WTE - Waste to Energy - in Italy

WORKSHOP

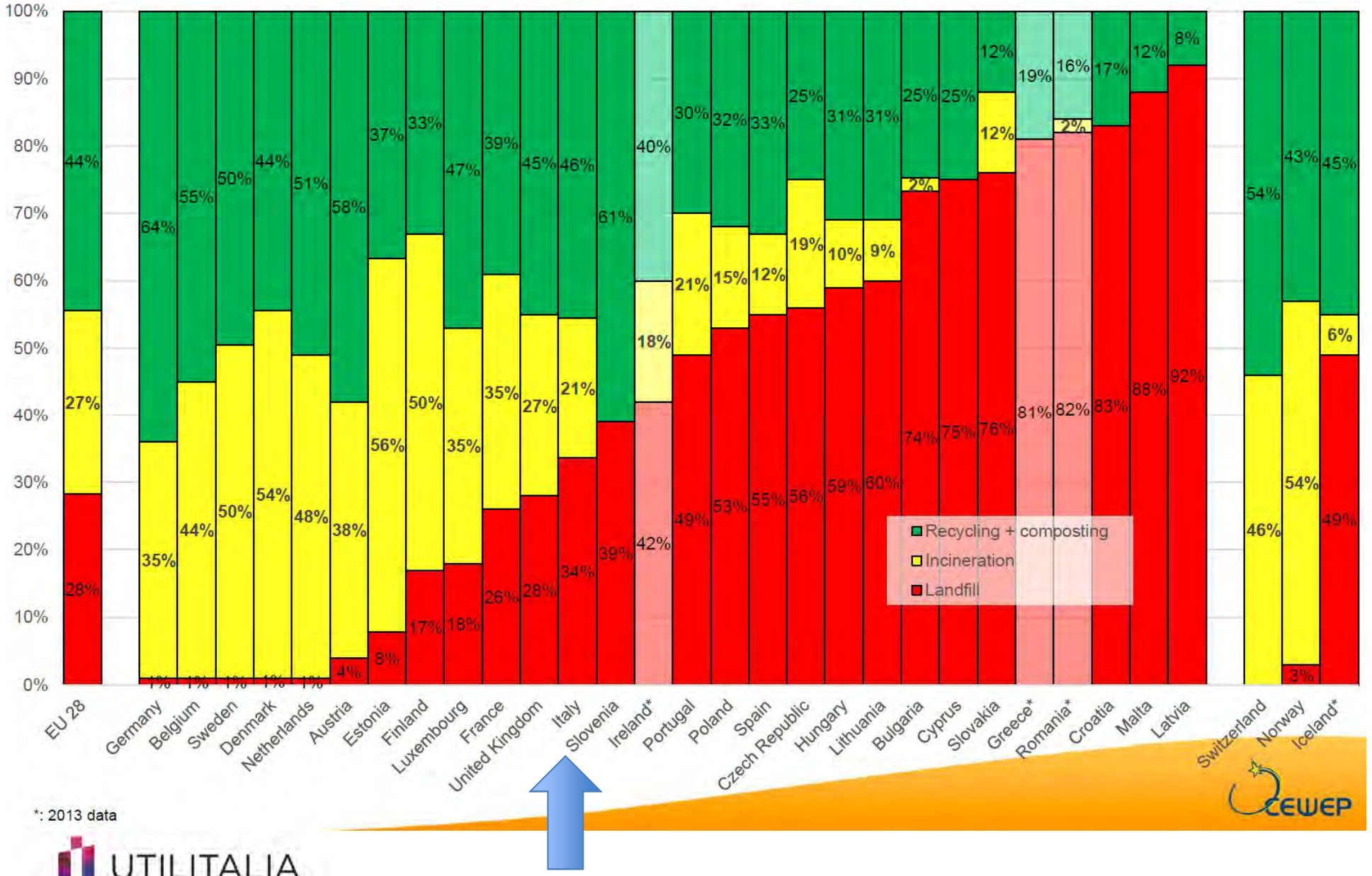
«Towards a Sustainable Waste Management»

