26. SPAIN

26.1 Legal Framework – Waste Management Plans and Strategies

The European Commission (EC) and the European Environment Agency (EEA) agreed to enhance efforts to improve knowledge on implementation of waste policies through tasks to review municipal solid waste, management in EEA member countries, using indicators, country factsheets and relevant European Commission studies. Together, these instruments establish a range of waste management targets and broader goals for the years to 2020.

The Legal framework in the field of waste management includes 16 acts, most of which have already been transposed in the Spanish and Portuguese legislation, as indicated in the Table 104:

Table 104. Legal framework in the field of waste management

European Law
1) Framework Directive on waste no. 75/442/EEC, as amended by Directive no. 91/156/EEC.
2) Directive no. 91/689/EEC on hazardous waste.
3) Directive no. 75/439/EEC on the disposal of waste oils, as amended by Directive no. 87/101/EEC and Directive no. 91/692/EEC.
4) Directive no. 91/157/EEC on batteries and accumulators containing certain dangerous substances
5) Directive no. 93/86/EC on the marking of batteries.
6) Directive no. 2000/76/EC on the incineration of waste.
7) Directive no. 94/62/EC on packaging and packaging waste.
8) Directive no. 96/59/EC on the disposal of biphenyls and polychlorinated terphenyls (PCB and PCT)
9) Decision no. 2000/532/EC, as amended by Decision no. 2001/119 establishing a list of wastes (replacing Decision no. 94/3/EC establishing a list of wastes Decision no. 94/904/EC establishing a list of hazardous waste)
10) Regulation no. 259/93 on the supervision and control of shipments of waste within, into and out of the European Community.
11) Directive no. 86/278/EEC on the protection of the environment, and particular of the soil, when sewage sludge is used in agriculture
12) Directive no. 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment, as well as
13) Directive no. 2002/96/EC on waste electrical and electronic equipment (WEEE).
14) Directive no. 78/176/EEC on waste from the titanium dioxide industry.
15) Directive no. 82/883/EEC on procedures for the surveillance and monitoring of environments concerned by waste from the titanium dioxide industry

16) Directive no. 92/112/EEC on procedures for harmonising the programmes for the reduction and eventual elimination of pollution caused by waste from the titanium dioxide industry.

In the following sections the legal framework governing CDW management and waste management plans in Spain are explored.

26.1.1 National Legislation concerning CDW

Overview of National legislation in Spain

- Royal Decree 180/2015, of 13 March, on waste shipments, which develops Article 25 of Law 22/2011 and regulates waste shipments, was approved in March 2015.
- Law 22/2011, of 28 July, with the modifications incorporated in Law 5/2013, of 11 June, on Waste and Contaminated Soils incorporates Directive 2008/98/EC, of the European Parliament and of the Council, on waste and repealing certain directives, into Spanish legislation.
- Royal Decree 105/2008, of 1 February, on Construction and Demolition Waste production and management. This legislation specifically covers production and management of CDWs. It establishes a jurisdiction on the production and management of CDWs, in order of emphasis, the prevention, reutilization, recycling, forms of recovery and the assurance that all waste is properly treated thus contributing to a sustainable development in the construction sector.
- Royal Decree 1481/2001, of 27 December, regulating the disposal of waste by landfill.

In Spain the management of CDW depends from the Autonomous Regions with the exception of the waste originated from minor house works; therefore, the Autonomous Regions have defined their management CDW plans referring to the National legislation.

Overview of the relevant legislation at Regional level

- Andalucía
  Decree 73/2012, of 20 March, on approval of the Regulation of Waste in Andalucía.
- Aragón
  Decree 262/2066, of 27 December, on approval of the Regulation of production, property and management of the CDWs in Aragón. It also establishes a jurisdiction on the public service of valorisation of debris in Aragón.
- Basque Country
  Decree 112/2012, of 26 June, on regulation of the production and management of CDW in Basque Country.
- Canarias
  Decree 112/2004, of 29 July, on regulation of the procedure and requirements for the grant of authorisation related to waste management. Furthermore, it sets down the Registration of the Waste Management Association of Canarias.
- Cantabria

Decree 72/2010, of 28 October, on regulation of the production and management of CDWs in Cantabria.

- Castilla la Mancha
  Decree 189/2005, of 13 December, on approval of the waste management plan concerning construction and demolition of Castilla La Mancha
- Castilla y León
  Decree 11/2014, of 20 March, on approval of the regional waste management plan «Plan Integral de Residuos de Castilla y León»
- Extremadura
  Decree 20/2011, of 25 February, establishing a jurisdiction on the production, property and management of the CDWs in Extremadura.
- Galicia
  Law 10/2008, of 3 November, on waste management in Galicia.
- Madrid
  Order 2726/2009, of 16 July, of the Council of Environment, Housing and Land management, for CDW management in Madrid.
- Navarra
  Foral Decree 23/2011, of 28 March, on regulation of the production and management of CDW in Navarra.
- Valencia
  Law 10/2000, of 12 December, for waste in Valencia.

26.1.2 Waste management plans (WMP) and Strategies

Implementation of environmental policies, especially waste policies, is one of the European Commission's key priorities, as confirmed by its proposal for a 7th Environment Action Programme (EC, 2012) and the Roadmap to a resource efficient Europe (EC, 2011). While the EU's Waste Framework Directive (EU, 2008) and Landfill Directive (EU, 1999) set binding targets for recycling municipal waste and diverting biodegradable municipal waste from landfill, EEA analysis indicates large differences in municipal waste management performance between countries (EEA, 2009).

In Spain the management of CDW depends from the Autonomous Regions with the exception of the waste originated from minor house works; therefore, the Autonomous Regions have defined their management CDW plans referring to the National Plans. The National waste management plans are referred hereunder:

<u>Overview of waste management plans at National level in Spain</u>

The National waste management plans are referred hereunder:

National Integrated Waste Plan (PNIR) for 2008-2015, approved by the Council of Ministers in December 2008, is intended to serve as a guide for the development of specific policies to improve waste management by reducing its generation and promoting its correct treatment.

Among its objectives, the Plan includes the treatment of domestic and similar waste (domestic urban waste), waste covered by special legislation (hazardous waste, vehicles, end-of-life tyres, batteries and accumulators, electrical and electronic appliances, waste from construction and demolition, sludge from sewage treatment plants), polluted soil, and non-hazardous agricultural and industrial waste. It also takes into account a reduction in biodegradable waste disposal.

The document gathers, in an integrated manner, specific chapters for:

- Municipal wastes
- Hazardous wastes
- End of life vehicles
- End of life tires
- Sewage sludge
- Construction and demolition wastes
- PCB/PCT and PCB/PCT containing equipment
- Wastes from accumulators and batteries
- Electric and electronic equipment wastes
- Wastes from extractive industries (mining activities)
- Wastes from agricultural plastics
- Non-hazardous industrial wastes
- Contaminated soils

The **II National Plan on Construction and Demolition Waste** (II PNRCD) is included in the PNIR.

State Waste Framework Plan (PEMAR) for 2016-2022, approved by the Council of Ministers in November 2015, is intended to guide the management policy in Spain, pushing the measures required to improve the identified deficiencies and promoting more sustainable measures to ensure the achievement of the legal objectives. This plan includes the household, commercial and industrial waste as well as waste with specific legislation, wastes from agriculture and sanitary waste. It includes also a chapter related with contaminated soils.

State Waste prevention programme 27.11.2013, was elaborated as response of the statement in article 29 of the Directive 2008/98/CE that all EU members should prepare waste prevention programmes no later than 12 December 2013. The main aim of this plan is to achieve a 10% reduction in weight of the waste generated in 2010 by 2020.

Overview of waste management plans in Spain at regional level

- Asturias
  Strategic Waste Plan of Asturias for 2014-2024.
- Baleares
  Approval of the Director Sectorial Plan for the management of CDW, bulky waste and end of life tires in Mallorca.
  Director Sectorial Plan for the management of non-hazardous waste of Menorca.
- Castilla y León
  Integrated Waste Plan of Castilla y León (BOCyL of 24 March 2014)
- Catalonia
  General programme on prevention and management of waste and resources of Catalonia (PRECAT 2020) for 2013-2020.
- Madrid
  Regional plan on Construction and Demolition Waste in Madrid for 2006-2016.
- Murcia
  Waste Plan of Murcia 2015-2020.
- La Rioja
  Director Waste Plan of La Rioja 2007-2015.
- Navarra
  Waste Plan of Navarra 2017-2027.

