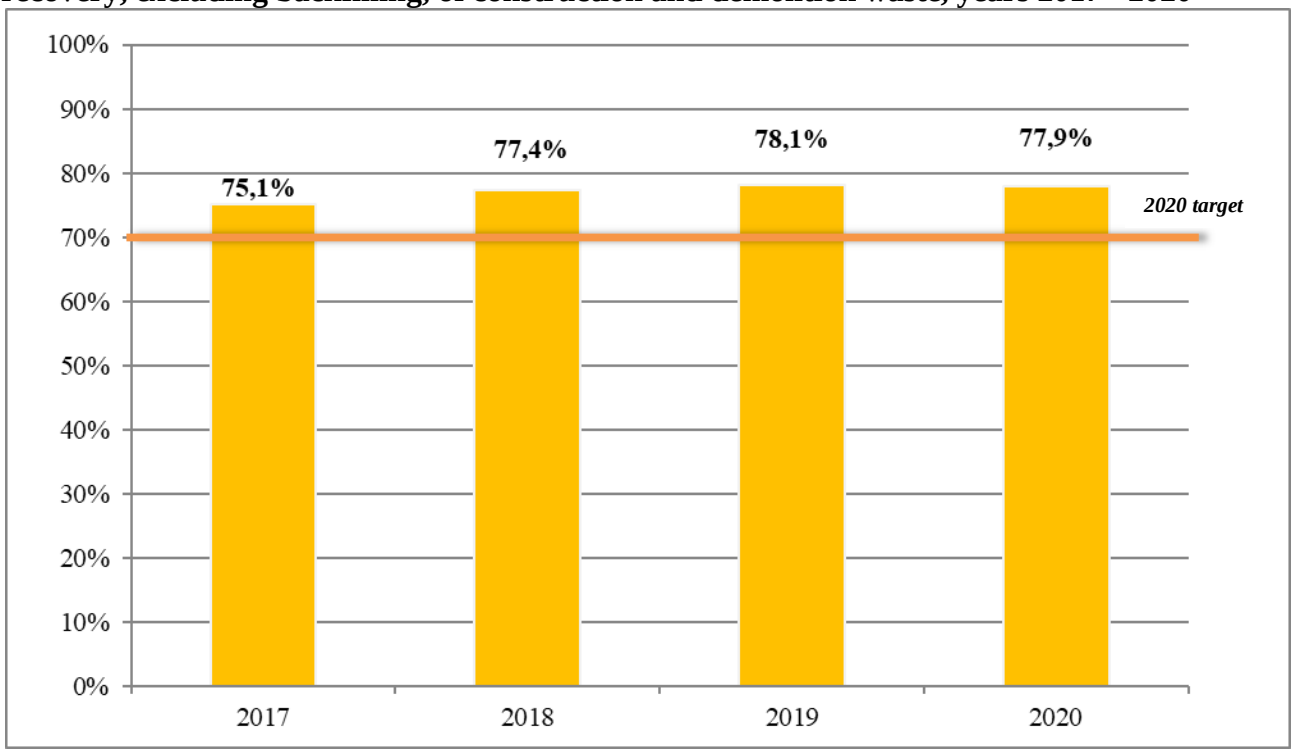
Material recovery reaches 39,1 million tonnes, with a decrease of -3,9% (1,6 million tonnes) compared to 2019. Specifically, for the mineral part of waste from construction and demolition operations, the main form of recycling is treatment for use in the production of concrete or asphalt or in road construction.
The percentage of recovery of demolition and construction waste is 77,9% in 2020, 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 302 thousand tonnes. Including these quantities, the recovery rate would reach 78,5%.

