

## 14. ITALY

### 14.1 Legal Framework – Waste Management Plans and Strategies

#### 14.1.1 National Legislation concerning CDW

National Regulatory concerning CDW in Italy are:

- D.lgs. 152/2006 e ss.mm.ii, “Norme in materia ambientale 8(Codice ambiente)”, which is the main legislation on waste;
- D.M 5/2/98 (amended by Decreto 5/4/06 n.186), “individuazione dei rifiuti non pericolosi sottoposti alle procedure semplificate di recupero ai sensi degli articoli 31 e 33 del Decreto Legislativo 5 febbraio 197, n.22”, dealing with the distinctin between dangerous and non-dangerous waste;
- D.Lgs. 36/2003 of 13/01/2003 “Attuazione della direttiva 1999/31/CE relativa alle discariche di rifiuti”, art. 2., lett e), which defines inet wastes and their management in landfill;
- D.M 27/09/2010 (amended by D.M. 24/06/2015) “Definizione dei criteri di ammissibilità dei rifiuti in discarica, in sostituzione di quelli contenuti nel decreto del Ministero dell’ambiente 03/08/2005”, which establishes inert waste categories for which laldfill recovery is allowed, without previous characterization, and sets the eluate concentration limits for inert waste acceptability in landfill;
- D.M. n.203 del 8/05/2003 “Norme affinché gli uffici pubblici e le società a prevalente capitale pubblico coprano il fabbisogno annuale di manufatti e beni con una quota di prodotti ottenuti da materiale riciclato nella misura non inferiore al 30% del fabbisogno medesimo”; which sets a quota of 30% for recycled materials and products in public procurement. This is mandatory only when there are recycled materials and products with the same characteristics of materials manufactured from virgin materials;
- Circolare 15/7/05 n. 5205 Green Public Procurement – “Indicazioni per l’operatività nel settore edile, stradale e ambientale, ai sensi del Decreto Ministeriale 8 Maggio 2003 n. 203”; which sets green public procurement rules for construction activities (including roads works);
- DM 161/2012 “Regolamento materiali da scavo” amending art. 186 Codice Ambiente; which sets the rules for re-use of excavated materials through “Piani di utilizzo” (an administrative document describing the use of excavated materials);
- DL 69/2013 (amended by L.98/2013), Art. 41 c. 2 and Art. 41-bis c. 1 e 5, which sets the rules for the “Piani di utilizzo”;
- D.L. 12-9-2014 n. 133 (entered into force on 13th september 2014) Art. 34 comma 9, which allows the re-use in situ of excavated materials whenever these materials are in line with the concentrations of pollutants as set by the legislation.

#### 14.1.2 Waste management plans (WMP) and Strategies

Italy has not developed a national waste management plan, as art.196 of D.Lgs.152/2006 provides that plans are developed at regional level. However, general criteria for the implementation of regional plans are defined in article 199 of legislative decree 152/2006.

According to national criteria, regional plans on waste management must include several provisions, such as:

- ✓ measures to ensure a reduction in the quantity, volume and hazardousness of waste;
- ✓ identification of ATOs;
- ✓ number and types of waste management plants that must be built in the region to ensure the proper management of waste (within each ATO);
- ✓ provisions to avoid soil and water pollutions, arising from waste landfilling;
- ✓ criteria to be followed by provinces in order to identify the areas not suitable for the location of plants;
- ✓ measures to prevent waste production and encourage reuse, recycling and recovery;
- ✓ measures to promote waste collection and management within the regional territory.

With Decreto Direttoriale of 7<sup>th</sup> October 2013, the Ministero dell'Ambiente e della Tutela del Territorio e del Mare has adopted the "Programma Nazionale di Prevenzione dei Rifiuti", which dissociates economic growth from environmental impact related to waste production. Based on data of Istituto Superiore per la Protezione e la Ricerca Ambientale (Ispra), the Programma sets the prevention targets up to 2020, and each national region has to integrate the owner regional planning with the national Programma indications.

With particular reference to CDW management plan, the association Green Building Council Italia has published in 2012 the "Guida per la Redazione del Piano di Gestione dei Rifiuti da Costruzione" which defines the minimum content of the CDW management plan, as:

- general information
- waste management targets
- measures for waste reduction, re-use, recovery and recycling
- measures for contaminated reduction
- measures of communication and education
- monitoring plan.

Examples of CDW management plan are in Lazio and Piemonte Regions.

#### 14.1.3 Legal framework for sustainable management of CDW

No data found

#### 14.1.4 Targets

The “Programma Nazionale di Prevenzione dei Rifiuti” of the Ministero dell’Ambiente e della Tutela del Territorio e del Mare, based on data of Istituto Superiore per la Protezione e la Ricerca Ambientale (Ispra), sets the prevention targets up to 2020 starting from data recorded on 2010:

- Reduction of 5% of urban waste generation per Pil unit;
- Reduction of 10% of hazardous special waste generation per Pil unit;
- Reduction of 5% of non-hazardous special waste generation per Pil unit.

With particular reference to CDW generation, art. 181 of D.Lgs. n.152/2006 sets that “by 2020, the preparing for re-use, recycling and other material recovery (including backfilling operations using waste to substitute other materials) of non-hazardous construction and demolition waste, excluding naturally occurring material defined in category 17 05 04 in the list of waste, shall be increased to a minimum of 70% by weight”, according to the European target set by Waste Framework Directive 2008/98/EC.

#### 14.1.5 End of Waste (EoW) status

The framework of “end-of-waste” is included in the Art. 184-ter of D.Lgs 152/2006 as amended by D.Lgs 205/2010. According to it, “a waste ceases to be such when it was subjected to a recovery, including recycling and preparation for re-use”.

A waste, to cease to be such, has to meet the specific criteria, in accordance with the following four conditions:

- a) The substance or object is commonly used for specific purposes;
- b) There is a market or demand for such a substance or object;
- c) The substance or object fulfills the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products;
- d) The use of the substance or object will not lead to overall adverse environmental or human health.