26.1.3 Legal framework for sustainable management of CDW

As already mentioned in section 1.1, Royal Decree 105/2008, of 1 February, on Construction and Demolition Waste production and management, establishes a jurisdiction on the production and management of CDWs, in order of emphasis, the prevention, reutilization, recycling, forms of valorisation and the assurance that all waste is properly treated thus contributing to a sustainable development in the construction sector.

In this line, the waste producer should provide at least the following information in order to obtain the building licence.

- An estimation of the amount of CDW generated, coded as per the European List of Waste (Commission Decision 2000/532/EC).
- Measures for the waste prevention.
- Measures for the reuse, valorisation or disposal of the waste generated.
- Measures for the separation of waste generated during the construction or demolition.
- The drawings of the installation for the storage, handling, separation and other procedures of CDW management.
- The technical specifications for the storage, handling, separation and other procedures of CDW management.

- Assessment of the cost for the CDW management.
- In refurbishment, renovation or demolition works, an inventory of the hazardous waste generated must be done.

According to this Royal Decree 105/2008, the CDW should be separated in fractions when the estimated amount of waste to be generated exceeds the following amounts:

- Concrete: 80 t
- Bricks, ceramics, tiles: 40 t
- Metal: 2 t
- Wood: 1 t
- Glass: 1 t
- Plastic: 0,5 t
- Paper and cardboard: 0,5 t

26.1.4 Targets

Following the Council Resolution of 7 May 1990, which invited the Commission to establish proposals for action at Community level, the Priority Waste Streams Programme was initiated. CDW was identified by the Member States as one such stream, even though at the time relatively little was known about the nature or volumes of the flows concerned.
The objectives of the Priority Waste Streams Programme respond to the waste management hierarchy, which prefers waste prevention or reduction to re-use, re-use to recycling or recovery (including the use of waste as a source of energy), and all of these to final disposal via landfill or incineration without energy recovery. Although not expressed in these terms in any of the key documents, the hierarchy is generally summarized as:
(i) Prevention or reduction (sometimes termed avoidance or minimization);
(ii) Re-use;
(iii) Recycling or materials recovery;
(iv) Energy recovery;
(v) Disposal in a safe manner.
It was known that most CDW had traditionally been landfilled, frequently in the same landfills as were used to dispose of municipal solid waste (MSW). Furthermore, it became clear that the volume of CDW, most of which is inert, was roughly equal to that of MSW. Given the increasing scarcity of landfill space, and the increasing costs of improved environmental protection involved in modern landfill engineering and management, it was obvious that action to re-use or recycle CDW would reduce the proportion going to landfill, thereby relieving the pressures on MSW disposal as well as respecting the hierarchy of waste management practices set out in the Framework Directive on waste (75/442/EEC as amended by 91/156/EEC) and the Fifth Environmental Action Programme.
In *Spain*, the Council of Ministers approved the 2016-2022 State Framework Plan on Waste Management (PEMAR) in November 2015, establishing the strategic lines of action and

measures necessary to advance towards a so-called circular economy and meet the European targets on waste. This is a key instrument for applying the waste management hierarchy and for advancing towards a circular economy, which reincorporates materials containing waste into the production process for the manufacture of new products. It also fosters coordination between administrative authorities, improved transparency and information on waste, inspections, control and social awareness.

In order to achieve progress in the efficient use of resources, the law incorporates:

- A prevention target: 10% reduction in the weight of waste generated by 2020 compared with 2010.
- And recycling and repurposing targets to be reached by 2020 for municipal waste: 50% preparation for reuse and recycling.
- And construction and demolition waste: 70% preparation for reuse, recycling and other repurposing of material.

26.1.5 End of Waste (EoW) status

The 22/2011 Law on Waste and Contaminated Soil transposes the WFD via its definition of the EoW principle and outlines the following conditions:

- Ensure that there is a market or demand for such substances and objects;
- Substances or objects meet technical requirements for specific purposes, that existing legislation and standards are applicable to products;
- Ensure an adequate degree of environmental protection.

At the national level, *Spain* has not concretely developed an EoW status for any waste flow. Concrete discussions on how to integrate a set End of Waste status for various waste flows for aggregates are taking place. Important national actors, such as the National Federation of Aggregates are playing an important role in these discussions. Although a EoW status for waste flows is under discussion at national level, on the regional level, the Basque Country has outlined an EoW status for (recycled) aggregates via their regional Order 12/01/2015 on the use of recycled aggregates from the recovery of CDW . This Order outlines the specificities of aggregate use, which is introduced in Decree 112/2012 for CDW management in the Basque Country. The specifications within this document are described hereunder:

- Define recycled aggregates from CDW as those that have arisen from the treatment of inorganic material previously used in construction;
- Outline limits that are used to prohibit the use of recycled aggregate (i.e. contamination with pollutants, subject to contaminated soil, etc.);
- Outline the permitted uses allowed for recycled aggregates;

- Outline under what conditions aggregates cease to be waste and obtain the status of products to be used in various applications (fabrication of bricks, concrete, etc.).

26.2 Non legislative instruments (best practices, guidelines, recommendations…)

Besides the waste management plans, there are not many non-legislative instruments, as best practices, guidelines, recommendations, in Spain at national or regional level.

A relevant instrument is a quick reference guide for manufacturers, companies, technicians, public bodies and local authorities' administration concerning the correct management and reuse of CDW in Spain. This technical guide has been prepared by the Spanish Association of CDW recycling ("RCD asociación") and comprises of the following chapters:

- Legal framework concerning CDW.
- Stakeholders/main players
- Control procedures in the local authorities (quick estimation of the CDWs generated in a work site, control of works with technical project, control of minor house works)
- Software tool RCDCAUTION to request, through the recycling plants, a bank guarantee for the CDW management at the work site.
- Production of aggregates and recycled materials.
- Recommendations of the Spanish guide concerning the recycled aggregates (GEAR). Applications such as asphalt mixtures, precast elements, landfill, concrete.

26.3 CDW management performance – CDW data

26.3.1 CDW generation data

According to data reported by the Spanish Federation of Construction and Demolition Waste (FERCD, Feburary 2015), the production of CDW in Spain has fallen by 56% during the period 2009-2013 in all the Autonomous Regions.

In 2013, the CDW production was stabilized for the first time in the period 2009-2013 with an estimation of 20 MMt.

The average of the production in this period was 0,66 t/inhabitants/year, accounts for 0,43 t/inhabitants/year by 2013.