Table 3.5.1 – Generation, preparation for re-use/recycling and other forms of material recovery, of C&D waste (excluding soil and rock and dredging sludge) - year 2020

Aggregates list of waste categories from Annex 1, Section 2 of Regulation (EC) No 2150/2002 (LoW code 17)		Generation	Preparation for re-use/recycling
Code	Description	tonnes	tonnes
6.1	Ferrous metal waste and scrap	3.843.886	3.352.437
6.2	Non-ferrous metal waste and scrap	290.664	179.307
6.3	Mixed metal waste	207.723	161.643
7.1	Glass waste	82.287	64.305
7.4	Plastic wastes	43.736	28.796
7.5	Wood wastes	207.086	180.453
12.1	Construction and demolition waste	45.506.917	35.115.218
Total		**50.182.299**	**39.082.159**

Source: ISPRA

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 2017 - 2020

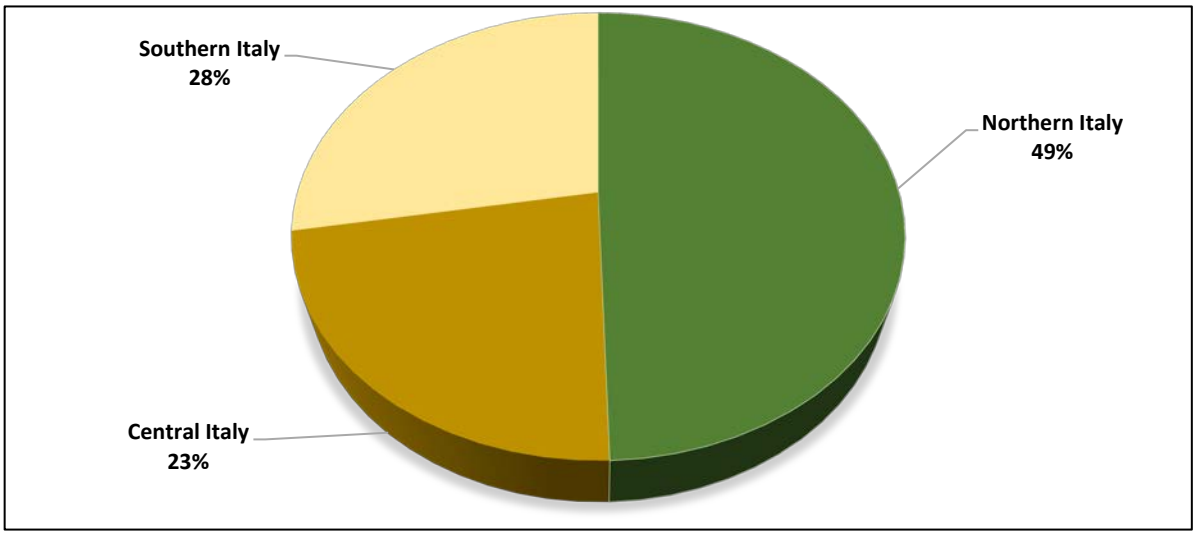


Source: ISPRA

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

In 2020, healthcare waste generation increased by 16% due to the SARS-COV2 pandemic and the resulting health emergency. Wastes from human or animal health care and/or related research, in short healthcare waste (LoW 18) produced in Italy amounts to about 232 thousand tonnes, of which about 23 thousand tonnes are non-hazardous and over 208 thousand tonnes are hazardous wastes.
As for hazardous healthcare waste, the summary information referring to the macro-areas (Figure 3.6.1) shows that production in Northern Italy is 49% of the total with over 103 thousand tonnes. The data varies considerably in Central Italy where production is about 47,5 thousand tonnes (23% of the total) and in the South where about 58 thousand tonnes are produced, 28% of the total.