EoW criteria can be determined through one or more Decrees of Environmental Ministry “in accordance with Community criteria” or, in the absence of Community criteria, “case by case” for each kind of waste.

To this day, European Community has adopted only three EoW implementing Regulations, respectively for copper scrap, glass scrap and Iron, steel and aluminum scrap. So, according to art.184-ter of D.Lgs 152/2006, in the interim, it shall apply the provision laid down by the Decrees of Environmental Ministry on 5<sup>th</sup> February 1998, 12<sup>th</sup> June 2002 n.161, and 17<sup>th</sup> November 2005 n.269.

The art. 4 of Legge 11<sup>th</sup> August 2014, n. 116, "Disposizioni urgenti per il settore agricolo, la tutela ambientale e l'efficientamento energetico dell'edilizia scolastica e universitaria, il rilancio e lo sviluppo delle imprese, il contenimento dei costi gravanti sulle tariffe elettriche, nonché per la definizione immediata di adempimenti derivanti dalla normativa europea", sets that it's possible to adopt simplified procedures for EoW, provided that all requirements, criteria and prescriptions have to be respected, with particular referring to:

- a) quality and characteristic of waste to will treat;
- b) specific conditions to be respect in the course of activities;
- c) necessary requirements to ensure that waste will be treated without endangering human health and without using methodology that could harm the environment, with specific reference to monitoring minimum obligations;
- d) destination of EoW according to the identified uses.

Furthermore, the Legge n.116/2014 requires entities and companies, who already carry out recovery operations of "materia prima seconda" or secondary raw material derived by specific waste typologies (according to D.M 5<sup>th</sup> February 1998, 12<sup>th</sup> June 2002 n. 161 and 17<sup>th</sup> November 2005 n. 269, and art.9-bis of Law 30<sup>th</sup> December 2008 n. 210), to adapt their owner activities at particular provisions.

As of today there is only one material within CDW for which EoW criteria are being developed: aggregates made from CDW for paving roads ("granulato da conglomerato bituminoso"). ANPAR is lobbying to develop EoW criteria also for aggregates used for other construction works and in particular for the construction of buildings. According to interview made with different stakeholders the development of end of waste criteria would be much quicker if it was led by initiative/input from EU Commission.

#### **14.2 Non legislative instruments (best practices, guidelines, recommendations...)**

Non legislative instrument that contribute to create conditions for a sustainable management of CDW is LEED.

With regards to waste management, art.196 of D.Lgs. 152/2006 sets the rules for regional plans for waste management. It makes Regions responsible for waste management planning. Provinces according to art.197 are mainly responsible for controlling waste management activities. So, each region and/or province, has approved guidelines, recommendations or other instruments for CDW management and control.

The institutions that have establish regulations about CDW management are:

- Liguria Region
- Veneto Region

- Lazio Region
- Independent Trento Province
- Bologna Province
- National Association of Recycled Aggregate Producers (ANPAR).

Liguria Region, with D.G.R. n. 734 of 20<sup>th</sup> June 2015, has adopted the “Linee guida circa la caratterizzazione dei rifiuti da costruzione e demolizione, prodotti nell’ambito di attività edili di piccole dimensioni ed avviati ad impianti di recupero in base alle procedure semplificate di cui al D.M. 5.2.1998”. This measure introduces the criteria for CDW delivery produced among construction activities of small dimensions, and send to recovery facilities according to D.M. 5.2.1998 simplified procedure.

In Veneto Region, the Regional Council has approved the following documents:

- Guideline on “Modalità operative per la gestione dei rifiuti da attività di costruzione e demolizione. D.Lgs. 03.04.2006 e s.m.i., n. 152; L.R. 3/2000”. This document provides a set of operative indication for a suitable management of issue about production and management of CDW as in the production site, as in treatment plans, focusing on the **selective demolition** as most effective solution to reduce the amount of CDW and encourage sorting and recovery of waste separate fractions;
- Guideline on “Modalità operative per la gestione e l’utilizzo nel settore delle costruzioni di prodotti ottenuti dal recupero di rifiuti”.

Lazio Region has drawn up, in collaboration with ARPA Lazio, the DGRL n. 34 of 26<sup>th</sup> January 2012 “Approvazione delle Prime linee guida per la gestione della filiera di riciclaggio, recupero e smaltimento dei rifiuti inerti nella Regione Lazio”. This document establishes the main guidelines for CDW management, from the yard production up to the treatment, as in recovery plans as in landfill. The guideline introduces the drafting of the “**Piano di Gestione dei Rifiuti**”, which is a conceptual design for work organization, and the “**Selective demolition**” to ensure CDW recovery. It also defines criteria for the construction and the management of waste facilities, and for acceptance procedure of waste in entrance to recovery plans.

The autonomous Trento Province with deliberation n. 1333 of 24<sup>th</sup> June 2011, “Legge provinciale 14 aprile 1998, n. 5 (Disciplina della raccolta differenziata dei rifiuti). Approvazione delle Linee guida per la corretta gestione di un impianto di recupero e trattamento dei rifiuti e per la produzione di materiali riciclati da impiegare nelle costruzioni e delle Norme tecniche e ambientali per la produzione dei materiali riciclati e posa nella costruzione e manutenzione di opere edili, stradali e recuperi ambientali” has approved two guidelines:

- A) Linee guida per la corretta gestione di un impianto di recupero e trattamento dei rifiuti e per la produzione di materiali riciclati da impiegare nelle costruzioni, which is a support

document for management and control activities of a CDW recovery facility for the production of construction and environmental materials;

B) Norme tecniche e ambientali per la produzione dei materiali riciclati e posa nella costruzione e manutenzione di opere edili, stradali e recuperi ambientali. This document reports the basic principles for the use of recycled materials derived from CDW treatment, with particular reference to potential use, technical and environmental characteristics.