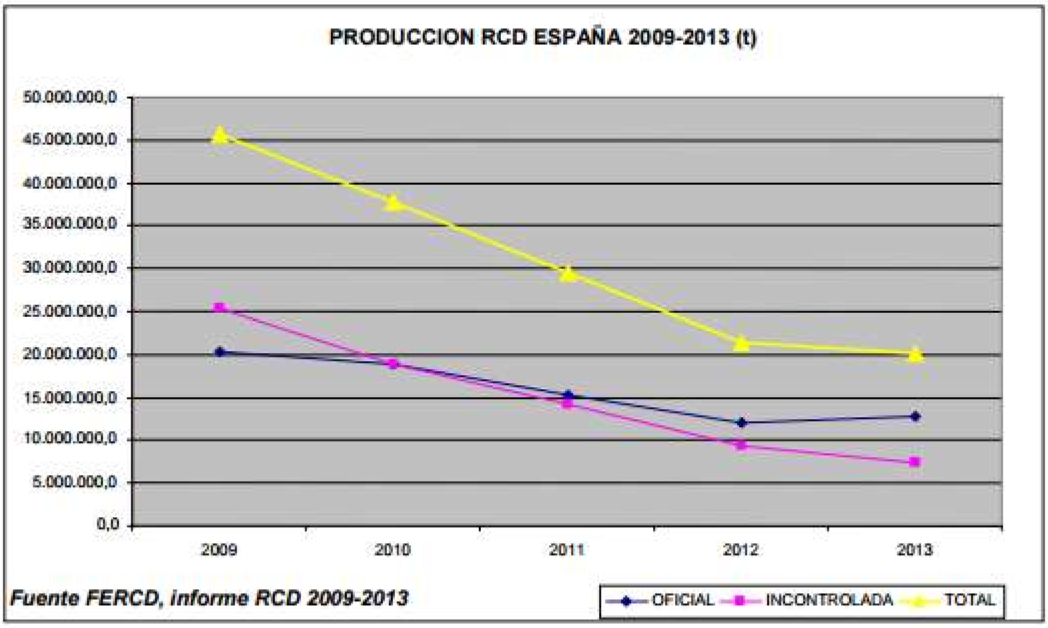


Figure 24. CDW generation data

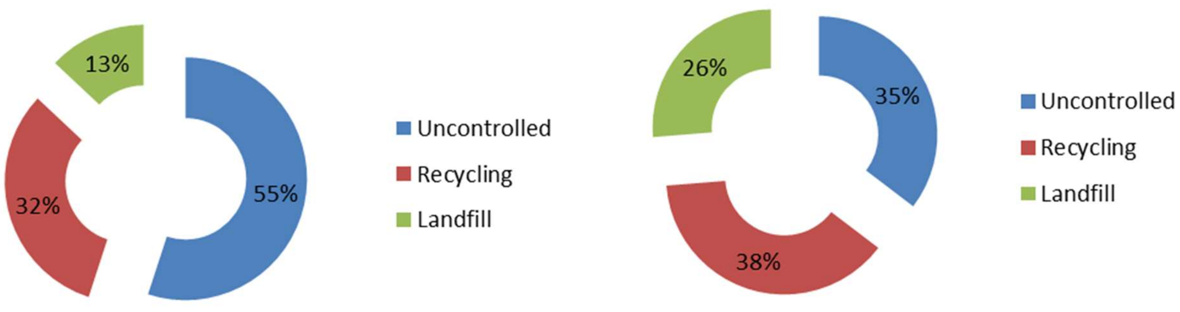
The Table 105 outlines CDW generation in each Autonomous Region according to data provided by FERCD (February 2015).

Table 105. CDW generation in each Autonomous Region according to data provided by FERCD (February 2015).

Autonomous Region	2009	2010	2011	2012	2013	Total (t)	t/inhabitant/year
Andalucia	7.605.494	7.147.007	4.704.554	3.103.321	3.069.482	25.629.857	0,61
Aragón	1.979.878	1.168.069	923.688	683.196	654.275	5.409.107	0,80
Asturias	951.886	809.162	655.034	423.598	377.358	3.217.037	0,60
Baleares	964.737	993.807	750.256	450.947	421.315	3.581.061	0,65
Basque country	2.611.812	1.966.714	1.593.064	1.180.977	1.108.399	8.460.967	0,77
Canarias	1.246.394	1.406.239	1.070.912	961.934	1.011.563	5.697.042	0,54
Cantabria	401.180	321.815	303.663	230.320	215.935	1.472.912	0,50
Castilla y Leon	2.507.093	2.048.843	1.591.79	1.170.824	1.084.242	8.402.082	0,66
Castilla La Mancha	2.025.206	1.635.849	1.406.308	807.951	557.828	6.433.142	0,61
Catalonia	8.995.875	6.553.387	5.455.215	3.977.642	3.761.340	28.703.458	0,76
Extremadura	736.189	557.425	375.728	308.447	324.936	2.302.725	0,42

Autonomous Region	2009	2010	2011	2012	2013	Total (t)	t/inhabitant/year
Galicia	2.063.198	1.668.903	1.317.964	1.016.091	1.110.939	7.177.096	0,51
La Rioja	384.699	397.569	310.957	247.476	213.786	1.554.487	0,96
Madrid	6.184.962	5.389.727	4.616.262	3.593.399	3.128.468	22.912.820	0,71
Murcia	1.192.550	804.576	630.062	465.980	477.473	3.570.640	0,49
Navarra	716.133	564.770	389.831	300.823	279.724	2.251.281	0,70
Valencia	5.178.651	4.382.313	3.335.126	2.535.646	2.388.645	17.820.382	0,70

In the period 2009-2013, recycling is stabilized in 33% of the CDW production, the landfill increases without treatment being 26% of the production in 2013 as well as the uncontrolled landfill decreases being 35% of the production in 2013.



a) b)

Figure 25. a) CDW management 2009 (Source: FERD) b) *CDW management 2013 (Source: FERD*

In the period 2009-2013, 43% of CDW production is associated with refurbishment works, 21% with residential construction works, 14%, corresponds with non-residential works and 23% related to civil works. CDW coming from refurbishment works accounts for 47% of the production by 2013.

26.3.2 CDW treatment data

The table below shows the CDW treatment data reported in the Spanish Statistical Office for 2012. There are no up-to-date data available.

Table 106. CDW treatment data reported in the Spanish Statistical Office for 2012

	Waste generated (t)	Recovery (t)	Backfilling (t)	Incineration (t)	Landfill (t)
Non-hazardous waste	27.637.698	19.007.146	4.328.999	0	4.301.553
Hazardous waste	66.156	3.878	0	0	62.278
Total	**27.703.854**	**19.011.024**	**4.328.999**	**0**	**4.363.831**

26.3.3 CDW exports/imports data

Waste Imports data

The table and graph below outlines the evolution of the amount of waste imported from EU and third countries for the period 2008-2012 (source: PEMAR). There are no up-to-date data available

Table 107. Evolution of the amount of waste imported from EU and third countries for the period 2008-2012 (source: PEMAR)

Year	Recovery	Disposal	Total
2008	150.643	255.369	**406.012**
2009	140.863	90.324	**231.187**
2010	186.464	63.712	**250.176**
2011	255.290	64.106	**319.396**
2012	305.703	25.141	**330.844**

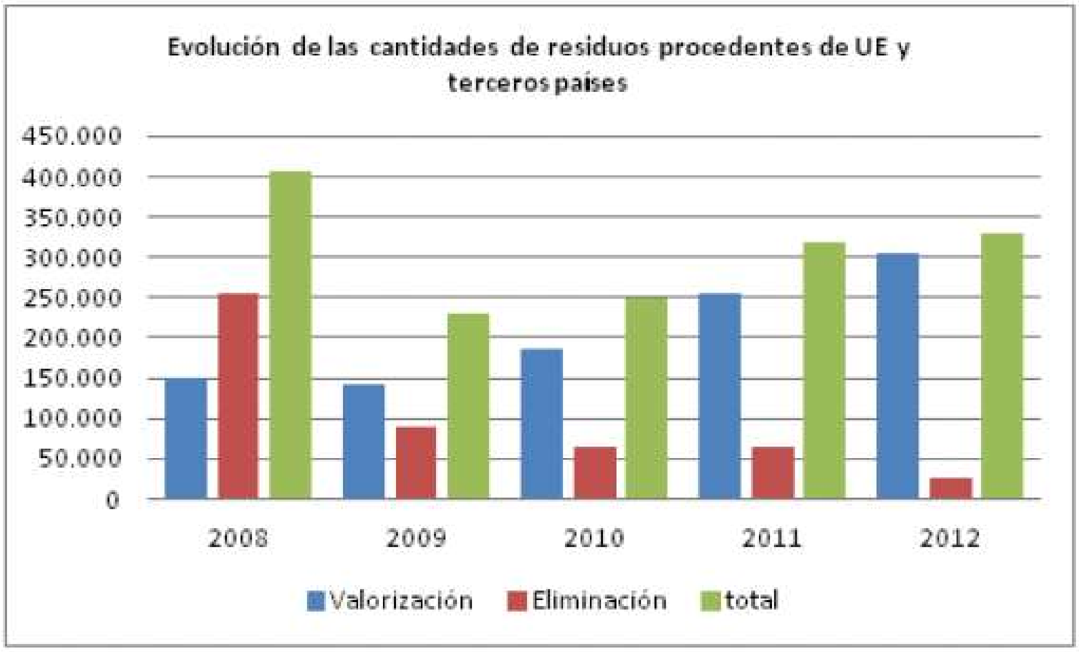


Figure 26. Evolution of the amount of waste imported from EU and third countries for the period 2008-2012 (source: PEMAR)

From the above data it can be observed that the amount of waste going to recovery have been increased during the period 2008-2012, while the quantities of waste going to disposal have been decreased between 2008 and 2009.

The Table 108 shows the quantities of treated waste from EU and third countries divided by Autonomous Regions for 2012 (source: PEMAR).

Table 108. Quantities of treated waste from EU and third countries divided by Autonomous Regions for 2012 (source: PEMAR).