Roma, 17th May 2016

UTILITALIA

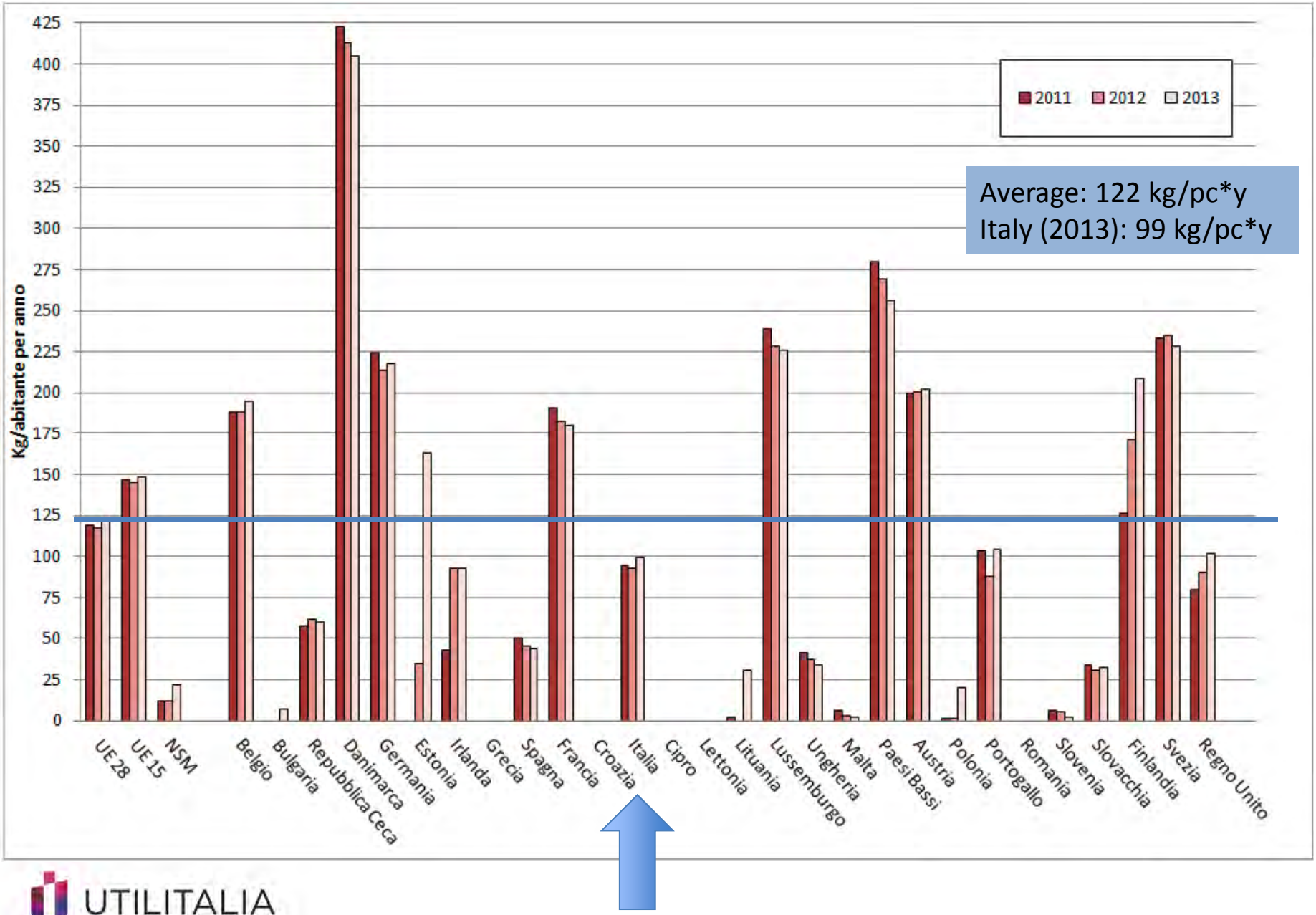
imprese acqua ambiente energia

MW Management in EU28 – year 2014



Source: CEWEP on EUROSTAT data

Per capita MW incinerated in EU; years 2011-2013



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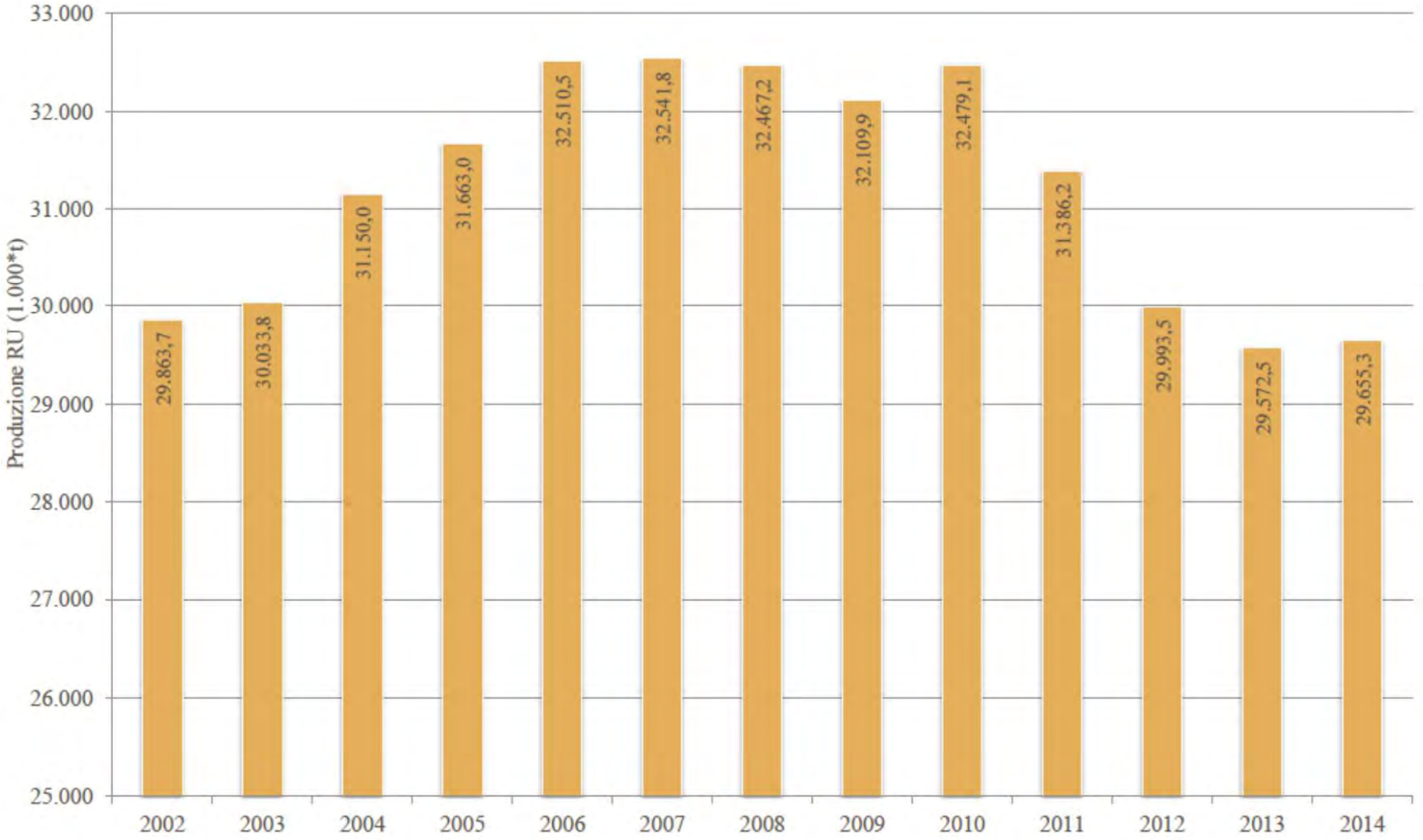
Source: ISPRA – Rapporto Rifiuti Urbani 2015

Municipal waste generation in Italy



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Source: ISPRA – Rapporto Rifiuti Urbani 2015

Per capita MW generation in Italy

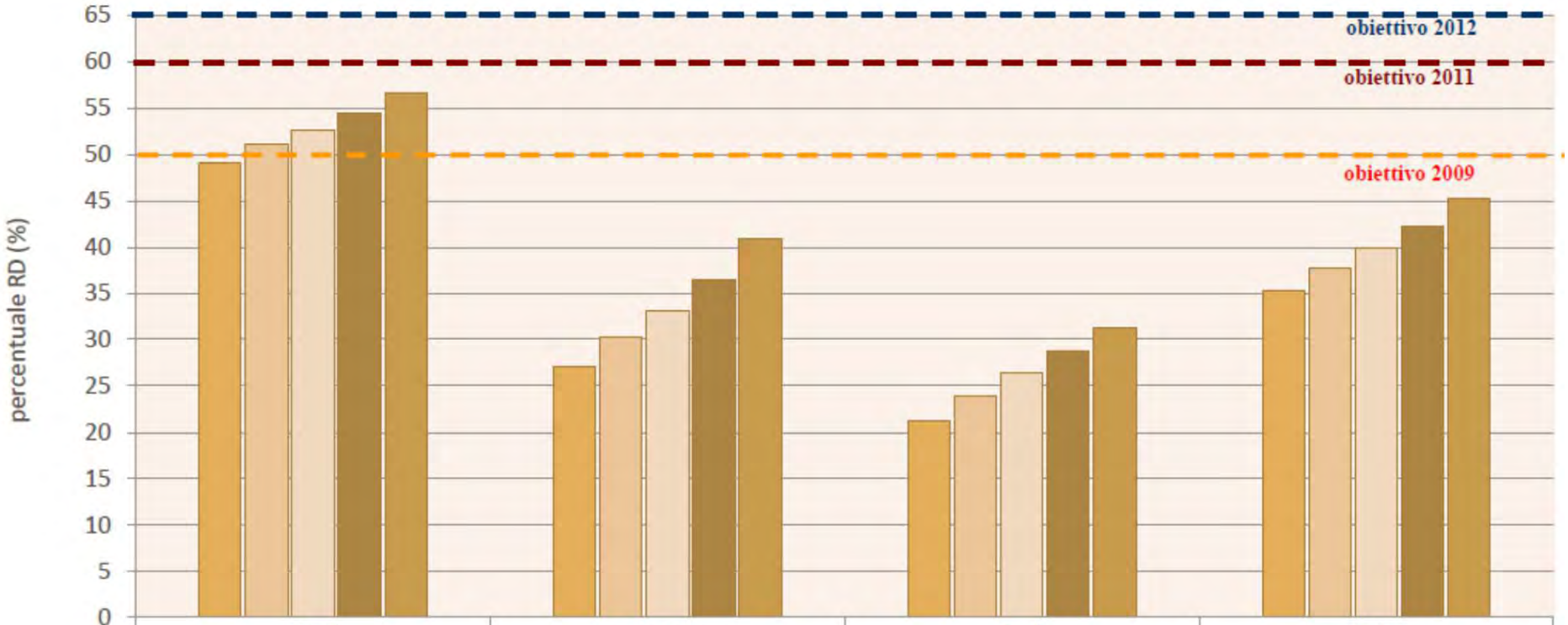
Macroarea	Popolazione 2014	2010	2011	2012	2013	2014
		(kg/ab.*anno)				
NORD	27.799.803	533	527	505	489	496
CENTRO	12.090.637	613	605	582	549	547
SUD	20.905.172	495	486	463	447	443
ITALIA	60.795.612	536	528	505	487	488

Rispetto al 2013: aumento di **7 kg** per abitante per anno (**+1,3%**) al Nord, e decrescite pari a **2 kg** per abitante per anno al Centro e **4 kg** per abitante per anno al Sud

UTILITALIA

Source: ISPRA – Rapporto Rifiuti Urbani 2015

MW separate collection in Italy

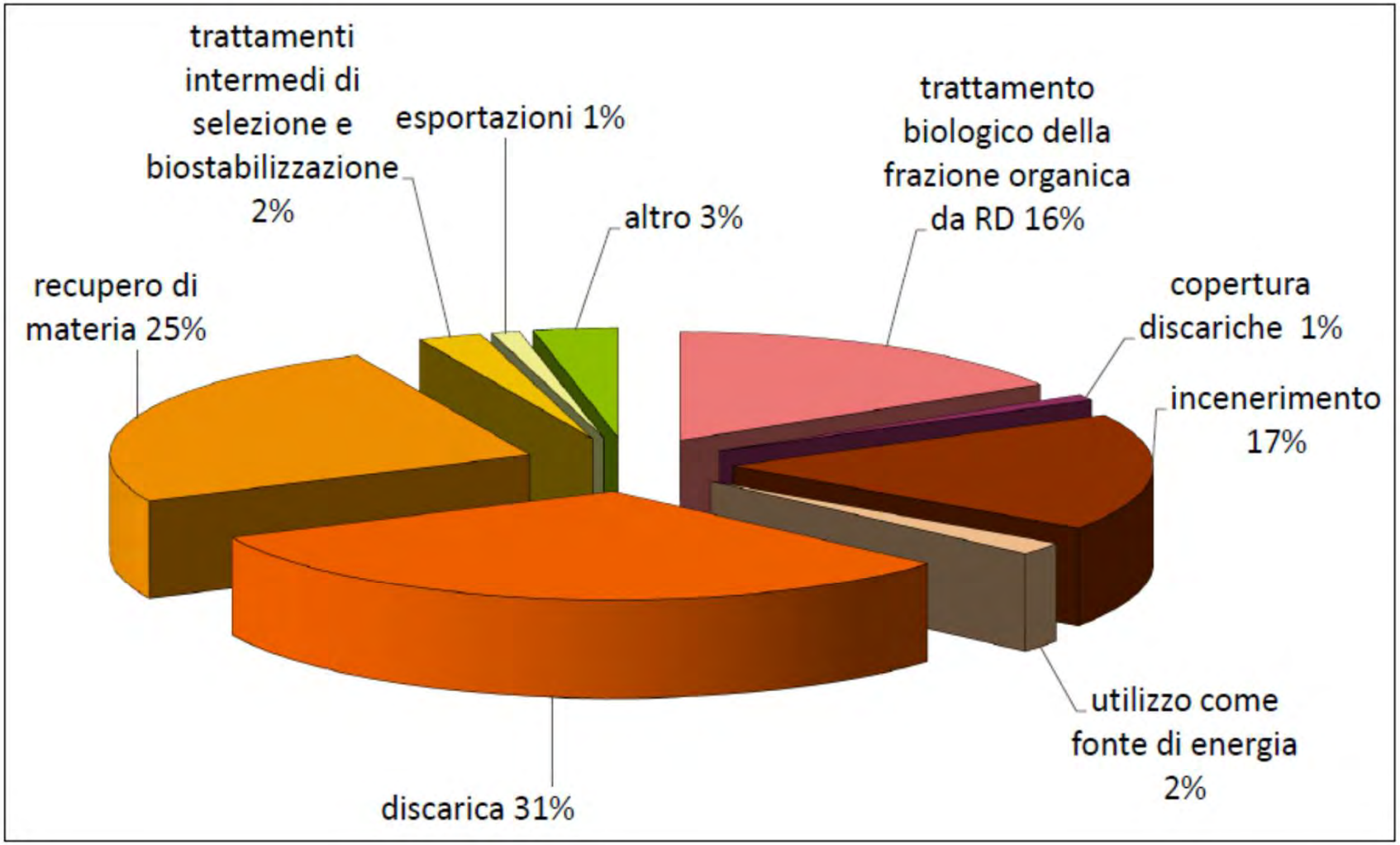


	Nord	Centro	Sud	Italia
2010	49,1	27,1	21,2	35,3
2011	51,1	30,2	23,9	37,7
2012	52,7	33,1	26,5	40,0
2013	54,4	36,4	28,8	42,3
2014	56,7	40,9	31,3	45,2

