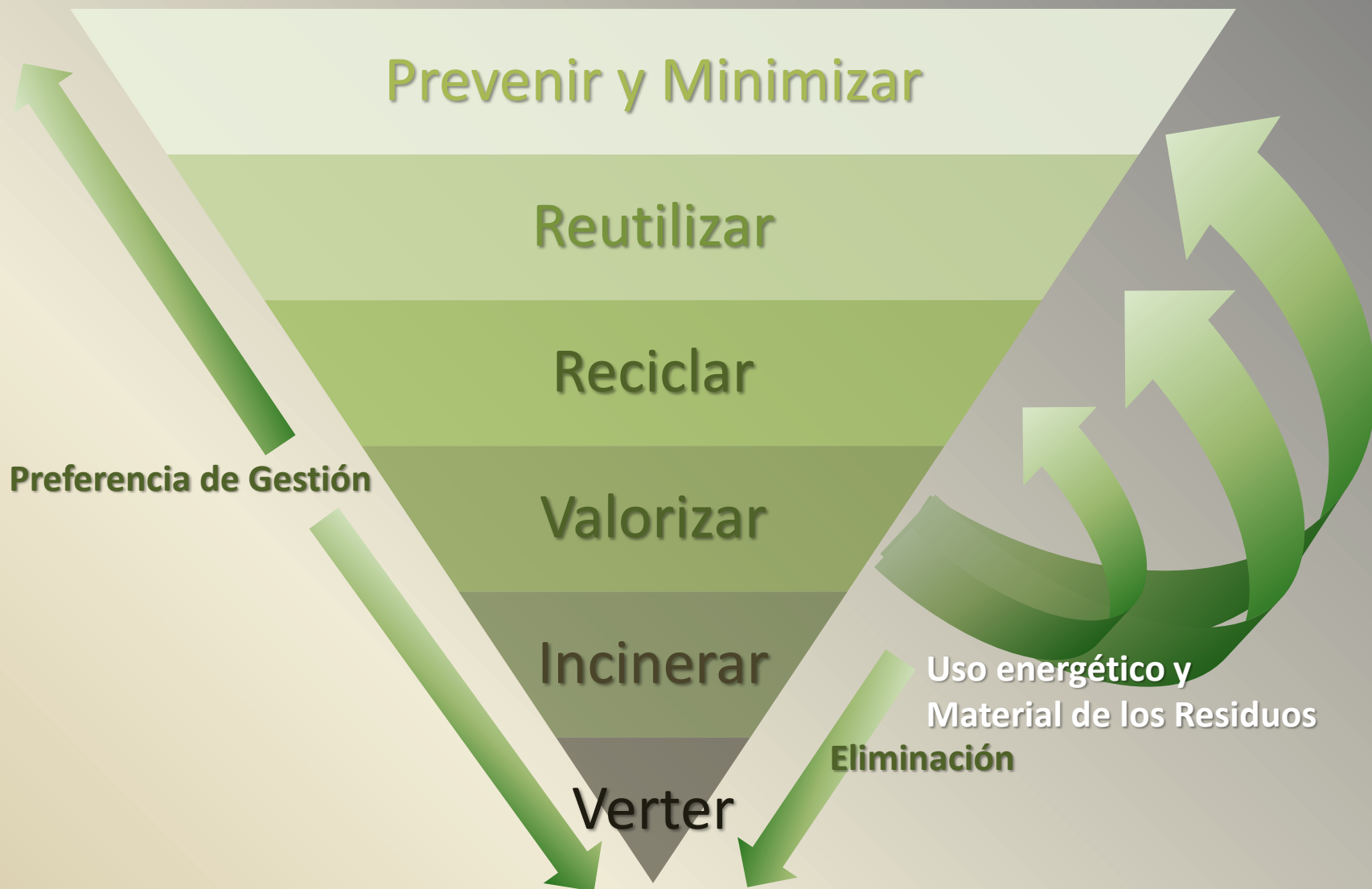


ESTADO Y PERSPECTIVAS FUTURAS DE LA VALORIZACIÓN ENERGÉTICA EN ESPAÑA

Antonio Orrego Duran

Vicepresidente de la Asociación de Empresas de Valorización Energética de Residuos Sólidos Urbanos