Autonomous Region	Exports data from EU (2012)		Exports data from third countries (2012)		Total	Percentage (%)
	Recovery (t)	Disposal (t)	Recovery (t)	Disposal (t)		
Andalucia	13.676,00	926,41			14.602,41	7,23
Aragón	10.174,06		243,24		10.417,30	5,16
Asturias	418,68				418,68	0,21
Basque country	50.854,33		1.848,71		52.703,04	26,12
Cantabria	132,874				132,84	0,07

Autonomous Region	Exports data from EU (2012)		Exports data from third countries (2012)		Total	Percentage (%)
	Recovery (t)	Disposal (t)	Recovery (t)	Disposal (t)		
Castilla y Leon	41.914,17		17.616,04		59.530,21	29,50
Castilla La Mancha	158,08				158,08	0,08
Catalonia	4.725,37	1.073,08	2.671,72	21.311,80	29.781,97	14,76
Extremadura	41,92				41,92	0,02
Galicia		193,33	1.911,50		2.104,83	1,04
La Rioja	4.482,14				4.482,14	2,22
Madrid	149,98				149,98	0,07
Murcia	14.464,37		7.147,19		21.611,56	10,71
Valencia	2.975,31	1.497,56	1.001,35	139,40	5.613,62	2,78
Total	**144.167,25**	**3.690,38**	**32.439,75**	**21.451,20**	**201.748,58**	**100,00**

From the waste imported and treated in Spain, 84% corresponds to hazardous waste, as it is shown in the following table (source: PEMAR).

Table 109. Waste imported and treated in Spain)

	Total (t)	Hazardous waste (t)	%	Non-hazardous waste (t)	%
Third countries	30.000	8.045	27	21.956	73
EU	300.844	268.430	89	32.413	11
Total	**330.844**	**276.475**	**84**	**54.369**	**16**

Waste exports data

The table and graph below outlines the evolution of the amount of waste exported to other EU members and third countries for the period 2008-2012 (source: PEMAR). There are no up-to-date data available.

Table 110. Evolution of the amount of waste exported to other EU members and third countries for the period 2008-2012 (source: PEMAR)

Year	Recovery	Disposal	Total
2008	77.666	21.429	99.095
2009	60.336	10.017	70.353
2010	59.63	10.208	69.820
2011	115.712	0	115.712
2012	53.570	13.521	67.091

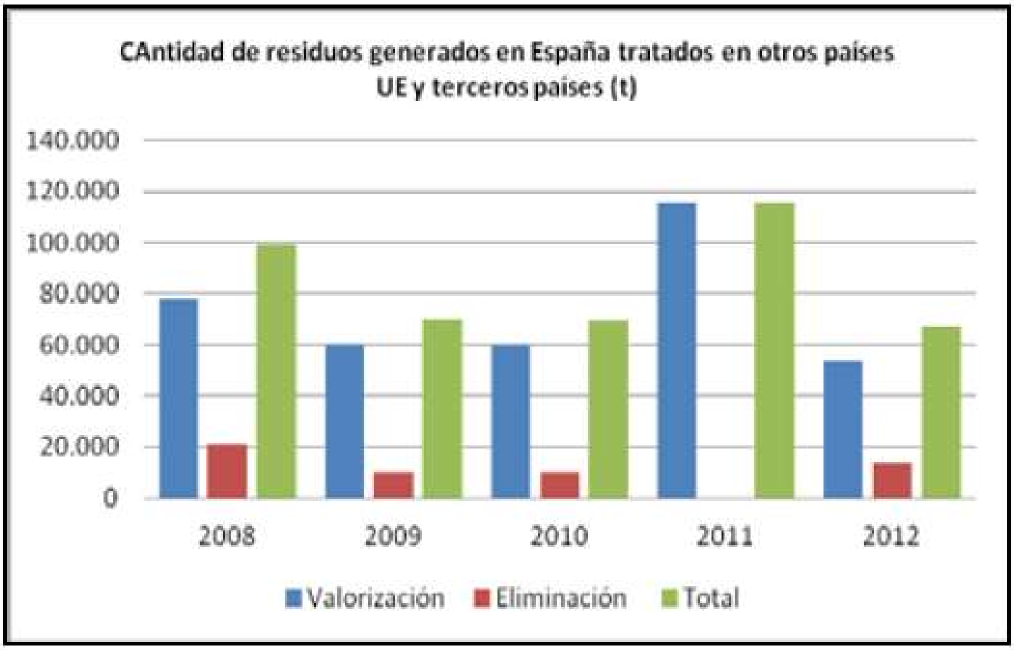


Figure 27. Evolution of the amount of waste exported to other EU members and third countries for the period 2008-2012 (source: PEMAR)

The Table 111 shows the quantities of waste generated in the Autonomous regions and treated in other EU members and third countries for 2012 (source: PEMAR).

Table 111. quantities of waste generated in the Autonomous regions and treated in other EU members and third countries for 2012 (source: PEMAR).

	Exports data from EU (2012)	Exports data from third countries (2012)		

Autonomous Region	Recovery (t)	Disposal (t)	Recovery (t)	Disposal (t)	Total	Percentage (%)
Andalucia	7.230,55	143,92			7.374,47	10,99
Aragón		0.79			0,79	0,00
Asturias		160,79			160,79	0,24
Basque country	5.109,29	1.399,74			6.509,03	9,70
Canarias			1.322,26		1.322,26	1,97
Cantabria	12.747,46				12.747,46	19,00
Castilla y Leon	60,34	6.000,00			6.060,34	9,03
Castilla La Mancha		26,78			26,78	0,04
Catalonia	21.204,71	5.173,90	4.981,30		31.359,91	46,74
Ceuta	200,00				200,00	0,30
Extremadura		70,56			70,56	0,11
Galicia		363,52			363,52	0,54
Madrid	648,70	88,27			736,97	1,10
Murcia		19,90			19,90	0,03
Valencia	65,84	75,50			141,34	0,21
Total	**47.266,89**	**13.520,67**	**6.303,56**		**67.091,12**	**100,00**

From the CDW generated in Spain and treated in other countries, 88% corresponds to hazardous waste, as it is shown in Table 112 (source: PEMAR).

Table 112. CDW generated in Spain and treated in other countries

	Total (t)	Hazardous waste (t)	%	Non-hazardous waste (t)	%
Third countries	6.364	54	1	6.310	99
EU	60.727	58.859	97	1.868	3
Total	**67.091**	**58.913**	**88**	**8.178**	**12**

26.3.4 CDW treatment facilities data

The Table 113 outlines the CDW treatment facilities in Spain for 2013, divided by Autonomous Region. (Source: waste treatment specialist EMGRISA).

Table 113. CDW treatment facilities in Spain for 2013, divided by Autonomous Region. (Source: waste treatment specialist EMGRISA).

Autonomous Region	**Number of transfer plants**	**Number of treatment plants**	**Number of mobile treatment plants**	**Number of landfill**
Andalucia	92	119	21	71
Aragón	18	6	1	5
Asturias	3	4	5	1
Baleares	6	2	N/D	1
Basque country	N/D	N/D	11	N/D
Canarias	0	23	N/D	7
Cantabria	12	4	12	2
Castilla y Leon	0	45	0	3
Castilla La Mancha	N/D	28	27	12
Catalonia	12	50	0	57
Ceuta	N/D	N/D	N/D	N/D
Extremadura	16	21	1	0
Galicia	3	43	21	5
Madrid	10	14	0	4
Melilla	N/D	N/D	N/D	N/D
Murcia	2	4	32	19
Navarra	N/D	7	3	7
Valencia	N/D	N/D	N/D	N/D
Total	**174**	**386**	**134**	**196**

*N/D= No data available

26.3.5 Future projections of CDW generation and treatment

Table 114.Future projections of CDW generation and treatment

	2016	2018	2020
%CDW non-hazardous destined for the reuse, recycling and other recovery treatments (except clean soil).	60	65	70
% Disposal of non- hazardous CDW in landfill.	40	35	30
% clean soil (LER 17 05 04) from land and restoration works, conditioning or backfilling.	75	85	90
Disposal of soils (LER 17 05 04) in landfill (%) with respect the total volume of natural material excavated.	25	15	10

26.3.6 Methodology for CDW statistics

The Spanish Statistical Office is the body in charge of reporting CDW statistics at National Level. Autonomous Regions collect and report CDW statistics following the ELoW codes, following the methodology defined in the Decision 2011/753/EU. This data is then collected and compiled by the Spanish Statistical Office. Besides that, there are other organizations like the Spanish Federation of Construction and Demolition Waste (FERCD) or the Council of Ministers who report their own statistics.

26.4 C&D waste management in practice

26.4.1 CDW management initiatives

See section 1 & 2, mainly related with plans, strategies and non-legislative instruments for waste management.