The Bologna Province has submitted the “Accordo di Programma in materia di residui edili da costruzione e demolizione” (approved by the Consiglio Provinciale with Delibera n 70 of 24.07.2001 and amended with the Delibera consiliare n. 90 del 23.07.2002), with the aim to promote an efficient, affective and economic management of CDW, based on the collaboration of both public and private entities, involved in waste cycle management. In 2004 it was published the “Manuale per la gestione dei rifiuti da costruzione e demolizione in Provincia di Bologna in applicazione dell’Accordo di Programma” with the purpose to encourage and promote the knowledge and the application of the “Accordo”. The manual gives instruction for: selective demolition, grouping and transporting different kind of CDW, recovery and landfilling of each CDW fraction, suitable operating of recovery facilities to obtain high quality recycled materials. This is the approach to encourage the building economic operators, which could organized production processes in most efficient way, producing less waste and avoiding transport and disposal costs, and recycling more materials.

The Edili Group of Industrial’s Association of Udine Province, proposes the guideline “Linee Guida per la Gestione degli Scarti di Cantiere” with the aim to provide rationalized solutions about CDW management problems.

There are also the “Linee Guida per la Gestione dei Rifiuti da Costruzione e Demolizione” and the Circolare 01/2015 of ANPAR (Associazione Nazionale Produttori Aggregati Riciclati) which propose the management procedure of CDW and their acceptance in recovery facilities.

Finally, starting from the above mentioned documents, among the activities planned in the new “Programma Triennale 2014-2016” of Sistema Nazionale della Protezione dell’Ambiente (SNPA) del Sistema Agenziale, it has been create a Work Group on the topic “Recovery of inert waste”. This group has the duty of define criteria and technical recommendation for CDW recovery, with particular regard to the characteristics of materials for upper and lower roads and to the verifications necessary for environmental respect in the use of recycled materials. So they have drawn up two technical rules integration proposals:

- Linee Guida su modalità operative per la gestione dei rifiuti inerti, in particolare da attività di C & D. This document provides a set of operative indication for a better management of CDW. Particularly, following the European principle on waste

hierarchy, the guideline provides operative arrangements aimed to enhance CDW through a regulated management. In this contest, particular attention is assumed by the encouragement of the “selective demolition” as efficient solution for decrease CDW amount and for encourage sorting and recovery of selective CDW fractions.

- Linee Guida sulle modalità operative per la gestione e l'utilizzo nel settore delle costruzioni di prodotti ottenuti dal recupero di rifiuti inerti. This document defines the Technical Norm for construction products as planned in DM 5.2.98, differentiated between “prodotti di recupero” and “rifiuti tal quali”.

### 14.3 CDW management performance – CDW data

#### 14.3.1 CDW generation data

CDW national generation are estimated based on information within Modello Unico di Dichiarazione Ambientale (MUD) database, relating to the annually declarations done by the entities identified pursuant to art.189 of D.Lgs. 3<sup>th</sup> April 2006 n.152, such as traders, businesses and Institutions carrying out recovery operations and waste disposal, etc. MUD data are subjected to a specific estimation methodology by ISPRA (Figure 10 and Figure 11); particularly, CDW generation data are estimated through removing MUD declarations of intermediate steps of waste management cycle in order to avoid duplication of data, taking into account inventory CDW amount at the end of previous year, and excluding imported CDW.

According to ISPRA “Rapporto rifiuti speciali 2016”, the largest contribution to special waste generation is ever constituted by CDW, as according to ATECO 2007 economic activities classification (ATECO Code 41-42-43) (Table 47), as according to the European list of waste LoW (CER Code 17) (Table 48).

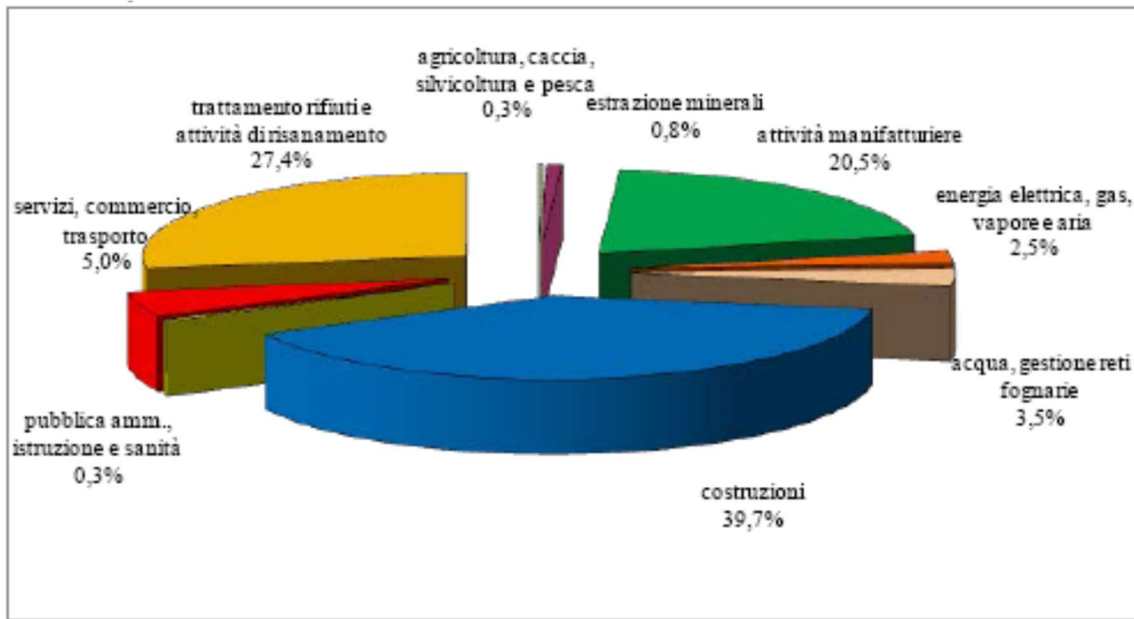


Figure 10. Percentage distribution of special waste generation according to the economic activities cataloguing (year 2014). By ISPRA