Prevenir y Minimizar

Reutilizar

Rechazo de Plantas
No recuperables
Impropios
Tóxicos

Preferencia de Gestión

Valorizar

Uso energético y
Material de los Residuos

Incinerar
Eliminar

Eliminación

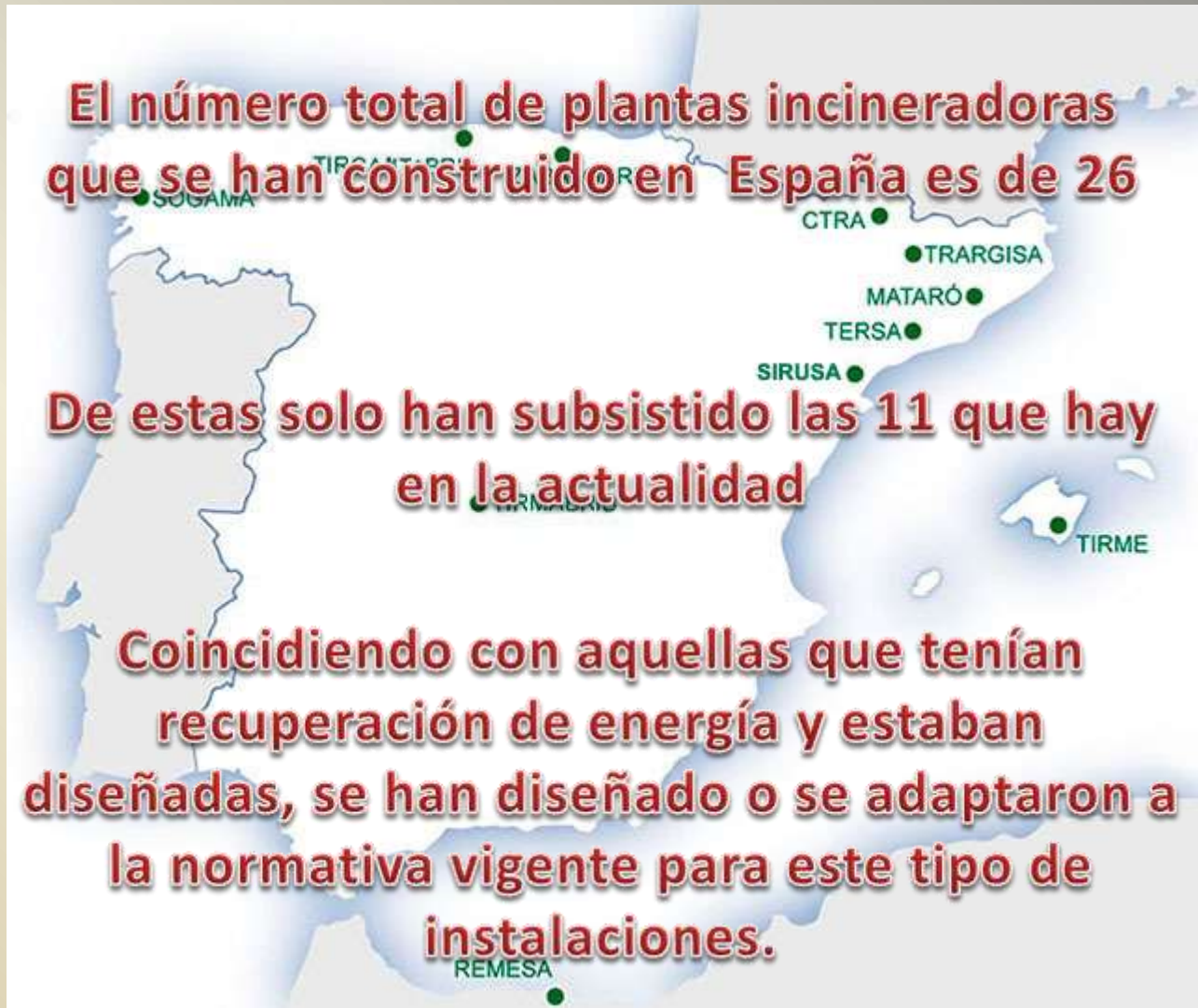
WtE en ESPAÑA

Plantas de VE en España y Andorra

El número total de plantas incineradoras que se han construido en España es de 26