26.4.2 Drivers / barriers to increase CDW recycling

<u>Main barriers to sustainable CDW management in Spain</u>

- Tough recovery from a hard hit economy
  - The economic crisis greatly hurt Spain's construction and demolition sector. CDW waste generation levels have risen and fallen with Spain's economic growth.
  - As indicated in the PEMAR, this economic crisis has furthermore left treatment centres without sufficient CDW supply to properly function (as many treatment centres are running below treatment capacity), and consequently, a wavering and unpredictable demand for prepared material.
- Lack of regulations (pre-demolition audits)
  - Many experts indicated that the lack of regulations on selective demolition and pre-demolition audits is considered to be a great source for CDW management issues. This

general lack of monitoring provides minimal incentives for waste and C&D actors to follow legislation and to be accountable of their actions.

- Market conditions for recycled aggregates
- Lack of markets for CDW (aggregates) deters development and promotion of the use of viable recycled waste.

- Lack of awareness of the advantages of recycled aggregates
  - This low awareness is directly related to the lack of markets for CDW (and vice versa). As waste actors are not well-informed about the advantages of using recycled aggregates in construction and renovation works, it is difficult to create a strong uptake in the market for CDW. Interviewed stakeholders indicated that many actors in the construction and renovation industry do not regard end-of-life CDW as a viable product to be used in construction and renovation works, especially since this waste material has a reputation to be highly contaminated and unprofitable to use.
- Availability of landfills and low landfill cost
  - Stakeholders generally believe that the landfill cost is not strict enough, and regardless of this perceived low price (EUR 5-40 depending on region)5, and the declared availability of 195 regulated landfills, illegal dumping is still not eradicated.
- Absence of GPP
  - It is a currently discussed topic on the national scale. The National Federation of Aggregates would be in support of envisioning a framework for obliging a 5-10% requirement for the use of recycled aggregates in construction works. However, this objective is currently difficult to obtain, as the use of recycled aggregates is only at about 1% and because there is not enough support to prioritise this objective.
- Lack of awareness
  - Stakeholders indicated that issues such as illegal dumping and improper management in light renovation works. In light renovation works that may not necessarily be carried out by professionals, there is a risk that the individual in charge may not comply by the proper measures for disposal. In regards to illegal dumping, there is no concrete way to harmoniously sanction all cases of illegal dumping.
  - Consumers are generally uneducated on how to act near a project site or how to conduct small renovation works on their households

Main drivers to sustainable CDW management in Spain

The following recommendations outline the main drivers in order to address the above mentioned obstacles:

- Leverage record low CDW levels to focus on other initiatives
  - The economic crisis, which drastically lowered the amount of CDW generated from the years of 2007-2009 could have potentially opened a door for the implementation of various initiatives, one being voluntary certification schemes. The LEED certification gained a slim level of recognition during the early years of the economic hit thanks to theoretically less expensive maintenance fees and increased value on its asset portfolio. However, as the amount of LEED certified buildings has only 252 registered buildings, with an even smaller 97 that have achieved the LEED certification, this initiative has not been considered as a driver in CDW management, although it potentially could be an advantageous tool. A stakeholder indicated that measures should be explored on how to leverage low CDW generation levels as an incentive to focus on other voluntary measures.
- Promote regulations (pre-demolition audits)
  - Although selective demolition exists on certain regional levels, such as in the Basque Country (Decree 112/2012), this is not a national practice, which greatly hinders the possibility to obtain good quality of CDW.
  - A positive driver towards promoting regulations consists of a mandatory financial deposit, required by law prior to demolishing buildings. Upon proving that the demolished building's CDW was lawfully managed, the deposit is reimbursed. While this system facilitates good management, as financial incentives are set in place, tighter monitoring needs to be set in motion in order to ensure that all actors are following through. At this stage, it is not clear whether this deposit scheme functions.
- Jump start the creation market conditions for recycled aggregates
  - On the national level, substantial levels of natural minerals are cheaper to excavate than to utilise recycled aggregates. Informal discussions are arising regarding taxing natural (raw) aggregates, however in practice certain stakeholders believe that this could further hinder the market for recycled aggregates, as current demolition practices leave demolition waste with relatively high levels of contaminants that are expensive to eliminate. Measures to promote the use of quality schemes should be implemented.
  - Green public procurement is not yet developed, although it could help the recycled aggregate market.
  - One of the objectives in the PEMAR is to include environmental costs within the cost for natural aggregates in order to make recycled aggregates more competitively priced.
- Increase availability of landfills and address low landfill cost issue
  - The introduction of a national entrance tax for landfills should be established nation-wide (Currently this is implemented on a regional level in Catalonia, Madrid and Murcia). Furthermore as outlined within the PEMAR a harmonisation of taxes

throughout all regions is foreseen, as certain regions' lower landfill taxes may unintentionally facilitate an influx of waste exports to those regions.

- Increase awareness
  - National, regional and local campaigns on the importance of properly disposing CDW and on conveying aggregates as viable construction material (to change its current perception as a waste material) could be advantageous. Targeted marketing efforts could be aimed at CDW actors on more technical subjects.

26.5 CDW sector characterization

26.5.1 CDW materials (CONCRETE, BRICKS, TILES AND CERAMIC, ASPHALT, WOOD, GYPSUM)

In *Spain*, CDW recycling plants produces aggregates and recycled materials for the construction sector in an 80%, in addition to recover, other sub-products like wood, metals, plastics, etc. in a 20%. The utilisation of recycled aggregates is becoming more and more common in the construction sector, in a wide range of applications like embankments and backfills, layers of asphalt pavements or concrete. The composition of the recycled aggregates in Spain shows a high percentage of concrete and ceramic materials. Each one of these applications forces different levels of requirements for the recycled aggregates properties. In the next figure, a data example of the Recycled materials in Spain is shown:

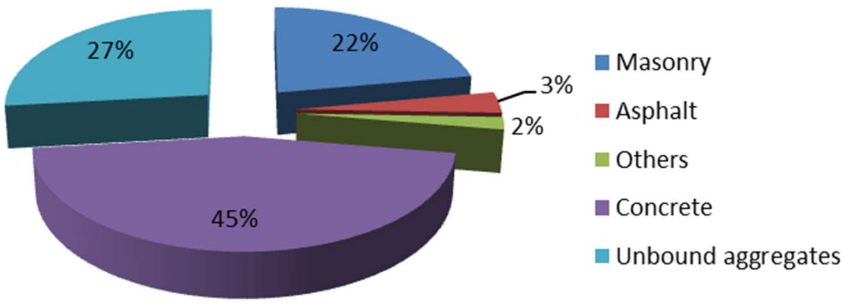


Figure 28. Recycled materials in Spain (Source: Spanish Association of CDW recycling (RCD)

Product description and applications

<u>Concrete</u>

Concrete is the predominant material in foundations and structures. It can be recycled as aggregate for new concrete, but to do this, it needs to be cleaned of masonry waste as well as wood, metals and plastics. It can also be used in the modification of the landscape, for example in gardened zones or in civil works as sub-bases of roads or filling of embankments. Depending on the type of work and the subsequent use of the waste, the crushing treatment will be different. On the other hand, the dust produced in the extraction of stones can be used as an aggregator and achieve a stony appearance in the manufacture of monolayer mortars. It can also be recycled into prefabricated concrete elements such as beams, pillars, joists, panels, alveolar slabs, pipes or pieces of urban furniture. Ultimately, they could be placed in vats next to other inert debris and taken to landfill and debris.

Bricks, tiles and ceramic waste

This material forms part of the main component of products fundamentally used in walls of facade and interior partitions, mainly bricks, tiles, and ceramics. They therefore account for a fraction of the CDWs. It is very usual to cut these pieces or to do rubs to facilitate the passage of the facilities, so it is advisable to prepare a space for the storage in order to be reused in the same work or in other place. If the recycling is not viable, it can be stored as debris or rubble from work site together with other inert CDWs (aggregates, soil ...) and can be deposited in controlled landfills. Stoneware can also be recycled, although the process is more complicated because of its diversity and small amount. Thus, it can ultimately be used as filler or storage material in controlled landfills. Porcelain waste can be used as filling of works and highways or for the manufacture of pre-crushed recycled concrete.