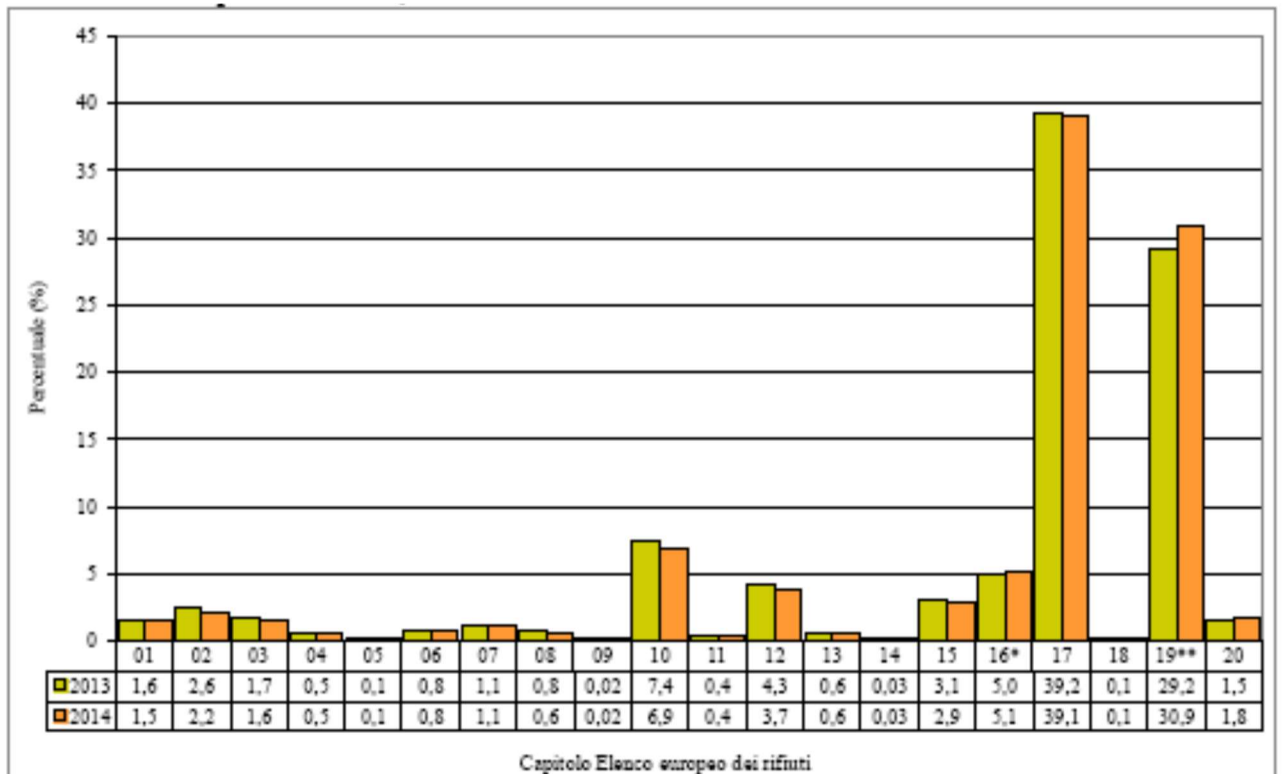


Figure 11. Percentage distribution of special waste generation according to the European list of waste (year 2014). By ISPRA



Table 47. CDW generation data according to the economic activities cataloguing – by ISPRA

	2012	2013	2014
Total Construction Waste (Code 41-42-43)	<b>53.072.414</b>	<b>49.314.540</b>	<b>51.846.344</b>
Non-hazardous construction waste (Code 41-42-43)	52.651.192	48.933.338	51.491.288
Hazardous construction waste (Code 41-42-43)	421.222	381.202	355.056

Table 48. CDW generation data according to the European list of waste – by ISPRA

	2012	2013	2014
Total CDW (Code 17)	<b>52.483.733</b>	<b>48.716.865</b>	<b>51.004.654</b>
Non-hazardous CDW (Code 17)	51.629.207	47.939.874	50.214.864
Hazardous CDW (Code 17)	854.526	776.991	789.790

ISPRA reports also the regional and the geographic macro-area breakdown for CDW generation (Table 49). With regards to the geographical macro-area, the northern Italian records production values per capita higher than the national average, in line with the productive and industrial fabric present in the territory. Southern Italy is the macro region with the highest increase of special waste produced, between 2013 and 2014, with + 12%. The increase mainly concerns the CDW (+ 27%), amounting to approximately 72% of the increase of macro geographical area waste.

Table 49. Regional and the geographic macro-area breakdown for CDW generation – by ISPRA

	NORD		CENTRO		SUD	
	2013	2014	2013	2014	2013	2014
Total CDW (Code 17)	<b>31.880.076</b>	<b>31.972.142</b>	<b>8.520.658</b>	<b>8.590.247</b>	<b>48.587.386</b>	<b>10.442.265</b>
Non-hazardous CDW (Code 17)	31.450.496	31.425.195	8.417.998	8.508.364	8.071.380	10.281.305
Hazardous CDW (Code 17)	429.580	546.947	1.022.660	81.883	115.272	160.960

With regards to the amount of different kind of CDW generation, EUROSTAT database reports the following data between years 2010 and 2014 (Table 50).

Table 50. EUROSTAT database with regards to the amount of different kind of CDW generation between years 2010 and 2014.

	2010	2012	2014
Mineral waste for construction	35.800.652	33.811.563	34.088.304
Metal wastes, ferrous	5.243.807	4.170.348	3.620.960
Metal wastes, non-ferrous	638.680	499.803	397.084
Glass wastes	47.872	60.650	72.265
Plastic wastes	26.864	36.451	28.366
Wood wastes	296.237	172.742	184.059
<b>Total</b>	<b>59.340.134</b>	<b>52.965.743</b>	<b>51.683.579</b>

#### 14.3.2 CDW treatment data

In the ISPRA document “Rapporto Rifiuti Speciali”, data related to waste management are analyzed by type of management: R1 – energy recovery; from R2 to R11 – material recovery; R13 – “mass reserve”; D1 – disposal in landfill; D15 – preliminary deposit; D10 – incineration; D8, D9, D14 – other disposal operations.

With this approach, CDW constitute the 63% of recovered waste and the 19% of disposed waste, for the 2014 year.