De estas solo han subsistido las 11 que hay en la actualidad

Coincidiendo con aquellas que tenían recuperación de energía y estaban diseñadas, se han diseñado o se adaptaron a la normativa vigente para este tipo de instalaciones.



Plantas de VE en España y Andorra

**11 AÑOS SIN CONSTRUIR
NINGUNA INFRAESTRUCTURA DE
VALORIZACIÓN ENERGÉTICA**

**O LO QUE ES LO MISMO, SOLO UNA PLANTA
DESDE LA PUBLICACIÓN DE LA DIRECTIVA**

2008/98/CE



Plantas de VE en España y Andorra



5 Plantas gestionadas por empresas públicas y 2 por empresa de economía mixta.

5 Plantas gestionadas por empresas privadas en régimen de concesión



562.142 Tm/año
74,8 MWe
255.474 MWh/año
351 Empleos

Mallorca (TIRME)



230.813 Tm/año
94 MWe
475.452 MWh/año
71 Empleos

Bilbao (Zabalgardi)



328.680 Tm/año
29,8 MWe
102.530 MWh/año
104 Empleos

Madrid (TIRMADRID)



603.439 Tm/año
50 MWE
332.761 MWh/año
80 Empleos

Cerceda (SOGAMA)



43.108 Tm/año
2,7 MWe
9.043 MWh/año
18 Empleos

Melilla (REMESA)



358.010 Tm/año
23,7 MWe
128.278 MWh/año
82 Empleos

Sant Adrià del Besòs (TERSA)



114.386 Tm/año
10,5 MWe
77.021 MWh/año
156 Empleos

Meruelo (Planta Cantabria)



131.152 Tm/año
7,4 MWe
47.070 MWh/año
51 Empleos

Tarragona (SIRUSA)



158.429 Tm/año
13,2 Mwe
57.757 MWh/año
100 Empleos

Mataró (CONSORCI DEL MARESME-TEM)



51.133 Tm/año
6,6 MWe
11.700 MWh/año
29 Empleos

Andorra (CTRA)



35.000 Tm/año (*)
3 MWe
28 MWh/año
25 Empleos

Girona (TRARGISA)

PLANTS	CAPACITY (t/year)	2018	
MALLORCA (TIRME)	690	562	128
MADRID (TIRMADRID)	315	329	-14
MELILLA (REMESA)	48	43	5
BILBAO (ZABALGARBI)	230	231	-1
MERUELO (CANTABRIA)	96	114	-18
CERCEDA (SOGAMA)	600	603	-3
SANT ADRIÀ DEL BESÒS (TERSA)	360	358	2
MATARÓ (CONSORCI-TEM)	160	158	2
TARRAGONA (SIRUSA)	144	131	13
GIRONA (TRARGISA)	35	0	35
ANDORRA (CTRA)	60	51	9
TOTAL	2.738	2.581	157