Asphalt waste

In construction, they originate mainly in the installation of waterproofing systems for roofs and basement walls. They can be recycled as asphalt or as fill mass in the work outside it, in a plant, by cold or hot processes. Efficient selective collection must be carried out without deterioration of the material. For this, it is necessary to carry out a pretreatment for the separation of other materials adhered in the contact zone, mainly residues of thermal insulation (glass fiber, polystyrenes ...) or separating layers (geotextiles, mortars ...). Subsequently a grinding should be carried out to achieve a uniform size for use in other mixtures.

Wood waste

Represents a significant proportion in CDW in Europe. The wood content in mixed CDW varies in between different EU countries and can reach up to 40% by weight, especially in countries where significant amounts of wood are used in the building sector. Wood waste includes clean lumber, but also painted or treated wood, plywood, pallets and furniture etc. Intact, massive wood parts might be reused for furniture, flooring, cabinets or other specialist reuse. Waste wood can be used for material recycling or energy recovery, depending on the quality and characteristics of the waste wood. The mixture of different wood qualities in CDW, like hardwood and softwood, engineered wood fractions (chipboards, particleboards etc.) and painted and/or treated wood complicates the material recycling, especially for higher grade applications.

<u>Gypsum waste</u>

Gypsum waste is usually generated in the trim and plaster coatings phases. Concrete elements (columns, walls, joists, etc.) must be covered with plaster because their sulfate content renders them unusable as components of a new concrete. They should be stored in rubble dumps. This type of gypsum waste from renovation, refurbishment and demolition works is more likely to present a certain degree of contamination, which can be in the form of nails, screws, wood, insulation, wall coverings etc. For this waste to be recyclable, it is required that the equipment processing the waste is capable of separating such contamination from the gypsum to arrive at a pure recycled gypsum.

Quantitative analysis

No data found.

Recovery techniques

No data found.

Environmental and economic impacts of CDW waste management

<u>Environmental impact</u>

<u>CONCRETE</u>

The Table 115 outlines the environmental impacts for each option for the management of concrete:

Table 115. Environmental impacts or each option for the management of concrete

Landfill	**Recycling as aggregates for direct re-use with no further processing**	**Recycling as aggregates for structural concrete**	**Re-use of concrete blocks**
• Transportation of waste to the landfill • No significant release of pollutants to water. Use of land space	• Transportation of waste concrete , raw materials and aggregates. • Processing of waste concrete into aggregates: dust production and noise during crushing and sieving steps • Extraction of raw	• Transportation of waste concrete, cement, recycled aggregates and raw materials. • Processing of waste concrete into aggregates: dust production and noise during crushing and sieving steps	• Transportation of waste concrete, cement and raw materials. • Processing of concrete blocks: energy for cleaning and decontamination • Transportation of concrete to the new

Landfill	Recycling as aggregates for direct re-use with no further processing	Recycling as aggregates for structural concrete	Re-use of concrete blocks
	materials (rocks and gravel for aggregates): land-use for quarries, production of dust, use of natural resources • Quarrying (land use , biodiversity) • Use of Resources Processing of raw materials into aggregates: dust production and noise	• Transportation of cement and recycled aggregates • Production of cement: energy consumption, greenhouse gases and pollutants emissions • Concrete production • Extraction of raw materials (rocks and gravel for aggregates): land-use for quarries, production of dust, use of natural resources • Quarrying (land use , biodiversity) • Use of Resources • Processing of raw materials into aggregates: dust production and noise	construction site • Extraction of raw materials (rocks and gravel for aggregates): land-use for quarries, production of dust, use of natural resources, biodiversity • Processing of raw materials into aggregates: dust production and noise • Production of cement • Concrete production •

CERAMICS, BRICK, TILES

The Table 116 outlines the environmental impacts for each option for the management of bricks, tiles and ceramics:

Table 116. Environmental impacts or each option for the management of bricks, tiles and ceramics

Landfill	Recycling in minor road works with no further processing	Recycling in heavy roads works with further processing	Re-use of bricks, tiles and ceramics CDW
• Transportation of waste to the landfill • No release of pollutants to water if the fraction is not contaminated (bricks, tiles and ceramics are made of clay, a	• Transportation of bricks, tiles and ceramics waste • Transportation of recycled material • Use of recycled aggregates: dust production when	• Transportation of bricks, tiles and ceramics waste • Production of aggregates from bricks, tiles and ceramics CDW: dust production and noise	• Transportation of bricks, tiles and ceramics waste • Processing of bricks, tiles and ceramics waste: energy for cleaning and decontamination

Landfill	Recycling in minor road works with no further processing	Recycling in heavy roads works with further processing	Re-use of bricks, tiles and ceramics CDW
natural material). Use of land space	loading, unloading the trucks and spreading the material on the roads • Extraction of raw materials (rocks and gravel for aggregates): land-use for quarries, production of dust, use of natural resources • Transportation of raw materials and aggregates. • Biodiversity impacts • Use of resources • Production of aggregates from virgin materials: dust production and noise during crushing, sieving steps • Use of virgin aggregates: dust production	during crushing and sieving steps • Transportation of recycled material • Use of recycled aggregates: dust production when loading, unloading the trucks and spreading the material on the roads • Extraction of raw materials (rocks and gravel for aggregates): land-use for quarries, production of dust, use of natural resources • Transportation of raw materials and aggregates. • Biodiversity • Use of resources • Production of aggregates from virgin materials: dust production and noise • Use of virgin aggregates: dust production	• Transportation of bricks, tiles and ceramics to the new construction site • Extraction of raw materials (clay material): land-use for quarries, use of natural resources • Biodiversity • Transportation of raw materials • Bricks, tiles and ceramic production: important initial energy consumption (energy intensive industry), associated greenhouse gases emissions • Transportation of bricks, tiles and ceramics to the construction site

ASPHALT

The Table 117 summarises the environmental impacts of the different end of life options for asphalt:

Table 117. Environmental impacts of the different end of life options for asphalt

Landfill	Recycling in a stationary plant to make new asphalt	In-situ recycling to make new asphalt	Recovery of reclaimed asphalt as a road base course in the form of aggregates
• Transportation of waste to the landfill • Potential PAH releases to water (when contaminated with tar) Use of land space	• Transportation of waste asphalt • Processing of waste asphalt into aggregates: particles generation and noise during crushing and screening steps • Production of new asphalt from reclaimed asphalt: fuel consumption for heating and associated greenhouse gases emissions (the energy consumption may be lower for the cold mix recycling method as the fuel consumption associated with the extra dryer of the hot mix recycling method is avoided) • Transportation of recycled asphalt • Extraction of raw materials (sand, stone and gravel): land-use for quarries, production of dust, use of natural resources, biodiversity • Transportation of raw materials • Processing of raw materials into aggregates: dust production and noise	• Processing of waste asphalt into aggregates: particles generation and noise during crushing and screening steps • Production of new asphalt from reclaimed asphalt: fuel consumption for heating and associated greenhouse gases emissions • Use of binders for fluxed asphalt in cold recycling processes • Extraction of raw materials (sand, stone and gravel): land-use for quarries, production of dust, use of natural resources, biodiversity • Transportation of raw materials • Processing of raw materials into aggregates: dust production and noise • Production of asphalt from raw materials: fuel consumption for heating and associated greenhouse gases emissions • Transportation of asphalt made from	• Transportation of reclaimed asphalt • Processing of waste asphalt into aggregates: dust production and noise during crushing and sieving steps (not relevant when the material is resulting from milling operations, therefore meeting the size requirements) • Transportation of recycled aggregates and virgin aggregates. • Extraction of raw materials (sand, stone and gravel): land-use for quarries, production of dust, use of natural resources, biodiversity • Transportation of raw materials • Processing of raw materials (rocks, stone, gravel, sand) into aggregates: dust production and noise •

Landfill	Recycling in a stationary plant to make new asphalt	In-situ recycling to make new asphalt	Recovery of reclaimed asphalt as a road base course in the form of aggregates
	• Production of asphalt from raw materials: fuel consumption for heating and bitumen production, and associated greenhouse gases emissions (the energy consumption may be lower for the cold mix method as the required temperature is lower that for the hot one, avoiding an extra fuel consumption) Transportation of asphalt made from virgin materials	virgin materials	

WOOD

The Table 118 summarises the environmental impacts of the recylcing and recovery options of waste wood.

Table 118. Environmental impacts of the recylcing and recovery options of waste wood..