Given that the CDW generated in the year 2014 in Italy amounted to about 68,087 million of tons (including the waste remained in storage at the plants and from producers to December 31), they are treated as in the Table 51.

Table 51. CDW generated in the year 2014.

	Non-hazardous CDW [tons]	Hazardous CDW [tons]	TOTAL CDW [tons]
Recovery	56.556.960	111.400	56.668.360
Landfill	3.071.420	487.920	3.559.340
Energy recovery	437.000	0	437.000
Incineration	4.599.000	2.823.000	7.422.000
<b>Total</b>			<b>68.086.700</b>

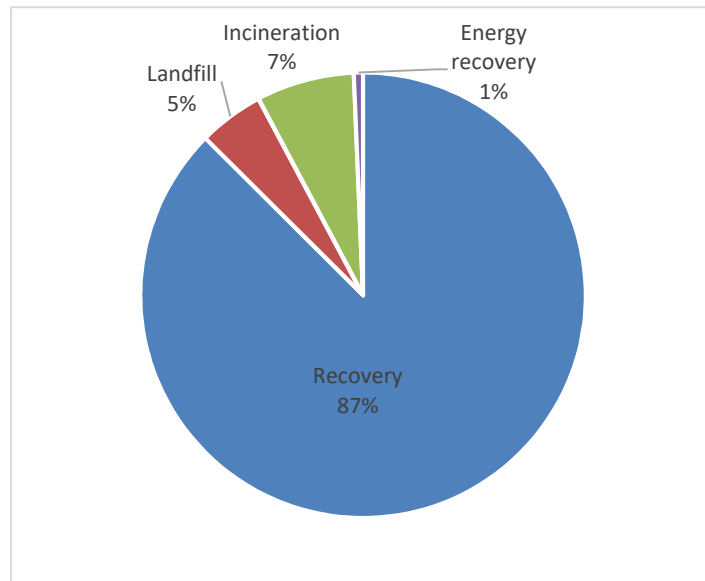


Figure 12. Percentage distribution of non-hazardous CDW treatment (year 2014)

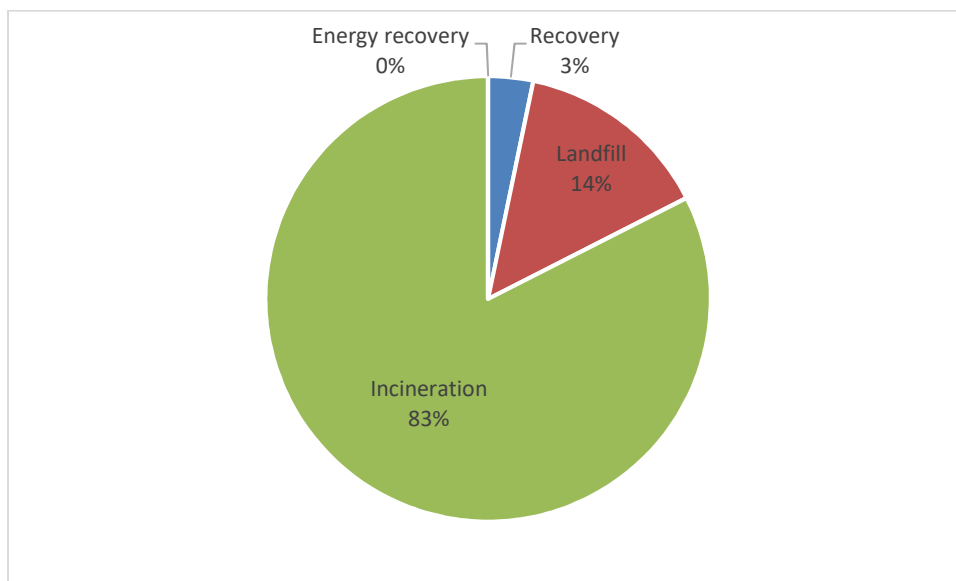


Figure 13. Percentage distribution of hazardous CDW treatment (year 2014)

Data published by EUROSTAT deals with different waste categories but becoming from all the economic activities. Therefore, only for the category “Mineral waste from construction”, data can be considered reliable, as in the Table 52.

Table 52. EUROSTAT - Mineral waste from construction.

Mineral waste from construction	2010 [tons]	2012 [tons]	2014 [tons]
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Mineral waste from construction	2010 [tons]	2012 [tons]	2014 [tons]
Landfill / disposal (D1-D7, D12)	1.009.838	919.878	1.049.201
Deposit onto or into land	1.009.838	919.503	1.049.201
Land treatment and release into water bodies	0	375	0
Incineration / disposal (D10)	2.684	2.720	4.375
Incineration / energy recovery (R1)	0	0	25
Recovery other than energy recovery	30.117.566	29.942.525	30.335.770
Recovery other than energy recovery - backfilling	337.196	160.290	316.790
Recovery other than energy recovery - except backfilling	29.780.370	29.782.235	30.018.980
<b>Total waste treatment</b>	<b>31.130.088</b>	<b>30.865.123</b>	<b>31.389.371</b>

#### 14.3.3 CDW exports/imports data

Total amount of special waste exported in 2014 is 3,2 millions of tons and the largest quantities of waste is destined for Germany and China: more than 245 thousand of tons of CDW (about 36% of the total amount of special waste) are exported in German.

CDW represent 3,9% of exported non-hazardous waste and 27,2% of exported hazardous waste.

Imported special waste in Italy in 2014 are about 6,2 millions of tons, and they are exclusively non-hazardous waste. CDW represent 49,4% of the total amount of non-hazardous waste, corresponding to about 3 millions of tons.

#### 14.3.4 CDW treatment facilities data

The number of operating landfills that have disposed of special waste decreased from 404 in 2013, to 392 in 2014 (Figure 14); the reduction is not attributable exclusively to the permanent closure of plants, but it is also attributable to the temporary non-operation of landfills especially medium and small size. This practice has been observed, even in previous censuses, especially with regard to landfills for inert waste, whose activities are often linked to exigent circumstances such as the opening / closing of yards in the different regional contexts.