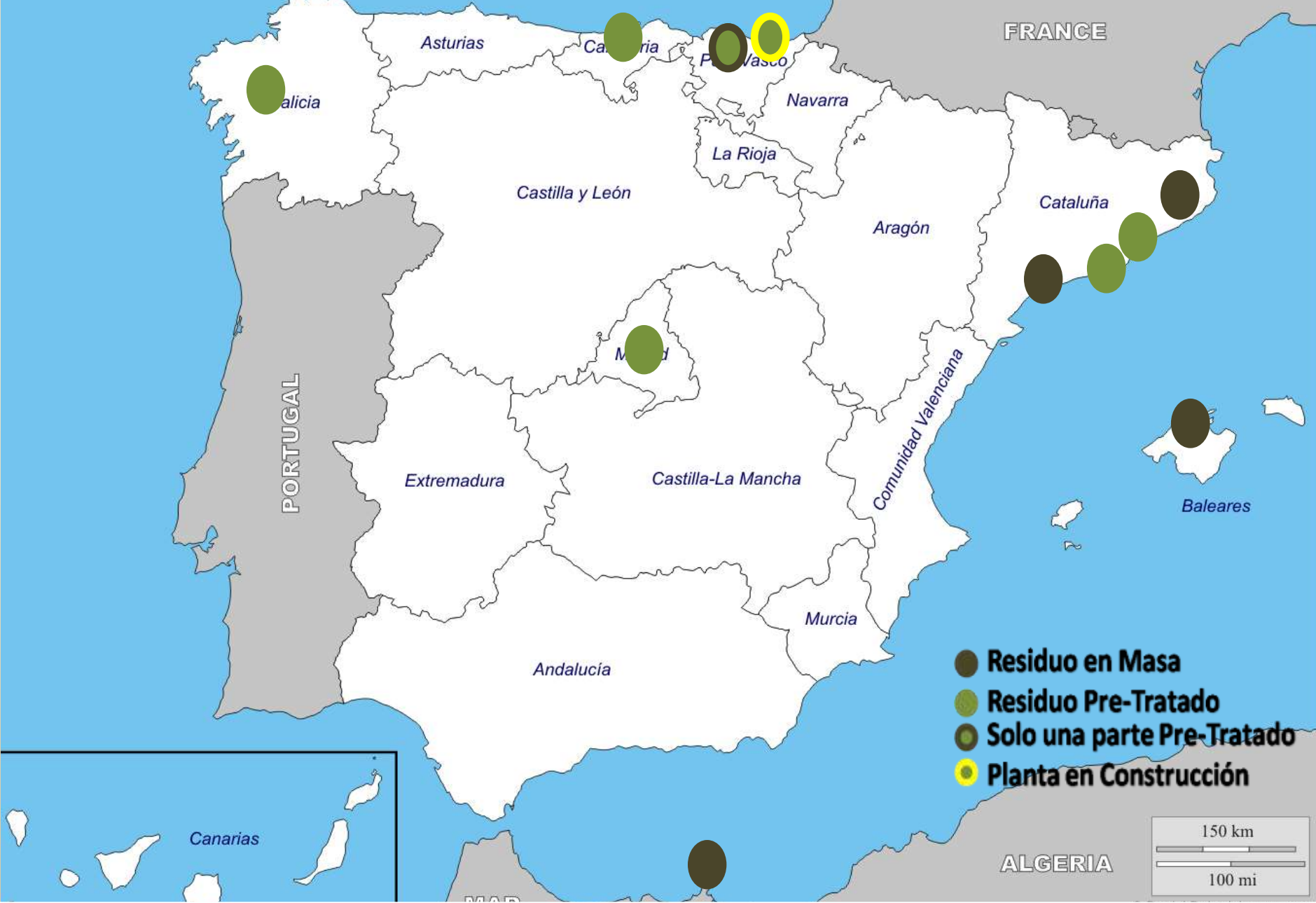


Table A1.5 Timeline for the new objectives and targets for waste, 2013–2050

Objectives	Sources	Deadline for implementation															
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2027	2030	
✓ Landfilling is limited to non-recyclable and non-recoverable waste.	Decision 1386/2013/EU	⇒2020															
Increase the rate of packaging waste prepared for reuse and recycled to 65 % (interim target).	2015 Circular Economy Package	⇒2025															
✓ Increase reuse and recycling of municipal waste to a minimum of 65 % (interim target).	2015 Circular Economy Package	⇒2025															
Minimum targets by weight for preparing for reuse and recycling:	2015 Circular Economy Package	⇒2025															
<ul style="list-style-type: none"> • 55 % of plastic; • 60 % of wood; • 75 % of ferrous metal; • 75 % of aluminium; • 75 % glass; • 75 % paper and cardboard. 																	