UTILITALIA

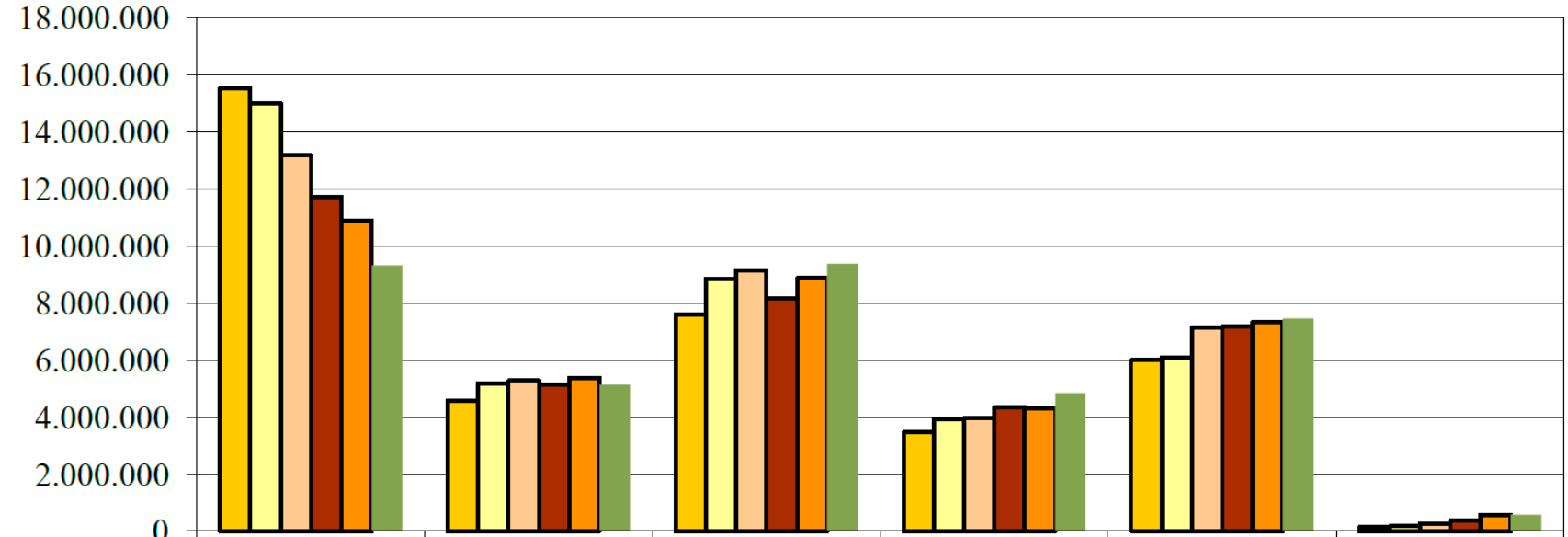
Source: ISPRA – Rapporto Rifiuti Urbani 2015

MW management in Italy - 2014



Source: ISPRA – Rapporto Rifiuti Urbani 2015

MW management in Italy - 2014



	discarica	incenerimento	trattamento meccanico biologico	tratt. biologico frazione organica	altre forme di recupero di materia	utilizzo come fonte di energia
2009	15.537.822	4.605.192	7.628.156	3.489.958	6.041.572	139.000
2010	15.015.119	5.215.665	8.868.728	3.942.637	6.106.281	171.107
2011	13.205.749	5.290.454	9.160.839	3.980.723	7.149.082	262.101
2012	11.720.316	5.167.886	8.167.522	4.365.686	7.176.963	361.137
2013	10.914.353	5.396.441	8.881.731	4.319.344	7.335.055	573.974
2014	9.331.561	5.155.030	9.390.658	4.865.278	7.472.007	565.484

UTILITALIA

Source: ISPRA – Rapporto Rifiuti Urbani 2015

MW landfilling in Italy

	Impianti		Quantità smaltita (1000*t)	
	2013	2014	2013	2014
Nord	77	77	2.781	2.613
Centro	39	40	2.933	2.144
Sud	65	55	5.200	4.575
ITALIA	**180**	**172**	**10.914**	**9.332**

UTILITALIA

Source: ISPRA – Rapporto Rifiuti Urbani 2015

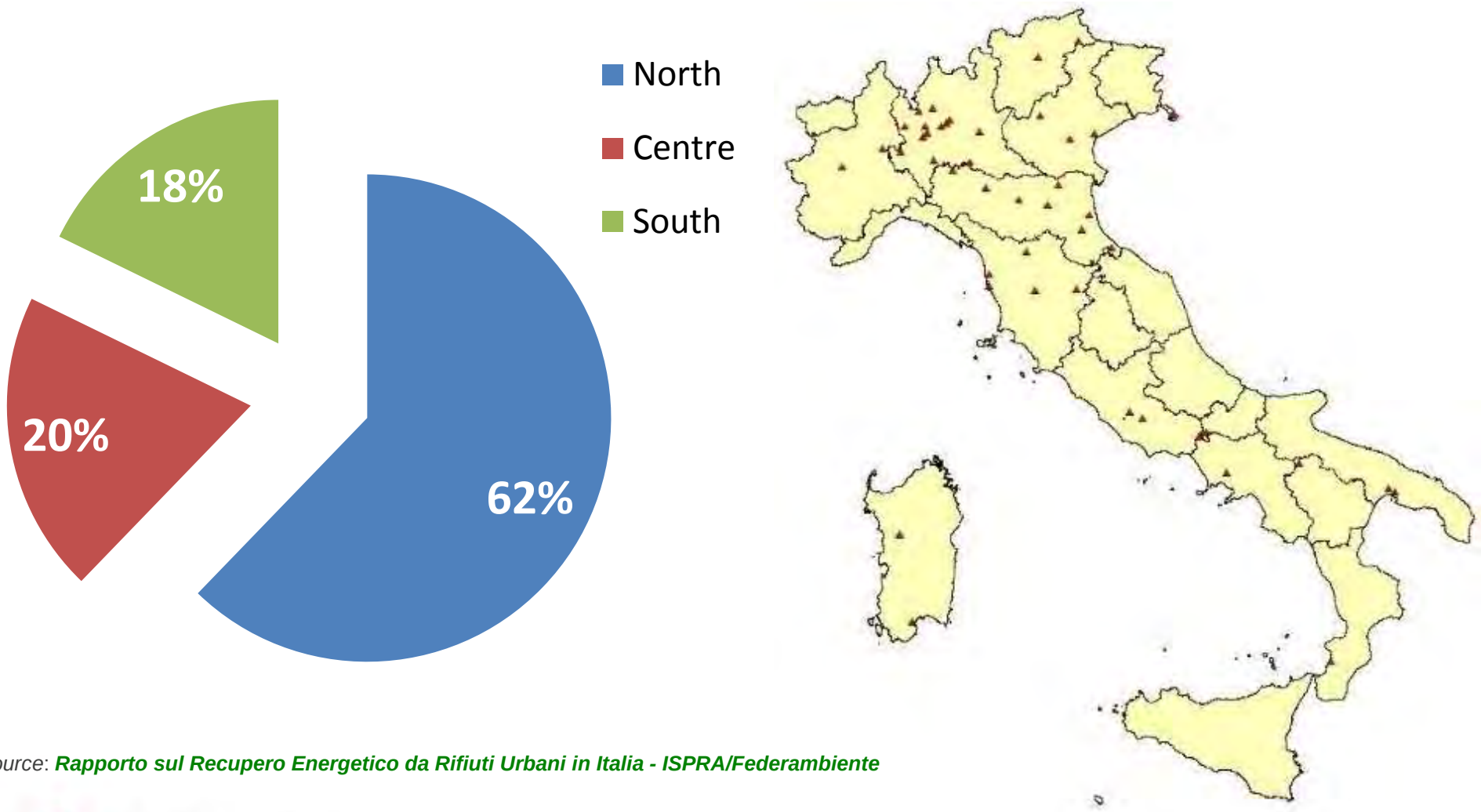
MW incineration in Italy

		Quantità (t)	
	N. impianti	RU, FS, CSS da RU	Totale
Nord	29	3.628.950	4.503.191
Centro	8	489.962	640.086
Sud	7	1.036.118	1.135.553
ITALIA	**44**	**5.155.030**	**6.278.830**