In 2014, most of the landfill is located in the North with 228 plants, 58 are located in the Centre and 106 in the South; it should be noted, therefore, a non-uniform distribution throughout the country which follows the course of the production of special waste, closely linked to the industrial fabric of the country.

The data by geographic macro-area show that of the 12 operating plants in less surveyed nationwide, 8 are located in the South, 3 North to the Centre and only 1.

46.4% of all operating systems are made up of landfills for inert waste (182), 50.5% landfills for non-hazardous waste (198) and only 3.1% for landfills hazardous waste (12). The 182 landfills for inert waste are located: 118 in the North, 14 in the Centre and 50 in the South. In some territories like the Valle d'Aosta region or South Tyrol, characterized by extensive mountainous areas, the number of plants for waste aggregates is particularly important; these landfills, mostly managed by municipalities, are small and dedicated to the disposal of inert waste generated within the municipal area, often for use by residents. Landfills for inert waste mainly functioning on their own at the extraction of the minerals service companies.

In the last year examined, the number of landfills for inert waste and waste operating hazardous remained virtually unchanged.

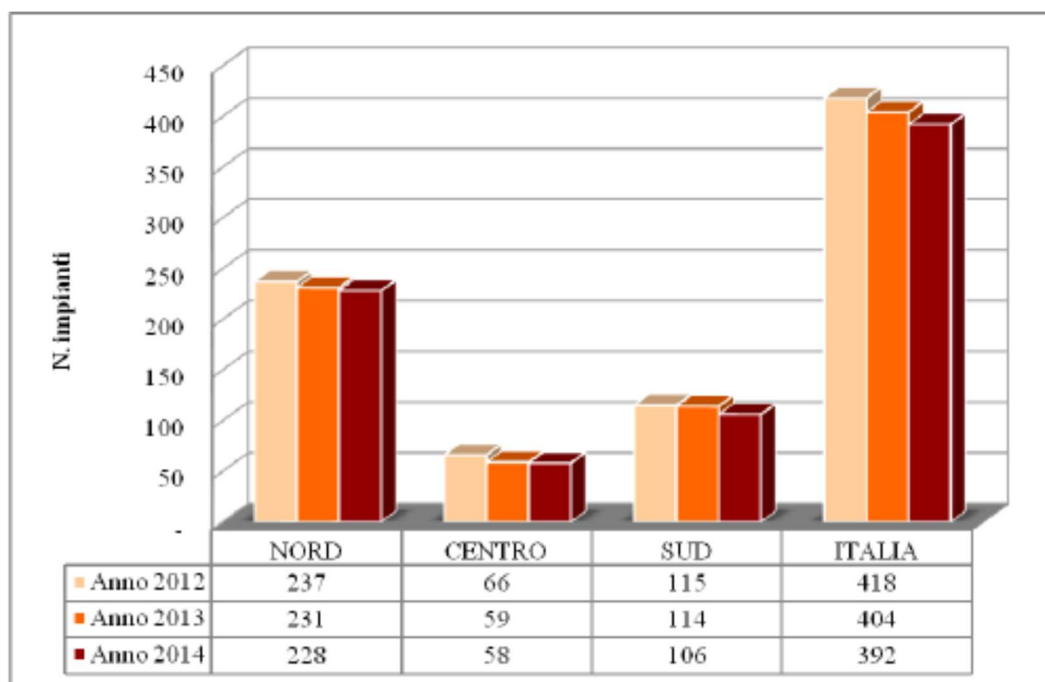


Figure 14. Special waste disposal plans in Italy – by ISPRA

#### 14.3.5 Future projections of CDW generation and treatment

An important opportunity for the sector's development is the application of the rules on GPP in the different areas of use of recycled aggregates. Italy with the publication of Law 221/2015 was the first country among the EU Member States, to impose an obligation of CAM application for procuring public stations, raising on the importance of green purchasing play as a tool strategic. The law also provided for in Article 23 of program agreements and incentives aimed at supporting the recycling sector.

With the Public Contracts Code (Legislative Decree no. 50/2016), then, it was confirmed the inclusion mandatory CAM in the calls for tender, providing a minimum of 50% or 100% of the auction value in relation to the categories of contract and where, not secondary, it promotes the identification of actions to reduce waste. Also in the Official Gazette no. 16 of 21 January

2016 was published the Decree of the Ministry of Environment of 24 December 2015 in which they are CAM issued for the award of planning services and work for the new construction, renovation and maintenance of buildings and for the management of the public administration sites that provide, among the criteria for the evaluation of the projects participating in public tenders, also properties related to the concrete. For concrete, and related components materials packaged at the construction site, it is in fact provided for a minimum of recycled matter content of at least 5% by weight, as the sum of the percentage of recycled material contained in the individual components (cement, additions, aggregates, additives), consistent with the limits imposed by the specific technical standards. So today all regulatory instruments seems to be developed, necessary for proper dissemination and implementation of GPP in the construction industry.

The use of recycled aggregates in the construction sector, however, is still not very developed because the vast majority of recovered material is used in infrastructure projects. Therefore, in view of the centrality of their role, it is hoped to be a part of the Ministry CAM resume and complete the assignment of services to design and construction of the new construction, renovation and maintenance of infrastructure (roads, railways, airports, etc.) and on the other hand that public administrations apply the provisions giving the market momentum of recycled aggregates, directing and stimulating demand, and require the application of the rating systems for the sustainable construction industry and for the infrastructure that promote and recognize purchasing strategies of green products based on logic circular economy.

Within some regional plans some proposals for simplification in the field of analysis of incoming waste and certification of the resulting products, have been presented.

The application of these proposals involves the establishment of strict management procedures, almost exclusively in the context of possible environmental quality procedures (ISO 14001, EMAS) and product (CE marking, system 2+).

The best results are possible in a context that integrates the construction procedures and with those of the recovery. It's important that some of the proposals made at individual level region are taken up and possibly reworked by other regions with a view to an optimization work and synthesis.

#### 14.3.6 Methodology for CDW statistics

The methodology for CDW statistics of data reported in this document is described in paragraph 14.3.1.