✓ RMB a Vertedero ✓ 50% Reciclaje

Table A1.5 Timeline for the new objectives and targets for waste, 2013–2050

Objectives	Sources	Deadline for implementation													
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2027
Reduction in the consumption of lightweight plastic carrier bags (2018–2025) (*).	Directive 94/62/EC as amended by Directive 2015/720/EU	⇒2025													
Increase the rate of packaging waste prepared for reuse and recycled to 75 % (final target).	2015 Circular Economy Package														⇒2030
✓ Increase reuse and recycling of municipal waste to a minimum of 65 %.	2015 Circular Economy Package														⇒2030
✓ Reduce the amount of municipal waste landfilled to 10 % of the total amount of municipal waste generated.	2015 Circular Economy Package														⇒2030
Minimum targets by weight for preparing for reuse and recycling:	2015 Circular Economy Package														⇒2030
<ul style="list-style-type: none"> • 75 % of wood; • 85 % of ferrous metal; • 85 % of aluminium; • 85 % glass; • 85 % paper and cardboard. 															

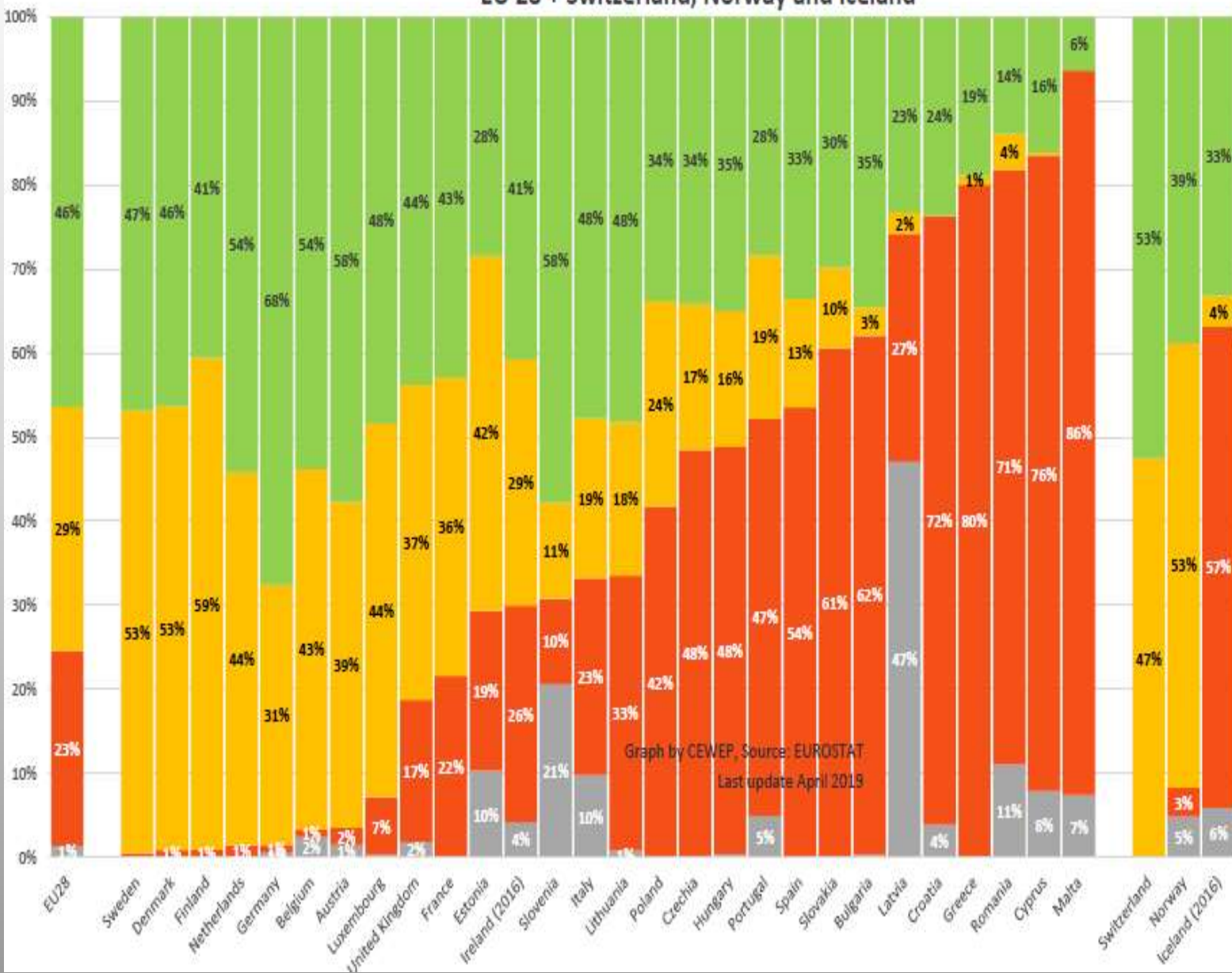


✓ 50% Reciclaje



Municipal waste treatment in 2017

EU 28 + Switzerland, Norway and Iceland



- Landfill
- Waste-to-Energy
- Recycling + Composting
- Missing data



Graph by CEWEP. Source: EUROSTAT
Last update April 2018

Percentages are calculated based on the municipal waste reported as generated in the country