UTILITALIA

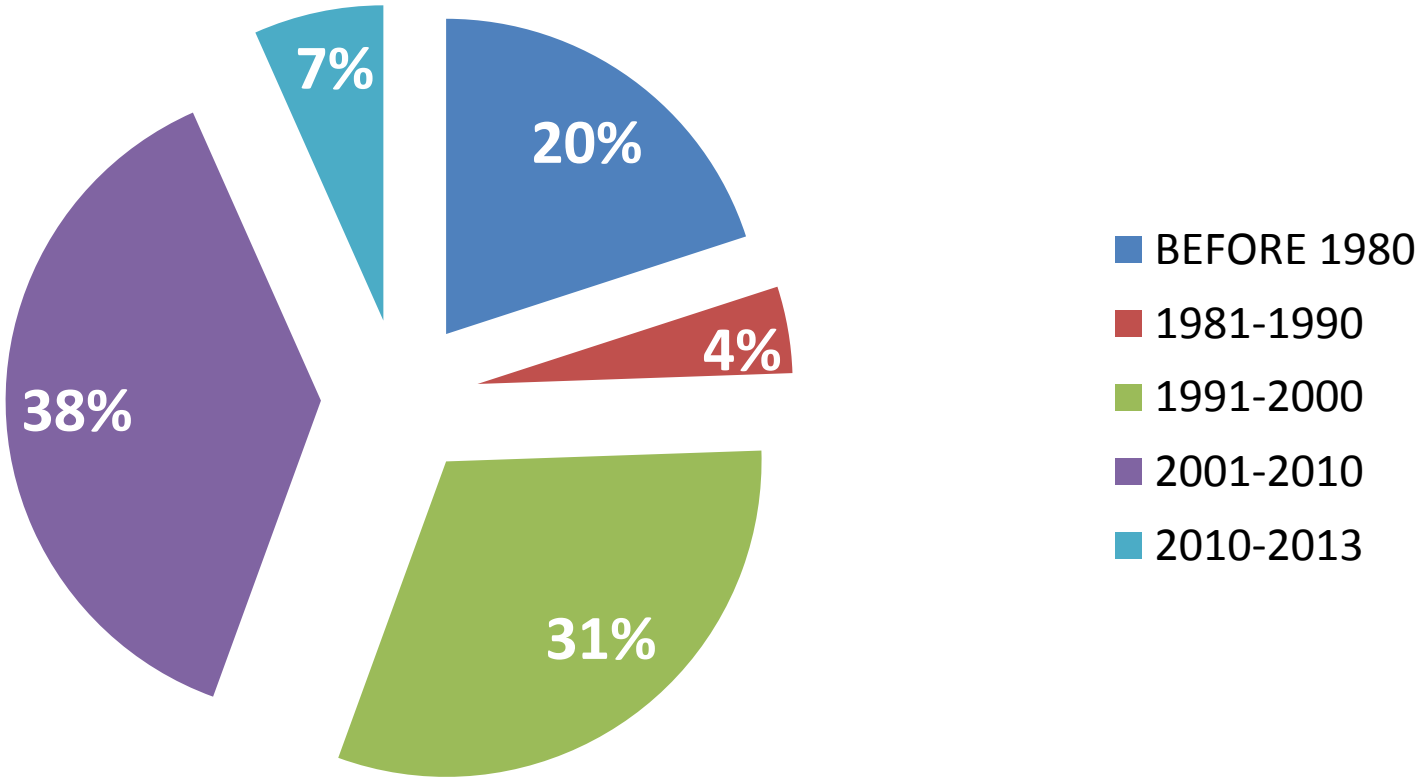
Source: ISPRA – Rapporto Rifiuti Urbani 2015

Incineration plants, Italy 2013



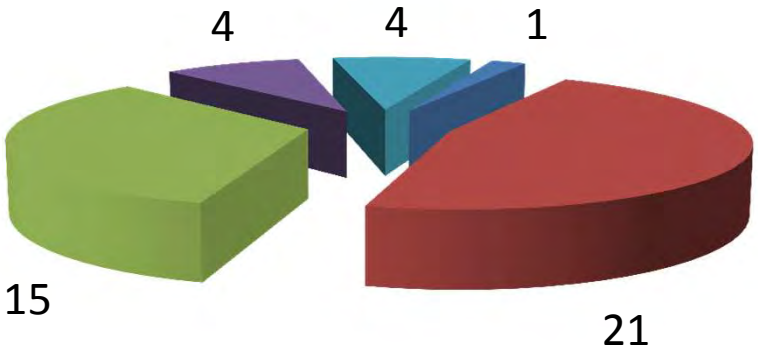
Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

Plants age



Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

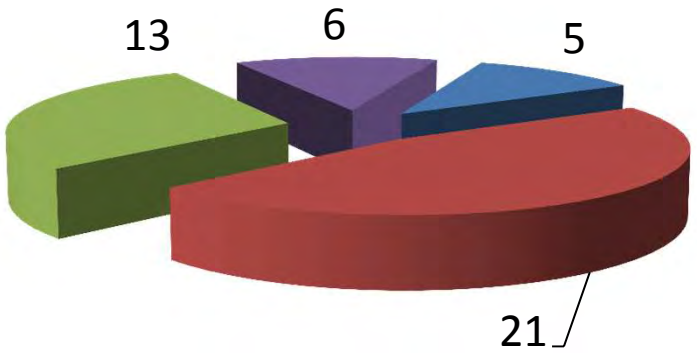
Incineration plants size



Average capacity 488 t/d
4 plants → 34,5% of total capacity

■ ≤ 100 t/d ■ >100 ≤ 300t/d ■ > 300 t/d ≤ 600 t/d ■ > 600 ≤ 1200 t/d ■ > 1200 t/d

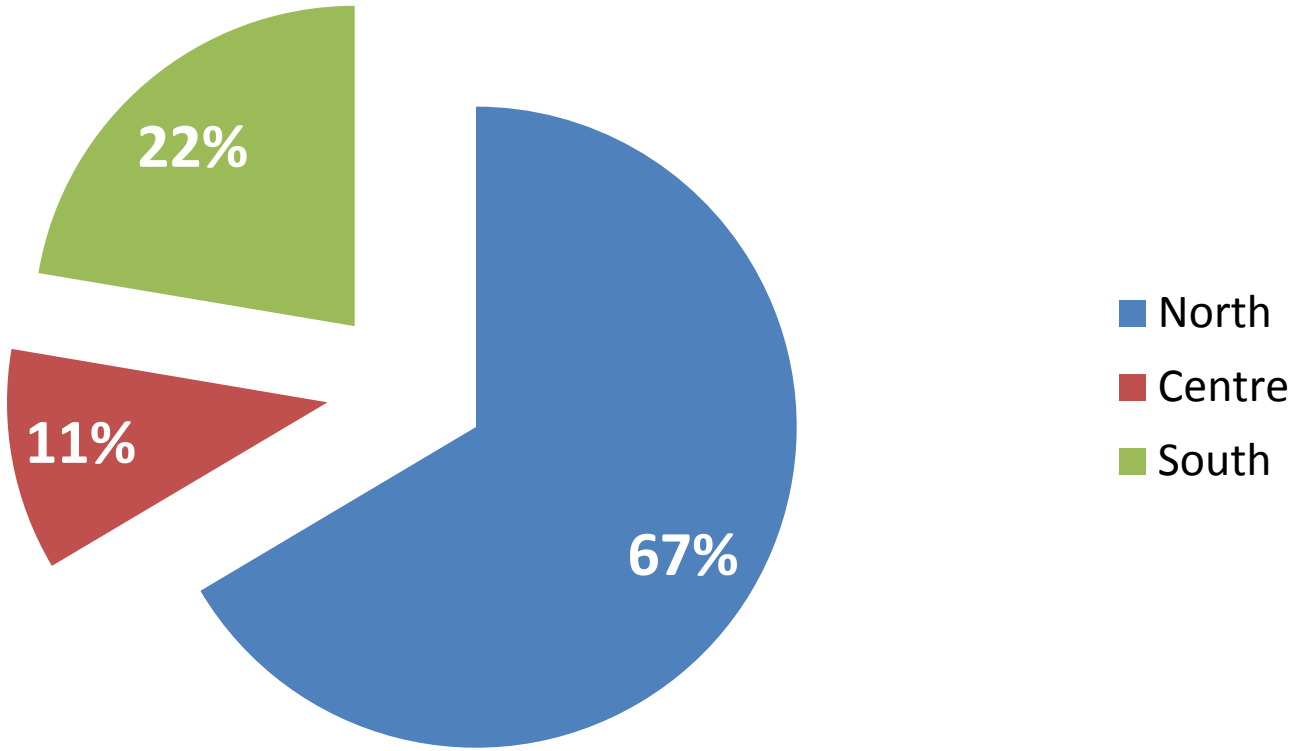
Thermal capacity (MW)



■ ≤ 20MW ■ > 20 MW ≤ 50 MW ■ > 50 MW ≤ 100 MW ■ >100 MW

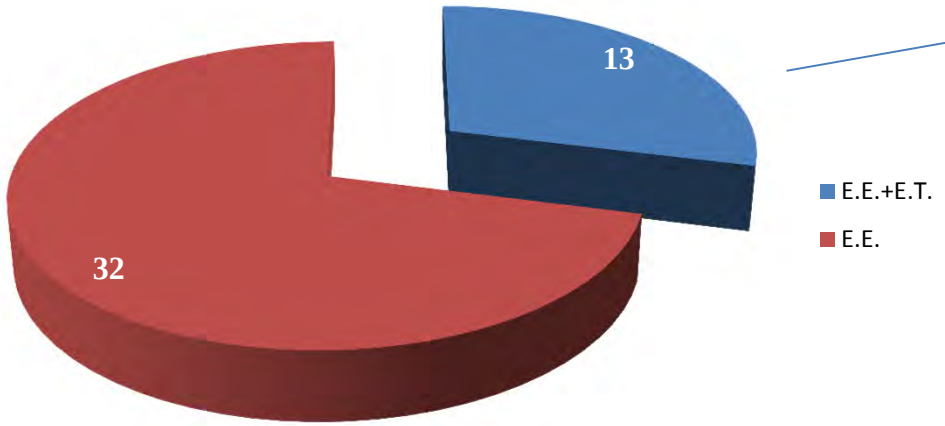
Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

Energy from WTE, 2013



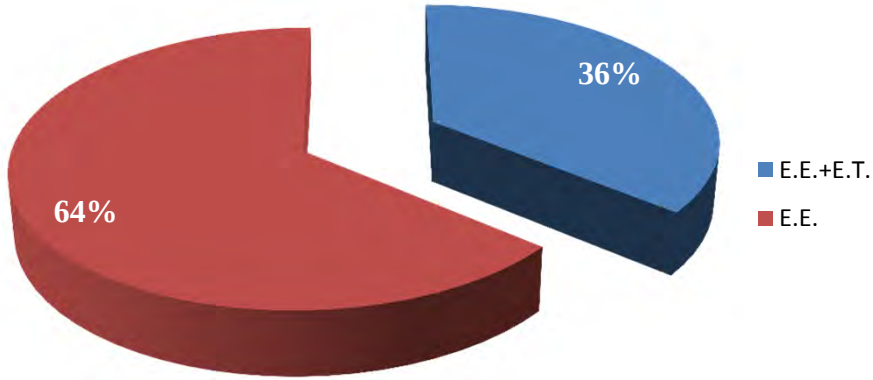
Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