### 14.4 C&D waste management in practice

#### 14.4.1 CDW management initiatives

**Emilia Romagna Region** has recently adopted the Regional Plan for Waste Management: among the many tools available in the field to ensure that a proper and environmentally sustainable waste management and boost the economic development of the relevant

business sectors, the Plan promotes the development of a project dedicated to the valorization of CDW activities. The purpose of the Project are:

- A better understanding of the sector and encourage the proper application of legislation on the recovery of inert waste and the use of recycled products;
- Define actions and instruments to regulate and promote an inert waste management, which contextually ensures environmental protection and high technical performance of produced materials;
- Encourage the use of recycled aggregates for the various types of works, depending on the performance characteristics, with reference also to the field of public works (Green purchasing).

The Provincial Environmental Agency commissioned the IFEU Institute (Institut für Energie- und Umweltforschung Heidelberg) to develop the study "**Recovery of CaseClima demolition materials**". The project was funded by the European Union Programme "Regional Competitiveness and Employment FESR 2007-2013". With the present study, it's firstly detected the current situation of Bolzano Province, making a rough estimate of building and materials types used to in the past for CaseClima buildings. On this basis it is estimated in the second part of the study the extent to which the waste management system is required on other flows and other compositions of waste.

**SNAP-SEE Project.** The project focuses on developing and disseminating tools for aggregates management planning in Southeast Europe (SEE). It builds on the results of the Sustainable Aggregates Resource Management (SARMA) project. Due to regional differences in historical development, there are diverse approaches to aggregates policies, planning and management in SEE, which is hindering resource efficiency and economic development in the region:

- differences among mineral policies;
- aggregates policies and plans are distributed among many different legal documents, making coordination and a comprehensive understanding difficult;
- authorities in SEE countries do not have the understanding of either sustainable aggregates resource management (SARM) or planning for sustainable supply mix (SSM) and;
- there is almost a complete lack of coordination on planning supply from primary and secondary aggregates sources.

The primary result was to develop a Toolbox for Aggregates Planning to support national/regional, primary and secondary aggregates planning in SEE countries, which include:

- SNAP-SEE Vision for a transition to integrated, comprehensive sustainable aggregates planning in SEE;
- Handbook on Capacity Building and Stakeholder Consultation;
- Handbook on Data and Analysis Methods;
- Aggregates Planning Scheme, containing planning modules that embody the principles, approaches and action necessary to achieve the goals of the Vision <sup>11</sup>.

**Osservatorio Recycle**, promoted by Legambiente, has the aim to tell and deepen the already ongoing innovation in the production of recycled aggregates.

**RECinert® Project**, promoted by S.O.A. society since 2001, applies solutions for the treatment of inert waste, for the production of recycled aggregates and for the certification of these destined for road-building and environmental sectors. The project offers to companies in the construction-road sector, demolition and earth moving, its know-how for the implementation of CDW collection centers for the production of certified recycled aggregates to handle in the Partnership Agreement, ensuring the essential services (design, start-up, training, transformation and product certification). During 2012 the company has adopted a specific product certification procedure of exclusive brand registered and enrolled in the Repertoire of the Recycling held by the Ministry of Environment (RI-inerte® - RECAL® - BITUMgreen®). These products, classified as recycled aggregates conform to ministerial standards to guarantee the obligations of the PA Green Economy in the field of "green purchasing" and of the limited use of natural resources in accordance with national and EU Directives, subjected to analysis of the life cycle, have gained recognition of an environmental label for construction sustainable (LCA®).

Gyproc Saint-Gobain, among the European Programm LIFE+, has developed **Gy.Eco Project** for the recycling of gypsum waste which, commonly, are sent in landfill. The project proposed, as an alternative to landfill, a recovery service of gypsum waste used for the production of Secondary Raw Materials (MPS). The project has enabled the development of a network of collection sites of waste gypsum and recovery plants. The quantities of waste gypsum that are recovered every year in Italy through GyEco, is equivalent to about 20% of the annual amount of waste gypsum.

This project led, in the course of 2015, the signing of a Memorandum of Understanding (MOU) between the National Association of Manufacturers Recycled Aggregates (ANPAR) and Gyproc Saint-Gobain, for the management of CDW gypsum. The MOU aims to:

- Offer to the building market alternative to disposal of gypsum waste in landfills;
- Promote products based on gypsum in the building market;

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<sup>11</sup> For more details see the project website: <http://www.snapsee.eu/>



- Promote proper management of gypsum CDW, aimed at the recovery of the same waste.

#### 14.4.2 Drivers / barriers to increase CDW recycling

Although the recycling of inert waste present a number of advantages:

- for public administrations and local authorities, which can safeguard the territory, increasing recycling and limiting recourse to landfill and the opening of new quarries of natural aggregates;
- For the construction sector, which can deliver its waste at recycling facilities at a lower cost than the use of landfills and, at the same time, supplies of materials that, with the same performance, have better prices than the natural materials;
- to environmental protect and human health safeguard;

there are still many obstacles which do not allow the sector to gain momentum and, therefore, become an active component in the circular economy mechanism.

In the following main barriers are analyzed:

- Distrust in the use of CDW derived products.

Although now recycled aggregates guarantee the same performance characteristics of natural aggregates used in road works, their origin from waste leads into potential user an instinctive mistrust, based, unfortunately, on unlawful practices that occurred sometimes in the country;

- Lack of reliable data on the production of inert waste.