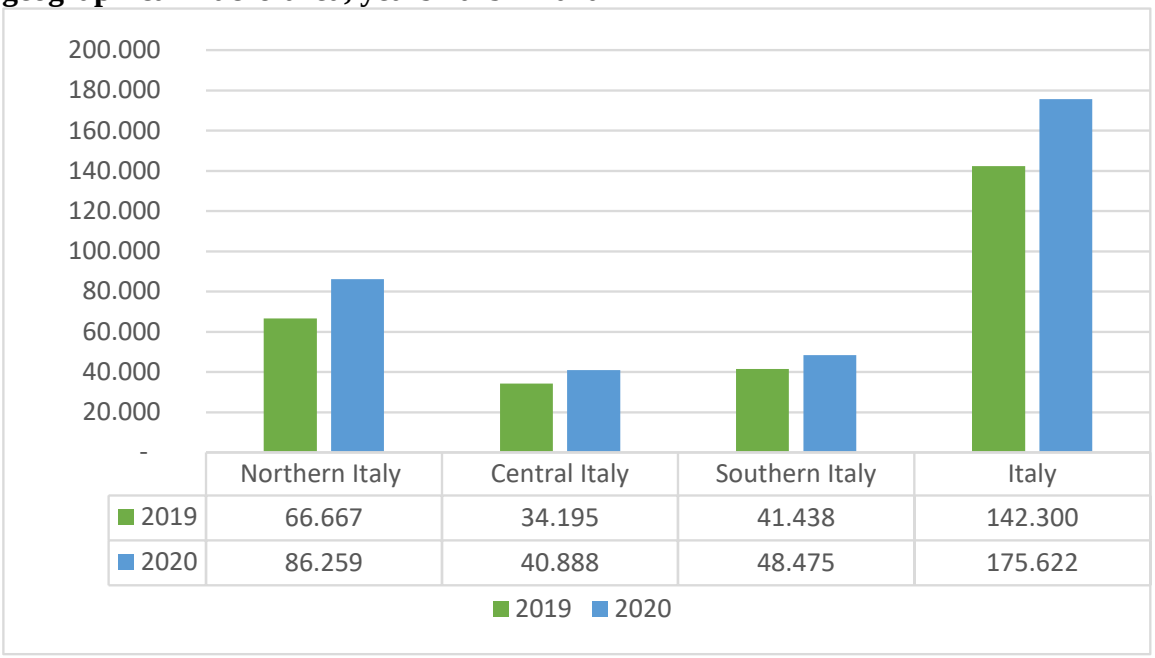
Figure 3.6.1 - Healthcare waste (LoW 18) produced, by macro-area, year 2020



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 (LoW code 180103*), amounting to 176 thousand tonnes, with a 23,4% increase compared to 2019. The increase in the North is 29,4%, with about 20 thousand tonnes more, in the Centre of about 20% (almost 7 thousand tonnes). Finally, the South goes from 41 thousand tonnes in 2019 to 48 thousand tonnes in 2020 (+17%).

Figure 3.6.2 - Generation of hazardous medical waste with a risk of infection (which must be collected and disposed of using special precautions to avoid infection - LoW Code 180103*), by geographical macro-area, years 2019 – 2020