Energy from WTE, 2013



7 Lombardia
1 Trentino Alto Adige
4 Emilia Romagna
1 Toscana

Per number of plants

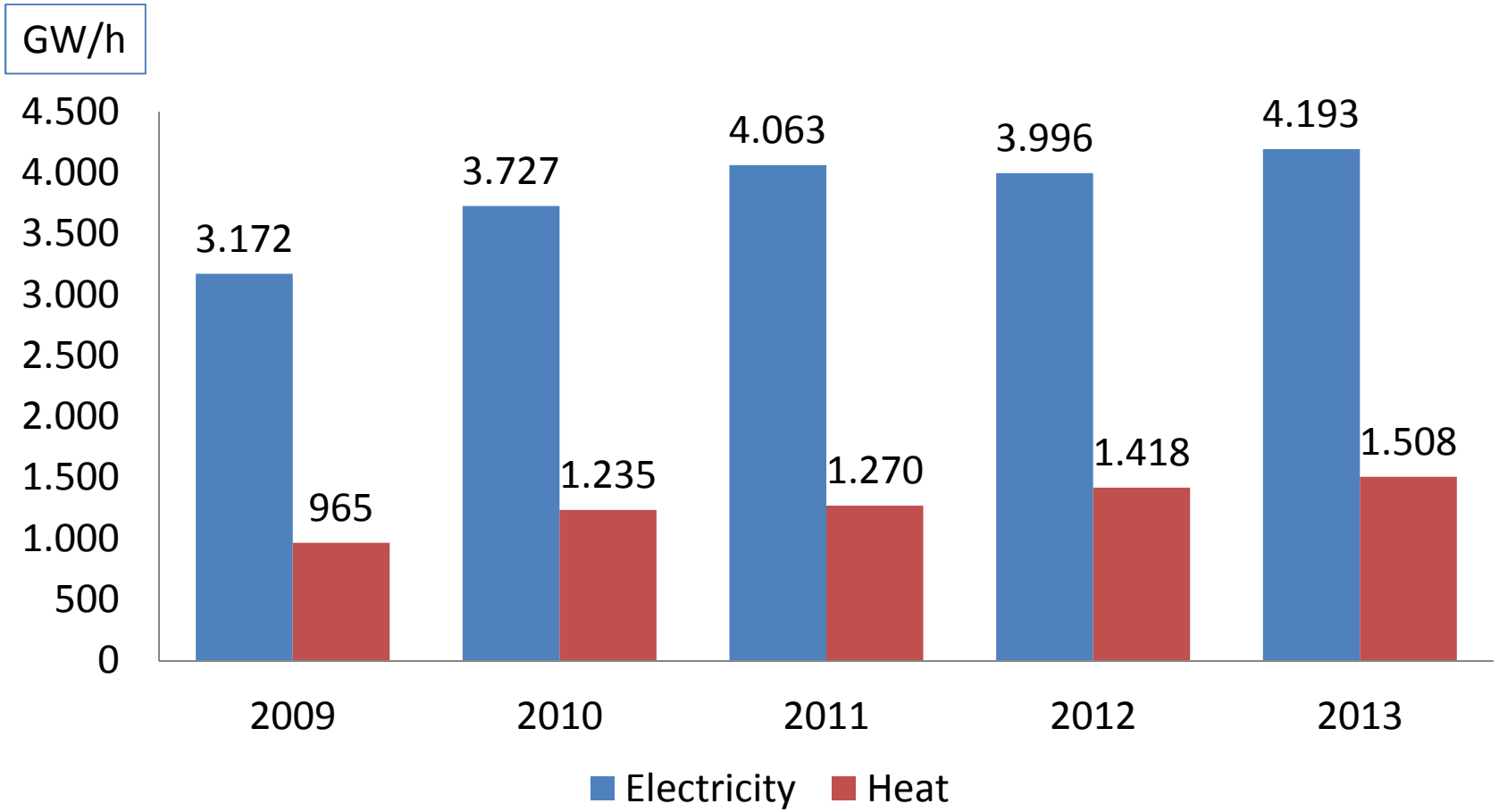


Per treatment capacity

E.E. = Electric Energy
E.T. = Heat

Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

Energy from WTE



Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

Generation and management of residues - 2013

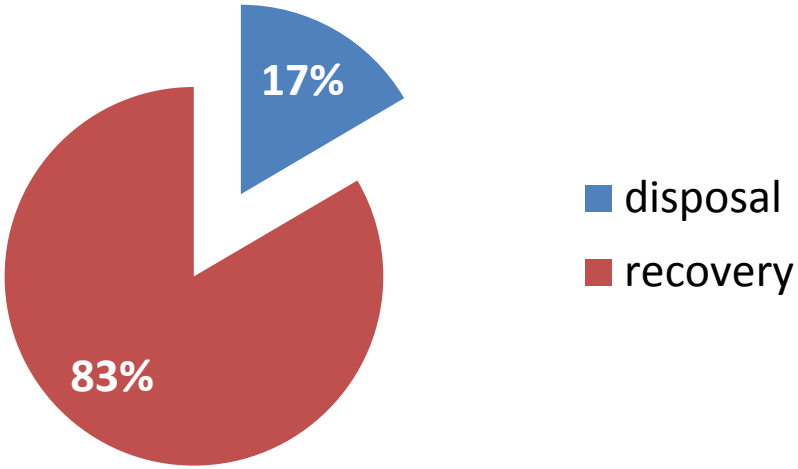
Macro-area	Bottom Ash ($t*10^3$)			Fly Ash ($t*10^3$)		
	generation	disposal	recovery	generation	disposal	recovery
North	720,9	105,6	615,2	295,5	249,8	48,4
Center	99,2	30,6	68,6	32,3	30,8	1,5
South	172,7	44,9	129,6	61,6	61,6	0
ITALY	**992,8**	**181,0**	**813,4**	**389,4**	**342,2**	**49,9**

94% of Bottom Ash are non-hazardous waste

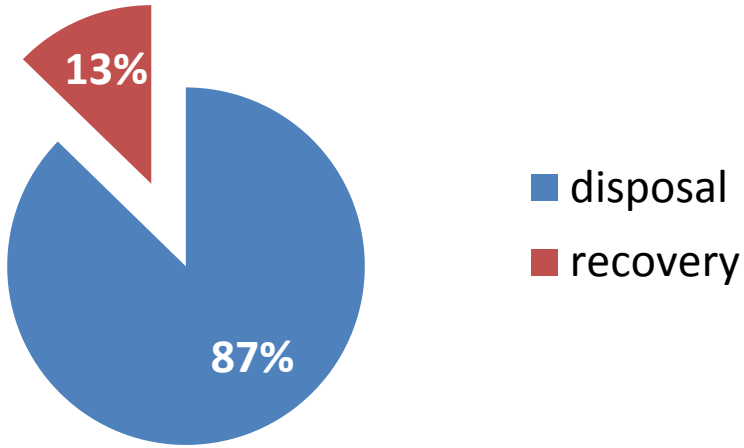
Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