2017

250 Millones de toneladas producidas

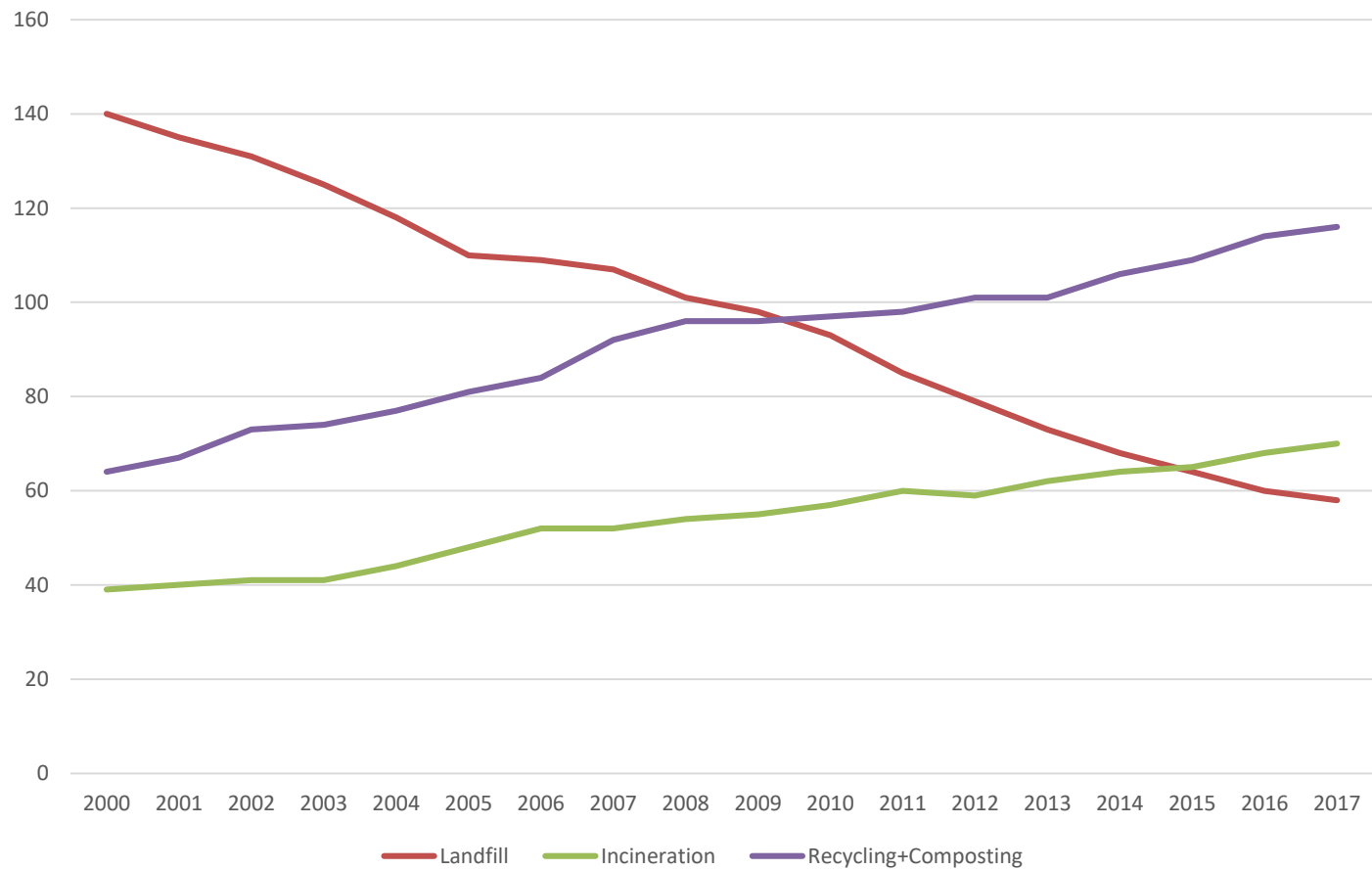
53,6%

23% Destinado a vertedero

33,4% 46% Reciclaje

29% Valorización Energética

13%



IMPLEMENTATION SCHEDULE

	PHASE + STEP	PURPOSE AND ISSUES TO CONSIDERER	DURATION
FEASIBILITY PHASE	Pre-feasibility study	Waste quantities, calorific values, capacity, siting, energy sale, organisation, costs and financing.	½ year
	Political Decision	Decisions on further investigations or abort the project.	¼ year
	Feasibility study	Waste quantities, calorific values, capacity, siting, energy sale, organisation, costs and financing in detail.	½ year
	Political Decision	Decision on willingness, priority and financing of incineration plant and necessary organisations.	½ year
PROJECT PREPARATION PHASE	Establishment of an Organisation	Establishment of an official organisation and establishment of institutional support and framework.	½ year
	Tender + Financial Engineering	Detailed financial engineering, negotiation of loans or other means of financing + selection of consultants.	¼ year
	Preparation of Tender Documents	Reassessment of project, specifications, pre-qualification of contractors and tender documents.	½ year
	Political Decision	Decision on financial package, tender documents and procedures in detail and final go-ahead.	¼ year
PROJECT IMPLEMENTATION PHASE	Award of Contract & Negotiations	Pre-qualification of contractors. Tender documents. Select most competitive bid. Negotiate contract.	½ year
	Construction and Supervision	Construction by selected contractor and supervision by independent consultant	2 ½ years
	Commissioning + Start Up	Test of all performance specifications, settlements, commissioning, training of staff+ start up by constructor	½ year
	Operation + Maintenance	Continuous operation and maintenance of plant. Continuous procurement of spare parts and supplies	20+ years