Landfill	**Energy recovery** (Substituted material: fossil fuels or any other source of energy)	**Recycling into derived timber products (**Substituted material (in the same proportion): aggregates from rocks and gravel extracted from quarries)
• Transportation of wood waste to the landfilling site • Release of methane to the atmosphere (except when burnt in flare for its complete combustion, therefore replaced by CO_2)	• Transportation of wood waste to the incineration plant • No release of pollutants the air thanks to appropriate air control equipment and dust filters • Energy consumption based on	• Transportation of waste wood to wood manufacturers • Production of timber products from waste wood: energy consumption for the cleaning, cutting, crushing

Landfill	**Energy recovery** (Substituted material: fossil fuels or any other source of energy)	**Recycling into derived timber products (**Substituted material (in the same proportion): aggregates from rocks and gravel extracted from quarries)
Use of land space	fossil fuels resources (energy recovery from wood waste is encouraged and considered as a renewable energy) as the heat produced can be used to heat surrounding buildings or to produce electricity. Release of CO_2, particulates, VOCs (volatile organic compounds), PAHs (polycyclic aromatic hydrocarbons) compared to other material incineration.	steps, noise production • Exploitation of forests: energy consumption for logging and associated greenhouse gases emissions (or release considering that trees act as carbon sinks) • Transportation of virgin wood to the manufacturing plant (may be substantial when considering tropical wood from South America or South East Asia) • Production of timber products from wood: energy consumption for the cleaning, cutting, crushing steps, noise production.

GYPSUM

The Table 119 summarises the environmental impacts of the different end of life options for gypsum waste.

Table 119. Environmental impacts of the different end of life options for gypsum waste..

Landfill	**Recycling of plasterboards for re-introduction of the gypsum powder into the manufacturing process**
• Transportation of waste to the landfill • Production of H2S (bad smell and toxic to human health) when mixed with biodegradable waste (the European legislation requires specific cells in inert landfills to avoid H2S emissions)	• Transportation of construction plasterboard waste from the construction site to waste processors • Processing of plasterboard waste into gypsum powder: dust production and noise during

Landfill	Recycling of plasterboards for re-introduction of the gypsum powder into the manufacturing process
• Use of land space	crushing and sieving steps, additional energy consumption for the removal of paper • Transportation of recycled gypsum to plasterboards manufacturers • Extraction of raw materials (mineral gypsum): land-use for quarries, production of dust, use of natural resources, energy consumption • Transportation of raw materials • Consumption of resources • Land use and biodiversity issues due to gypsum extraction Processing of raw materials into powder: dust production and noise

Economic impacts

CONCRETE

Despite the environmental benefits of recycling concrete, its limited production costs do not encourage re-use and recycling. Nevertheless, using recycled concrete can also show economic advantages, depending on the local situation. The identified factors include:

- Proximity and quantity of available natural aggregates
- Reliability of supply, quality and quantity of CDW (availability of materials and capacity of recycling facility)
- Government procurement incentives
- Standards and regulations requiring different treatment for recycled aggregate compared to primary material
- Taxes and levies on natural aggregates and on landfill

CERAMICS, BRICK, TILES

The harnessed extraction of clay and the development of new manufacturing techniques maintain clay bricks and tiles as competitive building materials that have good quality, long life, minimal maintenance requirements and provide energy efficient solution during the use phase. The reduced costs of bricks, tiles and ceramics produced from raw materials are therefore not encouraging the development of recycling[12].

[12] www.tiles-bricks.eu

ASPHALT

The processes for the preparation of reclaimed aggregates (crushing, sieving) being the same as virgin materials, the production costs are estimated to be identical. On the other hand, the availability of virgin aggregates explains why the supply costs for these materials are limited which therefore does not encourage asphalt producers to turn to reclaimed asphalt as a substitution. However, landfilling and incineration for energy recovery are not considered as viable asphalt management options according to the industry as asphalt is an added-value material that is easily recycled thanks to the existing techniques.[13]

WOOD

Due to the competition of utilisation and the limited supplies, the market price for recycled wood is going up. The margin of the market price is influenced by the following elements:

- The regionally available amount of waste wood
- The intensity of the competition between material and energy recovery
- Seasonal variations (winter stock etc.)

In general, the prices for sorting, storage and treatment of specific waste wood fractions are not an incentive to the development of waste wood recovery.

GYPSUM

No data have been found.

Drivers / barriers to increase recycling

CONCRETE

The barriers and drivers identified are summarized below:

- Use of recycled concrete aggregates in road works: a high potential in the short and mid-term

Nowadays, concrete is mainly recycled into aggregates for road construction and the potential for improvement is still wide but considering that the need for such infrastructures will reach its maximum at some point65 and that the demand for aggregates will be sustained mainly through the maintenance and the replacement of roads, research has to be encouraged to find alternatives that will allow to achieve the 70% target and more in the long term.

- Sorting at source: separation for an improved material quality

An effective sorting out of mixed CDW is necessary to produce a higher non-contaminated concrete CDW fraction, to make easier the further recycling of this specific waste stream and improve the overall recycling rates.

- Landfilling ban: a driver towards the development of alternatives

[13] EAPA

The landfilling ban at the European level following the example set by the Netherlands would incentivise concrete waste producers into more re-use and recycling.
This goes hand in hand with the funding of research for the development of new options and for the improvement of the existing options (in terms of energy consumption, efficiency and costs). Moreover, the ban of disposing of concrete waste in landfills is likely to ensure a more regular waste supply for recycling industries.
According to the European Ready Mixed Concrete Organization, the goal of "zero landfill" of concrete can be achieved if the structure of a building is carefully planned and designed, and if the building undergoes successful renovation and deconstruction.

- Quality certification for recycled materials: a secure framework for the re-use and recycling of concrete waste

Quality certification of secondary materials (obtained after concrete waste has been processed) is expected to act as a proof that these materials can meet high security standards and achieve the same properties as virgin materials. Therefore, it is one of the solutions to promote the use of recycled aggregates and concrete blocks by contractors and manufacturers. CEN standards for aggregates already establish such requirements for aggregates used in concrete, mortar, and other applications.

- Building conception: designing for the end of life

Acting at the design phase of a building is another way of tackling the issue of CDW. Indeed, a careful design of the buildings and infrastructures would allow the dismantling and maximise the potential for re-use and recycling. Such an approach is also likely to lengthen the service life of buildings, decreasing the amount of concrete waste produced and therefore improving the current re-use and recycling rates.

- Green building systems: promoting the use of former concrete waste

Green building systems can encourage the re-use of concrete elements and the use of structural concrete made of increasing recycled aggregates by integrating such criteria in their rating charts. This would influence public perception regarding the quality of recycled concrete and promote large possibilities for its use, by specifically addressing the recycled concrete issue in the system.

CERAMICS, BRICK, TILES

Some potential drivers and barriers are summarised below.

- Landfilling ban: a promotion for existing and developing recycling options

The landfilling ban at the European level following the example set by the Netherlands would greatly encourage bricks and tiles waste producers to process their waste stream through the existing recycling chains and even fund research for the development of more efficient and highly demanding recycling techniques.
Moreover, the ban of disposing of bricks, tiles and ceramics waste in landfills (or the increase of landfill taxes) is likely to ensure a more regular waste supply for recycling industries.

- Building conception: designing for the end of life

Designing for the deconstruction of buildings would make easier the reclamation of bricks and tiles, improve the quality of the waste stream and therefore increase the re-use of these elements for new construction projects.

From another point of view, projects could be designed for longer life span, leading to the reduction of the waste stream.

ASPHALT

The barriers and drivers identified are described below.

- Investments

Asphalt recycling plants need to be modified to be able to introduce more reclaimed material in the manufacturing process. Moreover, the improvement of the recycling rates and the efficiency of the process (reducing the energy consumption would reduce the costs of recycled material) goes hand in hand with scientific research. All these actions represent substantial investments that may require financial support.

- Increasing cost of virgin materials: a driver towards the systematic use of reclaimed asphalt

Even if the availability of virgin materials is not yet the issue, the increasing cost of virgin materials would push asphalt producers to turn to reclaimed asphalt as a secondary raw material. This would create a demand and economic opportunities that would drive the improvement of recycling rates.

- Landfilling ban: a driver towards the systematic recycling of reclaimed asphalt

Though landfilling is not commonly practiced for asphalt waste, a landfilling ban (as already enforced in the Netherlands) or high landfill taxes would therefore lead to higher amounts to be managed by waste producers and asphalt manufacturers. The expected direct effect is the shift towards the obligation of applying the existing recycling techniques that are readily available to deal with important amounts of reclaimed asphalt.