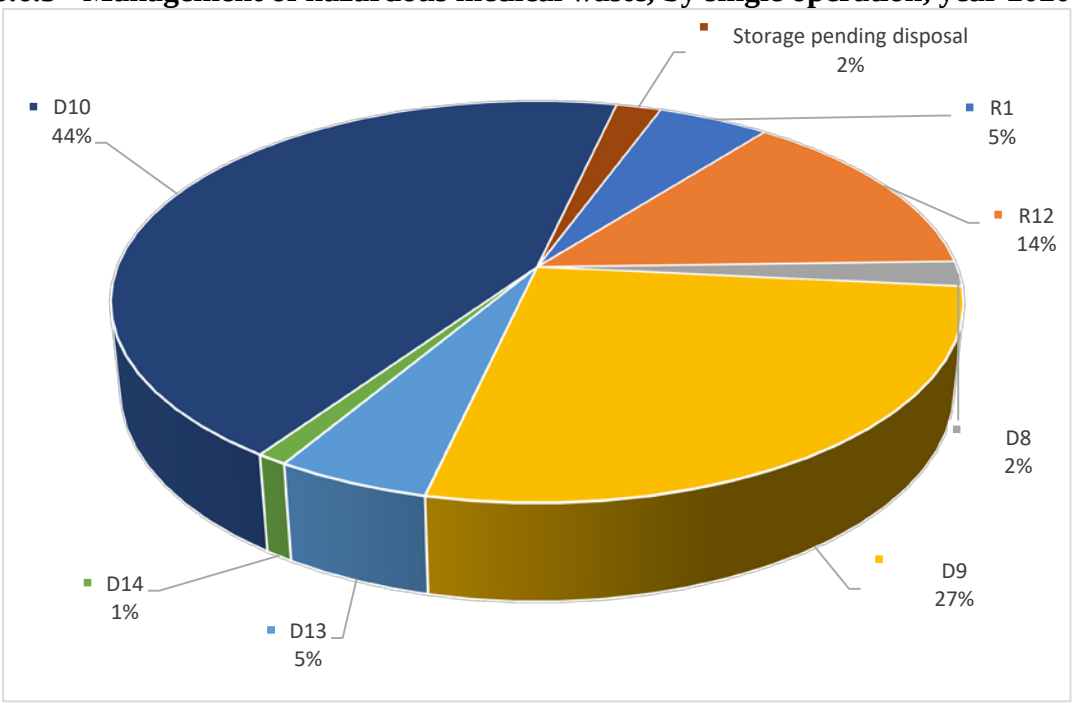


	Northern Italy	Central Italy	Southern Italy	Italy
2019	66.667	34.195	41.438	142.300
2020	86.259	40.888	48.475	175.622

Source: ISPRA

The healthcare waste treated are about 240 thousand tonnes, of which just over 22 thousand tonnes are non-hazardous wastes and about 218 thousand tonnes are hazardous wastes. Figure 3.6.3 shows the incidence rates of the different hazardous waste treatment operations, in relation to the total treated at national level. Waste disposal operations, accounting for 81% of the total, are the most common management operations. Specifically, with 44% of the total managed, incineration (*D10*) is the prevalent option, followed by physical-chemical treatment with 27% of the total.

Figure 3.6.3 - Management of hazardous medical waste, by single operation, year 2020



Source: ISPRA

Wastes whose collection and disposal are subjected to special requirements in order to prevent infection (LoW code 180103*) accounts for 83,5% (over 182 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 81 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 176 thousand tonnes, of which over 95% (168 thousand tonnes) was hazardous healthcare waste with infectious risks (LoW code 180103*). 90 thousand tonnes of these hazardous healthcare waste were sent to incineration and more than 77 thousand to sterilisation.

There are 18 sterilisation plants operating on the national territory, with a total treatment capacity of 154 thousand tonnes. Wastes treated with sterilisation are subsequently sent to waste-to-energy plant or landfill.
There are 22 plants authorised to incinerate this category of waste, with an authorised capacity for this type of treatment amounting to over 192 thousand tonnes. Total sterilisation and incineration capacity is more than 346 thousand tonnes.

Table 3.6.1 – Amount of hazardous healthcare waste incinerated or sterilised (tonnes), year 2020

Management option	Number of plants	Authorised capacity (tonnes)	Amount of hazardous healthcare waste treated (tonnes)	Amount of waste with LoW code 180103* treated (tonnes)
Incineration	22*	192.126	95.320	90.389
Sterilization	18**	154.059***	81.041	77.582
Total	**40**	**346.185**	**176.361**	**167.971**

* One facility did not treat wastes whose collection and disposal is subject to special requirements in order to prevent infection (LoW Code 180103*).
** This figure includes two facilities located in port areas and one facility equipped with two sterilisers.
*** This figure may be overestimated since the total authorised treatment capacity of hazardous waste, and not only hazardous medical waste, was calculated for some plants.
Source: ISPRA

Table 3.6.2 shows that in 2020, year characterised by the health emergency due to the SARS-COV2 pandemic, there was a +8,1% increase in the amount of hazardous medical waste sent for sterilisation (6 thousand tonnes), while the change in the amount sent for incineration was minimal.

For hazardous medical waste (infectious risk) treated in incineration and sterilisation plants, there was a +22,9% increase (approximately 31,3 thousand tonnes), largely due to the amount of waste sent to sterilisation (+ 65,5%).

Table 3.6.2 - Hazardous medical waste sent for incineration and sterilisation (tonnes), years 2019-2020

Management option	Amount of hazardous healthcare waste treated (tonnes)		Percentage variation	Amount of waste with LoW code 180103* treated (tonnes)		Percentage variation
	2019	2020	%	2019	2020	%
Incineration	95.394	95. 320	- 0,1%	89.774	90.389	0,7%
Sterilization	75.002	81.041	8,1%	46.865	77.582	65,5%
Total	**170.396**	**176.361**	**3,5%**	**136.639**	**167.971**	**22,9%**

Source: ISPRA

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