Management of WTE residues 2013

Bottom Ash



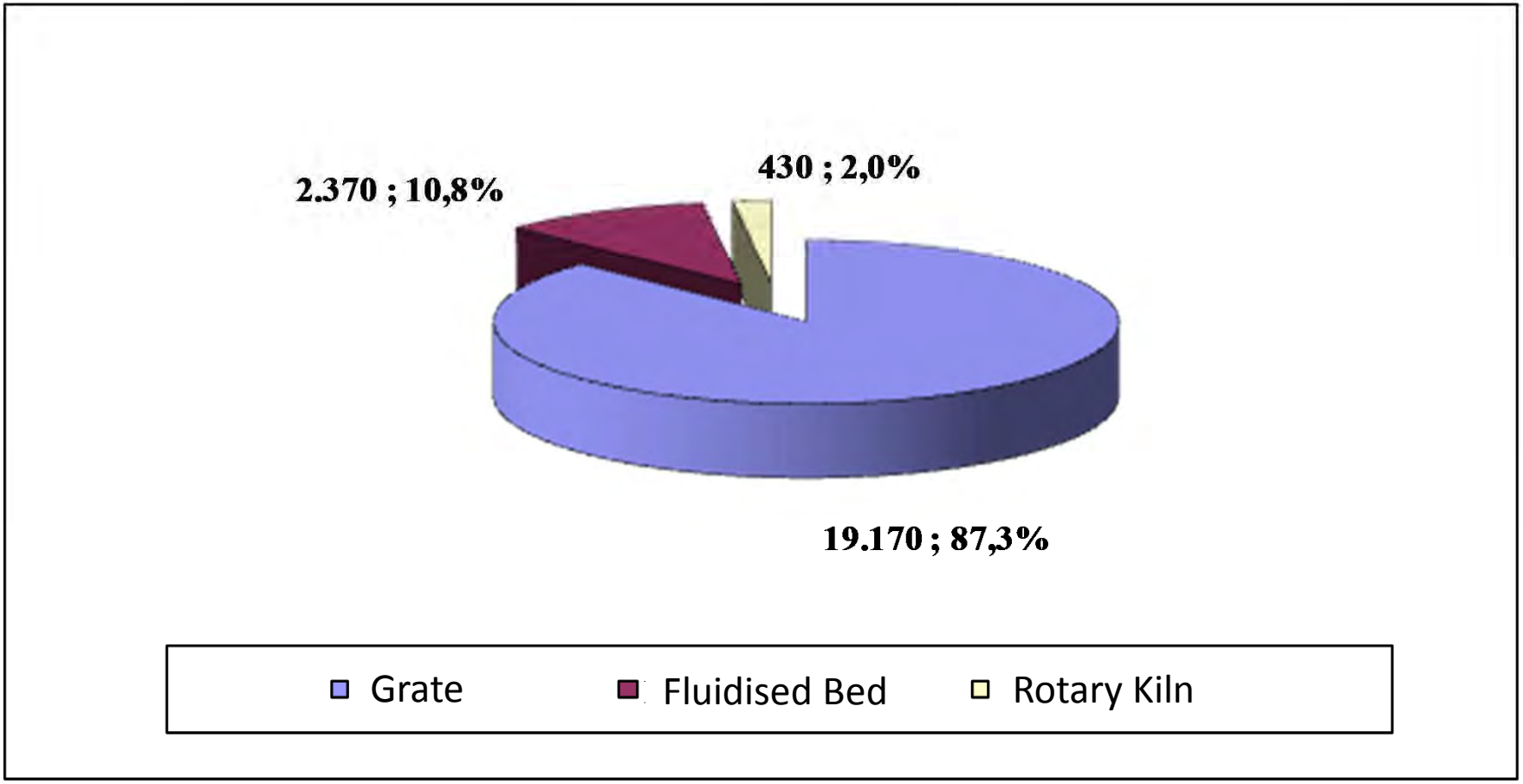
Fly Ash



Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

WTE COMBUSTION TECHNOLOGIES

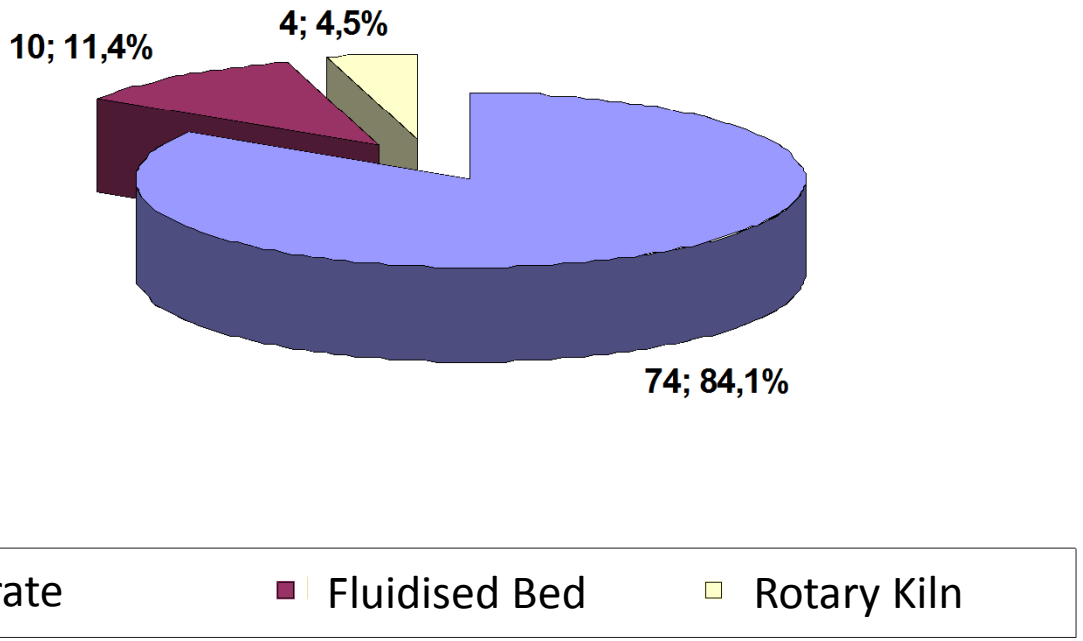
Distribution of thermal treatment techniques, related to their capacity installed (t/d)



Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

WTE COMBUSTION TECHNOLOGIES

Distribution of thermal treatment techniques, related to the existing lines



Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

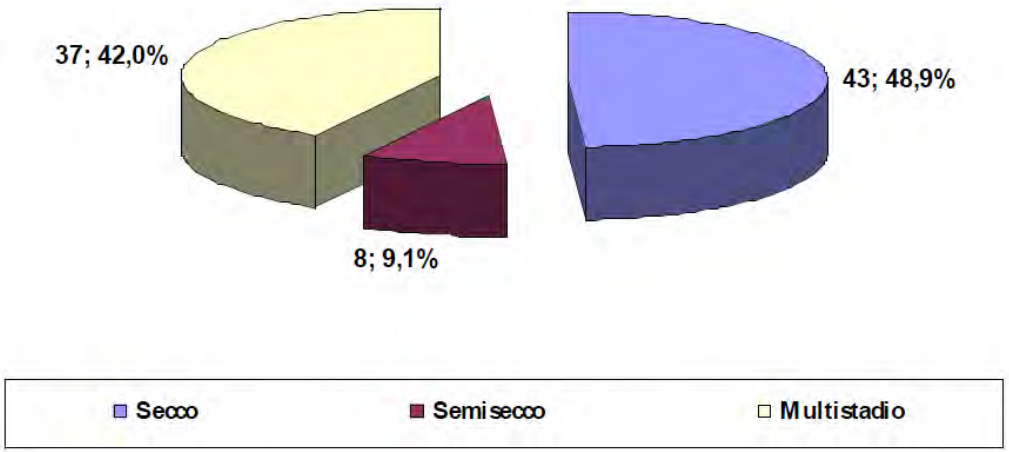
FLUE GAS TREATMENT

De-dusting	**Electrostatic precipitators (EP)** **Fabric Filters(FF)** **Cyclones (CY)**
Neutralization of Acid gas emissions	**Dry (DA)** **Semi-dry (SD)** **Wet scrubbing (WS)** **Multistage (MS) (generally: DA+WS)**
Reduction of Nitrogen emissions	**Selective non-catalytic reduction (SNCR)** **Selective catalytic reduction (SCR)**
Removal of micro-pollutants	**Activated carbon injection (AC)** **SCR**

Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

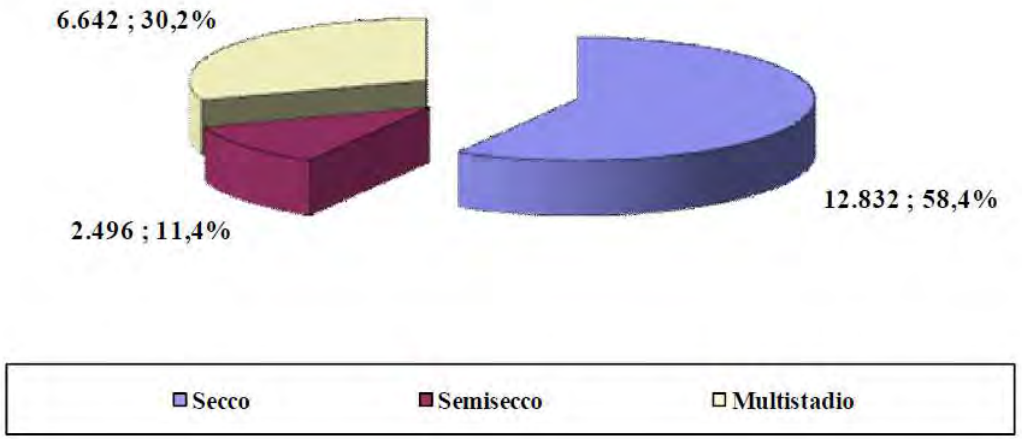
FLUE GAS TREATMENT

45 plants
88 lines



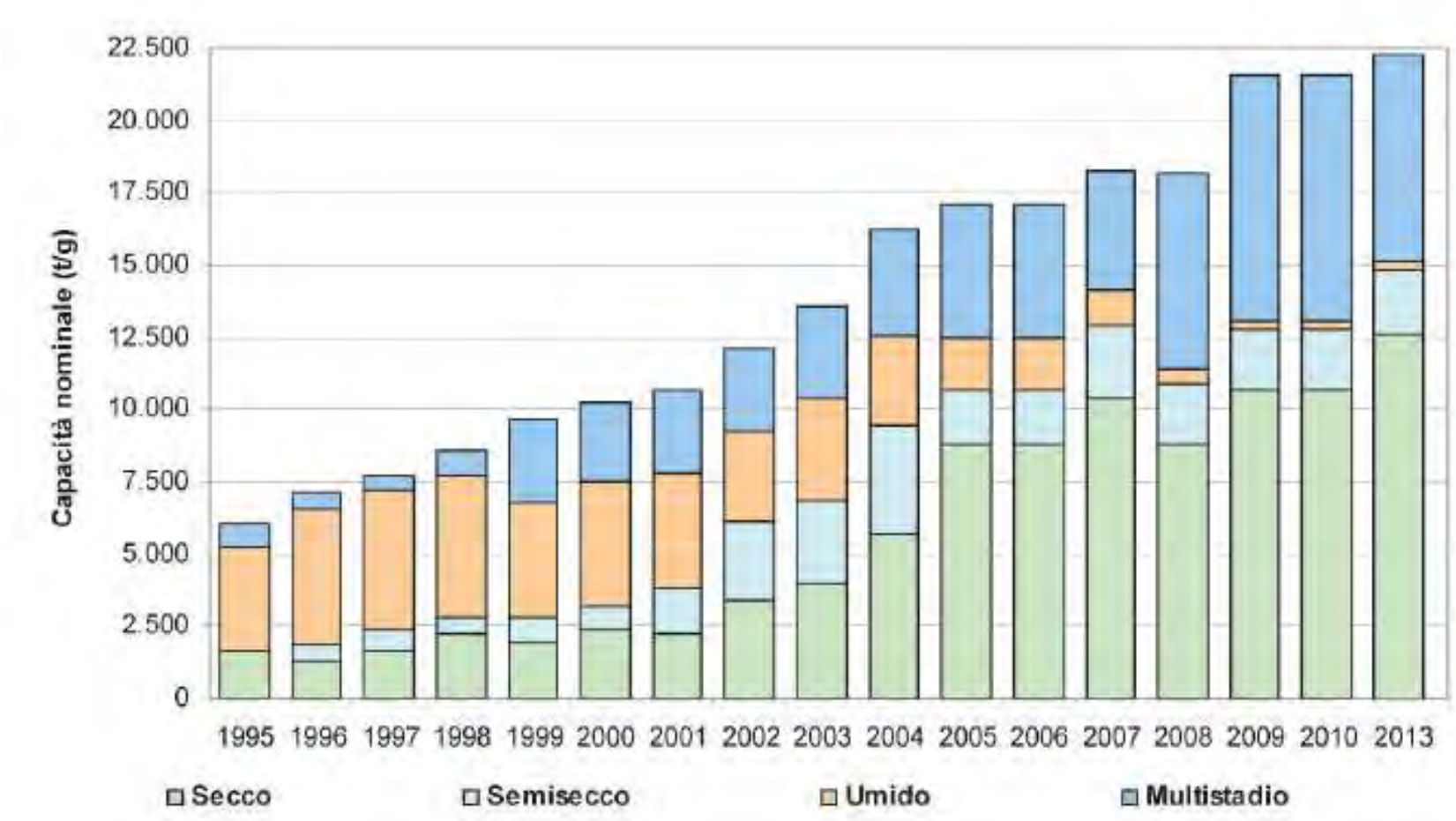
Per number of lines

Per treatment capacity



Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

FLUE GAS TREATMENT

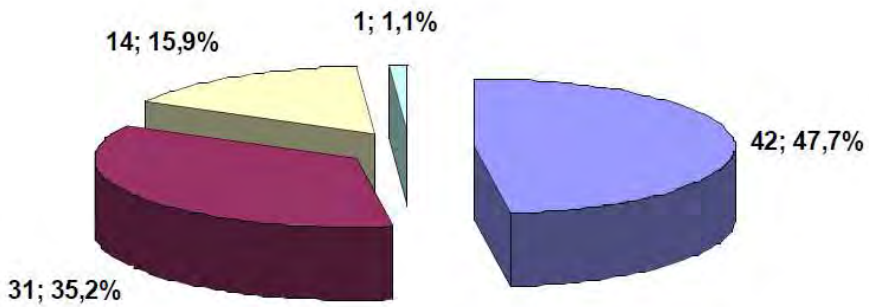


Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

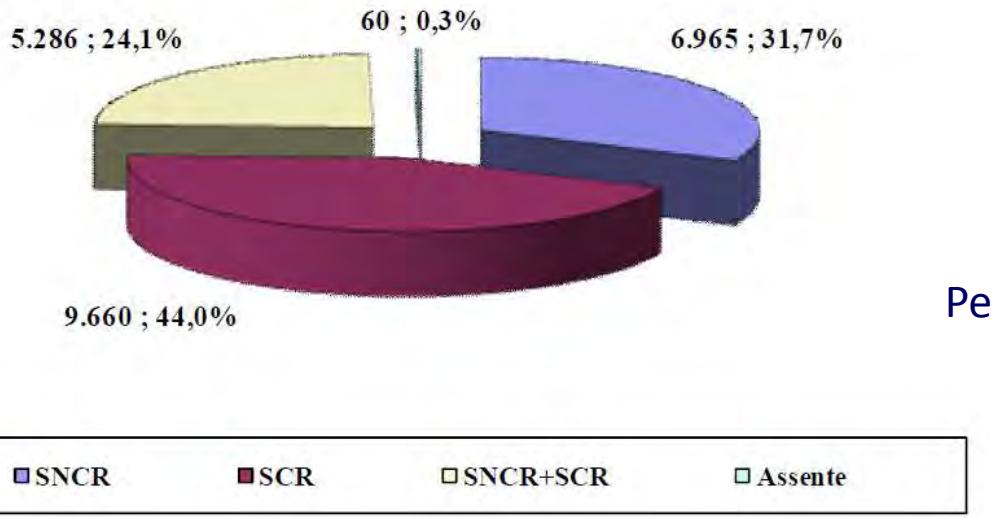
NOx CONTROL

45 plants
88 lines

Per number of lines



Per treatment capacity



Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

Monitoring of pollutants

According the legislation, the monitoring of pollutants was carried out by:

- Continuous monitoring of the following «macro-pollutants» (dust, CO, HCl, HF, SO_2, NOx) and in many cases of NH_3;

- Periodical sampling and measurement of organic and inorganic micropollutants (PCDDs/PCDFs, PAHs, Heavy Metals, Cd, Hg).

Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

Monitoring of pollutants

For organic and inorganic micropollutants, many plants carry out periodical measurements, with a higher frequency than the legislation standards (every 4 months). In some cases, also on a monthly or fortnightly basis.

Most of the plants carries out Ammonia measurements, in great part through continuous measurements (in 39 plants); the ELV are quite diversified but generally ranging from 5 to 30 mg/Nm3 on a daily basis.

At least 25 plants perform a continuous sampling of Dioxins, 16 the continuous sampling of Mercury and at least 30 plants periodically measure PCBs.

Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

AVERAGE ITALIAN PLANT

		2010	2013
Capacity (day)	t/d	400	490
Capacity (year)	t/y	135.000	161.000
Thermal capacity	MW	55	67,6
Eelctrical power	MW	14,8	18,8
N° lines	--	~2	~2
Thermal treatment	--	Grate	Grate
APC	--	“dry”	“dry”
NO_x Removal	--	SNCR	SNCR
Energy recovery	--	Electricity	Electricity

Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

AVERAGE ITALIAN PLANT

	u.m.	2005	2008	2010	2013	
Capacity	**t/g**	300	360	400	490	↑
Thermal capacity	**MW**	42	46	55	67,6	↑
Electrical Power	**MW**	10	11,5	14,8	18,8	↑
N° of lines	--	2	~2	~2	~2	=
Thermal treatment	--	Grate	Grate	Grate	Grate (WC)	=
APC	--	“dry”	“dry”	“dry”/MS	“dry”/MS	
NO_x Removal	--	SNCR	SNCR	SNCR (SCR)	SNCR -SCR	=
Energy Recovery	--	Electricity	Electricity	Electricity	Electricity	

Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

ITALIAN WTE PLANTS

	u.m.	2010	2013	Δ% 2010/13
Operating plants	-	50	45	- 10,0
Existing plants	-	53	55	+ 3,8
Treatment capacity	**Mt/a**	7,12	7,26	+ 2,0
Thermal capacity	**MW**	2.925	3.045	+ 4,1
Electrical Power	**MW**	782	848	+ 8,4
Treated waste	**Mt**	5,70	5,8	+ 1,8
Electricity	**GWh**	3.887	4.193	+ 7,9
Heat	**GWh**	1.212	1.508	+ 24,4
Bottom ash	**10^3t**	963	994	+ 3,2
Fly Ash	**10^3t**	306	392	+28,1

Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

CONCLUSIONS

- **45** operating plants , 7 non operating plants and 3 closed plants (at 31/12/2013)
- **Average size** quite small, but increasing
- Average plant: grate + Dry treatment + DeNO_x SNCR/SCR
- All the plants perform energy recovery, mostly electric energy
- Applications of new techniques and technologies, particularly for the APC
- **Recovery** of residues in constant growth
- An evident gap is persisting between North and Centre/South of Italy

Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

THE NATIONAL LEGISLATIVE FRAMEWORK

Climate Correction factor for R1 Formula

The Commission Directive on Climate Correction Factor for the Energy Efficiency Formula (R1 formula) 2015/1127 of 10 July 2015 established the two following conditions for the Climate Correction Factor (CCF):

1. Climate Correction Factor = **1,25 for plants authorised and operating within 1st september 2015**
2. Climate Correction Factor = **1,12 for plants authorised after the 31st august 2015** and for the plants above (at point #1) after the 31st december 2029

Thanks to the official establishment of this CCF value, **37** WTE plants in Europe **achieved R1 status** and were considered «recovery operations» (corresponding to the 34% of all WTE plants at the moment classfied as D10, disposal operation).

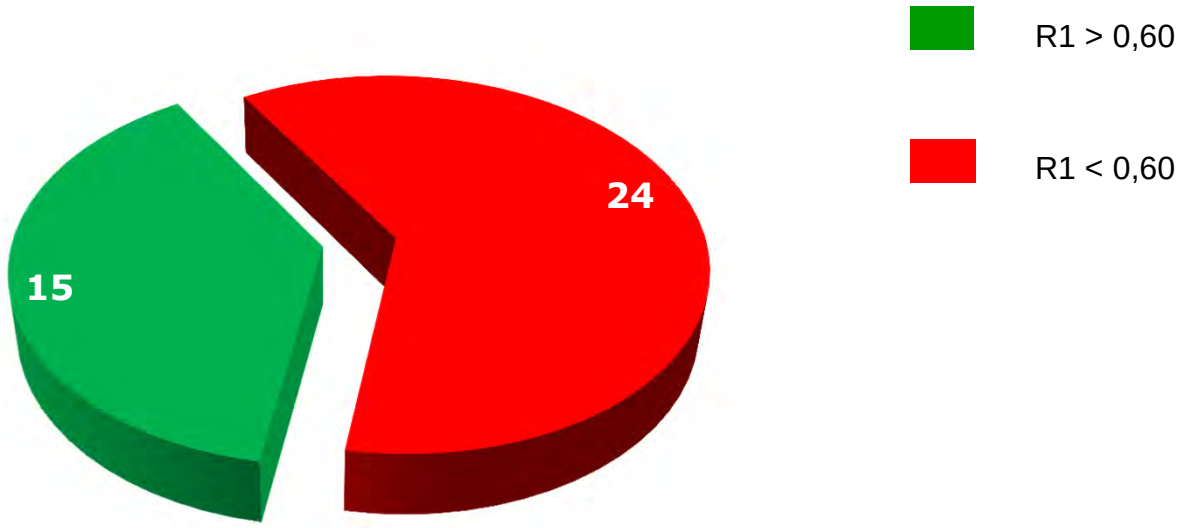
Ministerial Decree 7th August 2013

Application of the formula for the calculation of energy efficiency of Waste to Energy plants in relation to climate conditions

- The Decree established a climate correcion factor, corresponding to the «Option B» of the ESWET study ESWET (its value varies with temperature, for a maximum of 1,382)

- This climate correction factor can be applied only to WtE plants localised in Italy, treating only waste generated in the italian territory.