- Increasing the communication to asphalt producers to promote recycling

Even though asphalt producers are well aware of the economic benefits that can come from recycling RAP in certain parts of Europe, a better communication from national environmental agencies towards the Asphalt Industry would highlight such benefits in other countries. A way of delivering this message would be the organisation of workshops and conferences where asphalt producers would measure the benefits in practical and economic terms.

Finally, it should be noted that the name "asphalt waste" does not stimulate the use of reclaimed asphalt. The word waste is mostly associated in a negative way. Indeed, using waste in the production of new products is often seen as a potential problem. Considering reclaimed asphalt as a product, as aggregates, would stimulate its re-use and recycling.

- Presence of contaminants preventing recycling

Before the use of asbestos was prohibited, asbestos fibres were used in the production of asphalt. This was for example the case in France before 1997, and this raises the issue of recycling asphalt that was produced before this date: difficulties linked to the identification of asphalt containing asbestos were raised by some experts[14].

[14] Laurent Chateau, ADEME,

WOOD

Recycling could be improved by measures to promote efficient sorting of wood CDW to avoid contamination, to make greater amounts of wood waste available for the industry and as a consequence achieve better recovery rates from wood CDW.

As a result of the European strategy of security and sustainable energy and the Landfill Directive, the use of waste wood for either material or energy recycling are expected to play a dominant role in wood waste management and stimulate the competition between material recycling and energy recovery. However, incentives to use waste wood as a renewable energy source might hinder the 70% recycling target, as energy recovery is not included in the target. This issue is amplified in countries where wood represents an important fraction of the CDW stream.

GYPSUM

Gypsum CDW recycling faces several barriers and the only recycling opportunity accounts for 5 to 10% of gypsum waste from plasterboards. Therefore, to achieve the 70% target, signification actions must be undertaken.

The main barriers are:

- The high availability and the low costs of raw gypsum material
- The low availability of gypsum waste due to un-adapted C&D processes. Indeed, though the techniques exist, they are not implemented because they would represent a financial burden to the C&D sectors.
- The lack of knowledge on recycling or other material recovery options. Indeed, manufacturing processes currently in place do not allow the re-introduction of a higher recycled gypsum powder content.

In order to overcome those barriers several options should be considered, the following paragraphs describe potential actions.

- Sorting at source: separation for an improved material quality

The recyclability of gypsum-based products and especially plasterboards could be enhanced thanks to deconstruction which would therefore make the sorting process easier. Indeed, gypsum based interior partition elements are easily dismantled and a further effective sorting would produce a higher non-contaminated gypsum CDW fraction, make easier the further recycling of this specific waste stream and improve the overall recycling rates.
Therefore, the characterisation of gypsum waste, i.e. the identification of gypsum waste material from other elements is the key point to increase the amount of potentially recycled gypsum.

- Gypsum waste collection: increasing the potential for recycling

Actions to ease the gypsum waste collection could also be considered to increase the amounts of CDW Building conception: designing for the end of life

- Green building systems: promoting the use of former gypsum waste

As for concrete waste, green building systems (e.g. HQE – Haute Qualité Environnementale in France, BREEAM - BRE Environmental Assessment Method in the UK, German Sustainable Building Certificate) can encourage the recycling of plaster elements and the use of plasterboards made of increasing recycled gypsum powder by integrating such criteria in their rating charts. This would influence public perception regarding the quality of recycled plaster elements and promote large possibilities for their use, by specifically addressing the recycled plaster issue in the system. Recommendations on gypsum products are also provided by the Commission in its GPP background report on wall panels.

- Increasing landfilling costs: a driver towards the development of alternatives

Nowadays, the operation of landfills is regulated at the EU level by Decision 2003/33/EC151 on Waste Acceptance Criteria, which was adopted to strengthen the waste regulations established by Directive 1999/31/EC152. This directive requires the implementation of the Waste Acceptance Criteria (WAC) for high sulphate content products by July 2005 which states that gypsum-based and other high sulphate-bearing materials having more than 10% sulphate in any one load is considered as waste and is therefore accepted in landfills. Moreover, "non-hazardous gypsum-based materials should only be disposed of in landfills for non-hazardous waste in cells where no biodegradable waste is accepted.
Increasing landfilling costs would encourage the development of new recycling techniques as waste producers would only be able to sustain such costs to a certain point. In the same way, it will improve the sorting out of gypsum construction waste and produce a higher feedstock for existing options. The recycling of gypsum waste would turn into a business opportunity as the demand for gypsum products is likely to increase with the population and the need for new houses, schools, hospitals, offices and shops. However, to optimise the effect of such driver, these costs should be harmonised all across the EU.

- Promoting R&D initiatives to explore new recycling options

Concerning construction waste, it is estimated that up to 25% of gypsum virgin material can be replaced by recycled gypsum powder for the production of plasterboards[15]. Therefore the target set at 30% by the European gypsum industry as the percentage of recycled material being re-introduced into the manufacturing process seem to be achievable.
To achieve the 70% target, promoting R&D on production techniques and investments in gypsum facility to increase the amounts of waste gypsum that can be used in the production of new gypsum seems essential in order to improve current processes and allow the re-introduction of a larger part of recycled gypsum in building elements.

26.5.2 Recycled materials from CDW

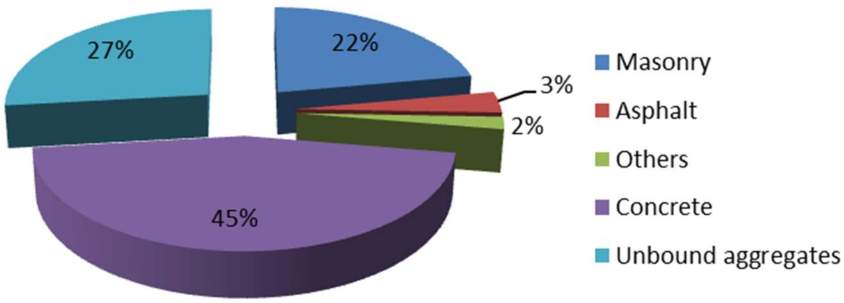


Figure 29. Recycled materials in Spain (Source: Spanish Association of CDW recycling (RCD.

[15] [Lund, 2008]

CDW recycling plants produces aggregates and recycled materials for the construction sector in an 80%, in addition to recover other sub-products like wood, metals, plastics, etc. in an 20%.

The utilisation of recycled aggregates is becoming more and more common in the construction sector, in a wide range of applications like embankments and backfills, layers of asphalt pavements or concrete. The composition of the recycled aggregates in Spain shows a high percentage of concrete and ceramic materials. Each one of these applications forces different levels of requirements for the recycled aggregates properties. Further information concerning technical regulation and legislation for the recycled aggregates in Spain will be provided in Deliverable D1.4.

26.5.3 Market conditions / costs and benefits

The landfill taxes in Spain are managed by municipalities, differing among the different municipalities. For example, there are some municipalities that apply a flat rate for landfill, while others apply different tariffs depending on the waste nature.

- Among the municipalities which have a flat rate for landfill, it can be found different prices ranging from 1€/t (Navarra) and 25,20 €/t (Madrid).
- Among the municipalities which have different tariffs, the inert landfill have cheaper tariff (20-10 €/t) than mixed waste (8-30 €/t).

Also the plants dedicated to the production of recycled aggregates supports the deposit of inert waste.

Table 120. Some examples for the costs for CDW landfilling in a recycling plant.

	Madrid	Albacete	Córdoba
Recycled CDW	10€/t	16€/t	8,50€/t
Reinforced concrete from CDW	5€/t	20€/t	6,70€/t
Bulk concrete	3,50€/t	9€/t	4€/t
Very dirty debris	-	25€/t	30,05€/t
Ceramic-concrete 0-40mm	3,50€/t	3€/t	

On the other hand, comparing the price of natural aggregates with the price of recycled aggregates, the first ones can range from 6- 12€/t for aggregates and 5-13 €/t for sands, while the price decreases for the recycled aggregates (see table below).

Table 121. Comparing the price of natural aggregates with the price of recycled aggregates.

Cost of the recycled aggregates		
	Madrid	Córdoba
Graded aggregate of 0-20mm	3€/t	2,40€/t

Cost of the recycled aggregates		
Graded aggregate of 0-40mm	4€/t	4,20€/t
Concrete aggregates 20-40mm	4€/t	4,20€/t
Ceramic-concrete 0-40mm	3,50€/t	3€/t
Ceramic-concrete 20-40mm	1€/t	3€/t
Filling material 0-6mm	2€/t	1,80€/t