6-7 Years

TECNOLOGIAS DE TRATAMIENTO TERMICO

PARAMETER	ADVANCED MOVING GRATE	FLUIDISED BED	THERMAL GASIFICATION	PLASMA GASIFICATION	PYROLYSIS	TWO STAGE COMBUSTION
Number of plants in operation	>1,500	~40, smaller number when MSW only	Unclear when MSW only, but <10 outside Japan	Unclear when MSW only, but <10	<10	<10
Size of modules tph	2-40	20	<10	<10	<10	<10
Waste limitation	No restrictions, wide range in waste quality	Shredded to <15 cm, removal of metals, narrow range in calorific value	Shredded to <15 cm, narrow range in calorific value/moisture	Shredded to <15 cm, narrow range in calorific value/moisture	Shredded to <15 cm, narrow range in calorific value/moisture	Shredded to < 15 cm, removal of metals narrow range in calorific value
Reported annual availability	≥8,000 h/y	<7,500 h/y	<5,500 h/y, but limited data available	Insufficient data available	Insufficient data available	<7,000 h/y
Proven, commercial operation >3 years	Numerous plants, well documented operation	Few facilities on MSW only	Limited operational data published	Limited operational data published	Limited operational data published	Few, if any after latest re-design
Require flue gas treatment	Yes	Yes	Yes	Yes	Yes	Yes
Process residues	Approx. 18-25% bottom ash <5% IFA and flue gas treatment residues	Approx. 18-25 % bottom ash, but potentially higher fraction of IFA	Limited data available Potentially vitrified IBA	Limited data available	Limited data available	Limited data available, potentially IBA and IFA similar to the moving grate combustion
Energy usage for pre-treatment	None	Limited data, estimate 50 kW/t	Limited data, estimate 50 kW/t	Limited data, estimate 50 kW/t	Limited data, estimate 50 kW/t	Limited data, estimate 50 kW/t
Net electricity production (incl. pre-treatment)	500-700 kWh/t	450-550 kWh/t	Limited data available 0-250 kWh/t	Limited data available <100 kWh/t	Limited data available <100 kWh/t	250-300 kWh/t
Investment cost	500-900 USD/t yearly capacity	700-900 USD/t yearly capacity	Limited data available	Limited data available	Limited data available	Limited data available
Gate-fee per ton of waste	30-100 USD/t depending on opportunity for sale of energy	30-100 USD/t depending on opportunity for sale of energy	Limited data available, according to information from Japan and Italy approx. 300-500 USD/t	Limited data available (project experience shows that >80-100 USD/t with power price of 100 USD/MWh is not sufficient)	Limited data available	Limited data available



A VALORIZAÇÃO ENERGÉTICA DE RESÍDUOS NO CONTEXTO DA TRANSIÇÃO ENERGÉTICA E DA ECONOMIA CIRCULAR. CONTRIBUTOS PARA OS DECISORES

LA VALORIZACION ENERGÉTICA DEBE SER LA OPCIÓN PREFERENTE A CUALQUIER OTRO SISTEMA DE DISPOSICIÓN FINAL DE LOS RESIDUOS CUANDO SOBRE ESTOS SE HA AGOTADO LA CAPACIDAD DE RECUPERAR LOS MATERIALES RECICLABLES QUE CONTIENEN.

ES EL UNICO SISTEMA DE DISPOSICION FINAL QUE DA VALOR AL RESIDUO AL OBTENER ENERGIA DE ELLOS.

ES UNA SOLUCION ESTRATEGICA Y EFICAZ FRENTE A LAS GRANDES CONCENTRACIONES DE POBLACION QUE SE ESTA PRODUCIENDO EN LAS GRANDES URBES DEL PLANETA, EL INCREMENTO DE PRODUCCION DE RESIDUOS QUE SE DEBE GESTIONAR Y LA DEMANDA ENERGETICA REQUERIDA.

ES UNA TECNOLOGIA RESPETUOSA MEDIOAMBIENTALMENTE CON EXHAUSTIVO CONTROL DE LAS EMISIONES PRODUCIDAS EN SU PROCESO. SOBRETUDO EN CONTRAPUNTO A LAS EMISIONES PRODUCIDAS EN VERTEDERO Y POR ESTAR ACEPTADA COMO ENERGIA RENOVABLE HASTA EL 50% DE LA PRODUCCION ELECTRICA DE LAS MISMAS.

DENTRO DE LOS TRATAMIENTOS TERMICOS LA INCINERACION CON VALORIZACION ENERGETICA DISPONE DE MULTIPLES REFERENCIAS QUE LA AVALAN COMO LA TECNOLGIA MAS CONTRASTADA Y FIABLE.

LA VALORIZACION ENERGETICA DEBE OCUPAR UN PAPEL FUNDAMENTAL EN LOS MODELOS DE GESTION DE RESIDUOS DE CUALQUIER PAIS Y HA DE SER INTRODUCIDA SIEMPRE COMO ALTERNATIVA AL VERTEDERO . PERO NO ES LA SOLUCION, TAN SOLO EL ULTIMO ESLABON PARA LA CORRECTA GESTION DE LOS RESIDUOS DENTRO DE LAS TECNOLOGIAS DISPONIBLES EN LA ACTUALIDAD.