R1 incineration plants in Italy in 2012



Source: ***Rapporto sul Recupero Energetico da Rifiuti Urbani in Italia - ISPRA/Federambiente***

National legislative framework

Decree –Law «Sblocca Italia», Law 11th november 2014 n. 164

Article 35
«Urgent measures for the realization on a national level of an adequate and integrated management system for municipal waste and to achieve the targets related to separate collection and recycling»

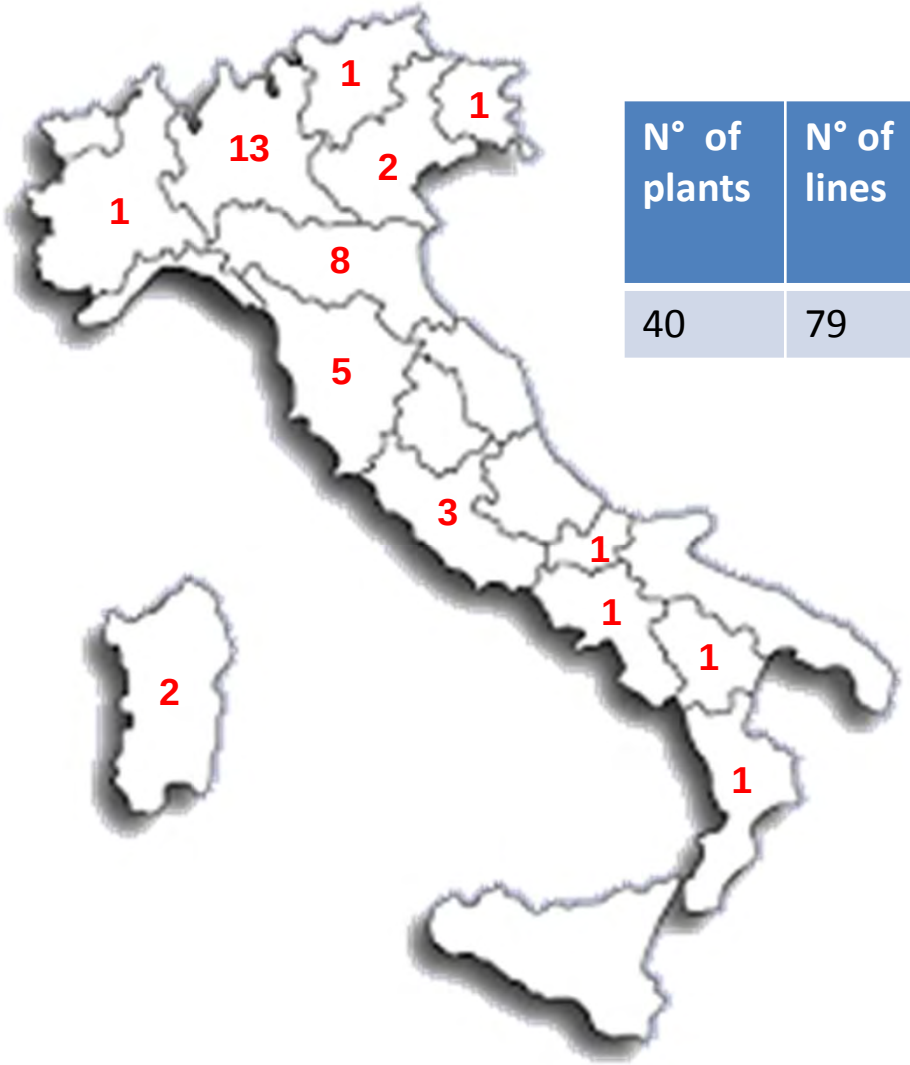
Draft DPCM implementing article 35, paragraph 1.

Objectives:

- the identification of the **current national treatment capacity** of incineration plants for municipal waste and similar waste, in operation at November 2015;
- the identification of the **potential national treatment capacity**, referring to the **authorized** incineration plants for municipal and similar waste and **not in operation** at November 2015;
- the identification, by macro-areas and regions, of the **incineration plants** with energy recovery of municipal waste and similar **to build or to potentiate**, in order to cover the national residual need.

Draft DPCM EX ART.35, §1 - DL SBLOCCA ITALIA

List of authorised and currently operating incineration plants



N° of plants	N° of lines	Thermal capacity (MW)	Authorised Capacity (t/y)
40	79	2.893,77	5.910.099

Draft DPCM EX ART.35, §1 - DL SBLOCCA ITALIA

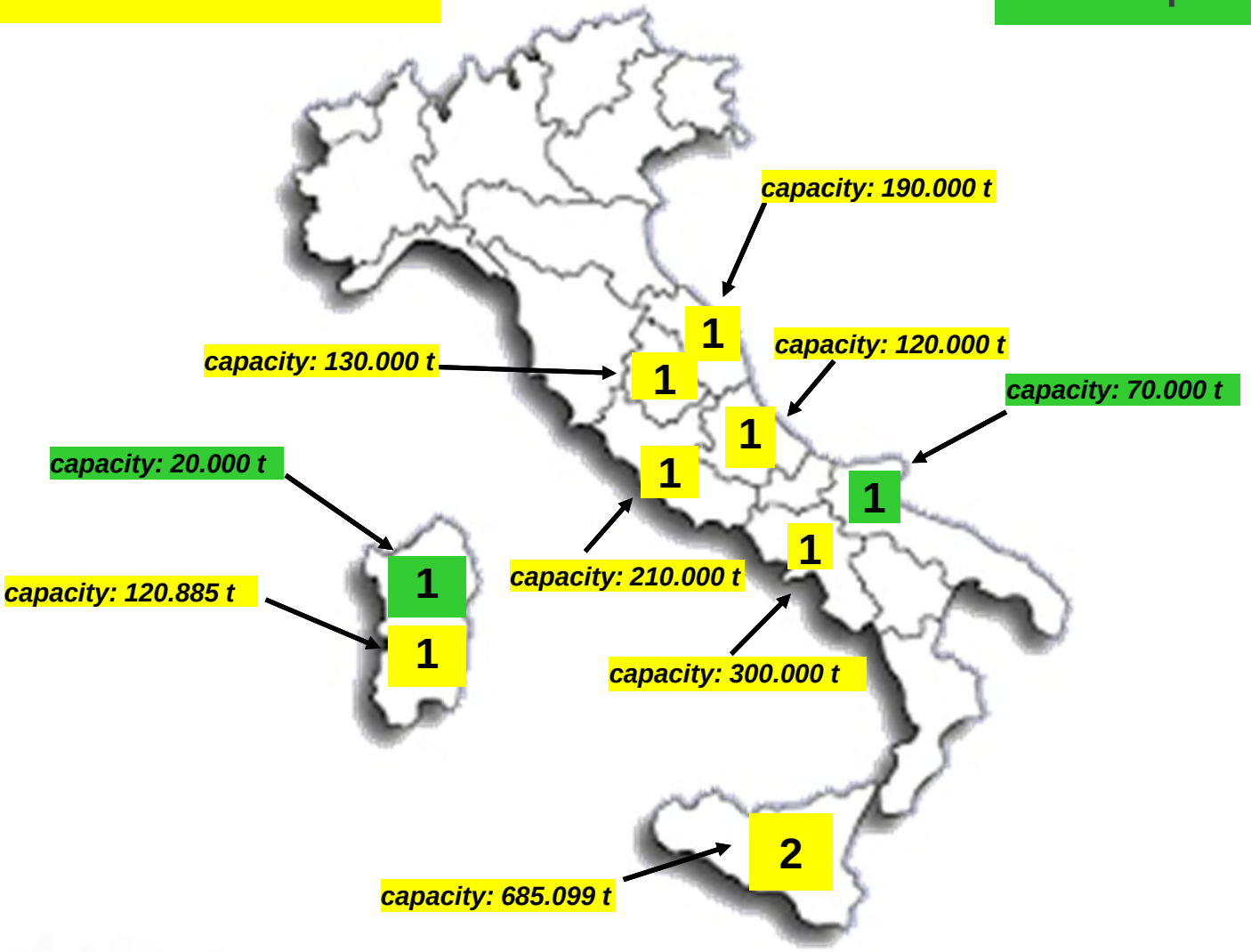
List of authorised but not operating incineration plants

N° of plants	N° of lines	Thermal capacity (MW)	Authorised Capacity (t(y)
6	9	449,1	665.650

Draft DPCM EX ART.35, §1 - DL SBLOCCA ITALIA

Plants to be built

Plants to potentiate



Identification, by macro-areas and regions, of the incineration plants with energy recovery of municipal waste to build or to potentiate, in order to cover the national residual need

TABELLA C

Individuazione, localizzazione e capacità degli impianti da realizzare o da potenziare per soddisfare il fabbisogno residuo nazionale							
Macro Area Geografica	**Nord**	**Centro**		**Sud**		**Sardegna**	**Sicilia**	**Totale**
Fabbisogno residuo da soddisfare [t/a]	nullo	523.918		488.432		120.885	685.099	**1.818.334**
Numero di impianti da realizzare per macroaree	0	3		2		1	2	**8**
Individuazione della capacità e della localizzazione degli impianti da realizzare [t/a]	0	130.000	Umbria	300.000	Campania	101.000	690.000	**1.741.000**
		190.000	Marche					
		210.000	Lazio	120.000	Abruzzo			
Individuazione della capacità e della localizzazione degli impianti da potenziare [t/a]	0	0		70.000	Puglia	20.000	0	**90.000**
Fabbisogno impiantistico da realizzare [t/a]	**nullo**	**530.000**		**490.000**		**121.000**	**690.000**	**1.831.000**

Article 6 – Final provisions

The WTE plants identified in the Decree are considered **strategic installations of national importance** and they constitute an **integrated and modern management system** for municipal and similar waste; **ensuring national security in the self-sufficiency** of the integrated waste management cycle, as required by Article 16 of Directive 2008/98/EC .

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