The absolute prerequisite for proper planning of inert waste management activities is the quantification of the produced volumes. In the case of CDW, and more generally of inert waste, such quantification is particularly difficult. The official production data of CDW provided by ISPRA are in fact only estimates and it is conceivable that there are still illegal practices;

- Lack of updated technical tools (Specifications tender)

Among the main reasons for the reduced mass production of recycled aggregates and dissemination of their use, may be counted the absence or deficiency of specific tools, such as special Specifications tender, updated with the harmonized European standards in the sector;

- The absence of "recycled aggregate" in the price lists of building works

The introduction of "recycled aggregate" in the price lists of the building works would help to facilitate use (a few are today the Chambers of Commerce that have been updated);

- Lack of source separation of waste and use of selective demolition practices

Traditionally the demolition in Italy does not provide for a special effort in the selection activities at the source of the various types of waste. On larger construction sites it tends to separate the dangerous component of waste (in particular materials containing asbestos and man-made vitreous fibers), the ferrous fraction and sometimes even the wood, while little is done on the remaining waste. CDW management Protocol drawn up by the European Commission DG GROW dwells on the need to identify the different types of waste by means of preventive audits, on the basis of which it is appropriate to draw up a plan waste management;

- Lack of taxation of mining

Among the economic instruments used mainly abroad to promote the market for secondary raw materials, it has an important role the tax on the extraction of virgin materials. In fact, the resulting increase in virgin materials cost would facilitate their use only for the applications where higher performance aggregates (eg. Concrete) are required, leaving to the recycled aggregates and to reused lands (treated or not depending on their characteristics) other applications (eg. road construction and fills);

- Lack of prohibition or obligation to contribute to the landfilling of inert waste

Another political tool, which has shown great effectiveness in the countries in which it was adopted, is the introduction, in national legislation, of the ban on landfilling of inert waste, which would favor the consequent development of recycling activities. Even the introduction of a tax on landfill would produce results through a more competitive recovery, although much would depend on the level of such fee;

- Requirement analysis performance for waste sent for recovery / recycling

The current regulatory framework provides for the obligation of performing the analyses for waste sent for recovery / recycling and the exemption for waste sent for disposal, with clear penalties for the recovery / recycling, particularly for the waste produced by micro renovations of civil building.

- Adoption of End of Waste criteria

The Waste Directive 98/08 / EC introduces the concept of End of Waste with the objective of setting technical and environmental criteria to determine when, downstream of certain recovery operations, a refusal ceases to be such and become a product no longer subject to waste legislation. The definition of precise and clear criteria should encourage the production of products recycled and reward those who invest more on the quality of its products. However, to date the End of Waste criteria, for waste from construction and demolition, have not yet been defined at European level and it is now clear that the intention of the Commission give freedom to that effect to the various Member States.

- CE marking

The relevant harmonized European standards for recycled aggregates are introduced, for several years now, the concept that products put on the market must be evaluated for their performance characteristics and not according to their nature. Only the CE marking of aggregates is able to ensure the end user on the characteristics of the material purchased. In a correct performance of the market, it is up to the user to request (in their intended function) minimum requirements for clusters, and to assure manufacturer. It is believed that if the designers and directors of the work, which provides the use of aggregates, they impose the accompaniment of the material with the required documentation (labeling and DoP), most of the problems in the market of recycled aggregates would be resolved.

## 14.5 CDW sector characterization

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

#### *Product description and applications*

## CONCRETE

Concrete waste can arise from different sources: returned concrete which is fresh (wet) from ready-mix trucks, production waste at a pre-cast production facility and CDW, which is the most significant source.

Main application of concrete waste is the production of recycled aggregates, which are commonly used:

- in the roads construction industry, in the underpinning or as filling in the detected, and
- for the production of new concrete for non-structural elements.

In the first case, the material is subjected to special treatment: iron removal, trituration, elimination of light fractions. The material that is produced is then used in road foundations: by the way has excellent characteristics because it gives the same stabilizing effect.

In the second case, instead, the product is obtained by trituration of the concrete. The aggregates thus obtained are used in place of those from natural rock and used for the production of construction elements in concrete.

## BRICKS

Bricks are highly durable materials and they can be re-used after a building selective demolition, or otherwise they can be recycled into mix inert used as substrate for the construction of roads.

The re-use of post-consumer bricks is an expensive process as it needs preventive removal of mortar and plaster and often the percentage of material to be discarded because not cleanable, is high. Maximize and optimize the re-use of building materials can be planning the disposal of the building or its components in the initial project.

The recycling of production bricks scraps, is more prevalent: the factory waste are ground and used as "smagranti" in subsequent production cycles.

## TILES AND CERAMICS

Tiles and ceramics waste are generally used, mix to other inert CDW, to produce recycled iner used in bound form or unbound: the aggregates are used "loose" or mixed with binders, to form mixed cemented or asphalt.

The prevailing use sectors relate to the construction of civil engineering soil works, of discovered bodies, environmental recoveries, of fills and filled, of road and railway works, of road, rail and airport foundations, of civil and industrial yards, of layers of foundation of the transport infrastructure, of the accessories layers with capillary function antifreeze and draining.

## ASPHALT

The asphalt, recovered with milling, reusable products are of high technical features as part of the same road construction from which they come (wear layers and connection composed of natural stone aggregates and bitumen).

## WOOD

Timbers are generally separated in the demolition phase, in order to be able to be re-used.

Otherwise, wood waste are separated during treatment process in plans and, if non contaminated, they could be used for energy recovery.

## GYPSUM

Three sources of gypsum waste exist: production waste, construction waste and demolition waste.

Waste gypsum under CER 170802 "Building materials made from different plaster from those mentioned in 170801", consist essentially of gypsum plaster and drywall. These materials, although they represent a modest amount compared to the total CDW, are the focus of numerous issues, both from the environmental managers and producers.

Even though gypsum is considered to be "fully and eternally recyclable" by the gypsum industry, only production and construction gypsum waste is currently recycled. Recycling of gypsum products that are collected from demolition and renovation projects can be contaminated with other materials, such as paint, fastenings, screws, wood and insulation materials among others, which can render recycling difficult.

### *Quantitative analysis*

The average composition of the CDW in Italy is dominated by the inert fraction, being constituted by 75-90% of aggregates (largely bricks and concrete, more sand, chalk and excavated earth), for 4-8% from plastic, wood, paper and cardboard; to 3-7% by metals. Regarding the composition of the inert fraction, the most reliable data are derived from detection of the types of inflow waste recycling plant: fragments of concrete mixes also reinforced, bricks, coatings and ceramic products, industry waste prefabrication of non-reinforced concrete, fragments of road and railway superstructure, cold milled asphalt, plaster, enticements, soil and excavation rocks. Ceramic materials account for about 45% of waste conferred in recycling facilities.

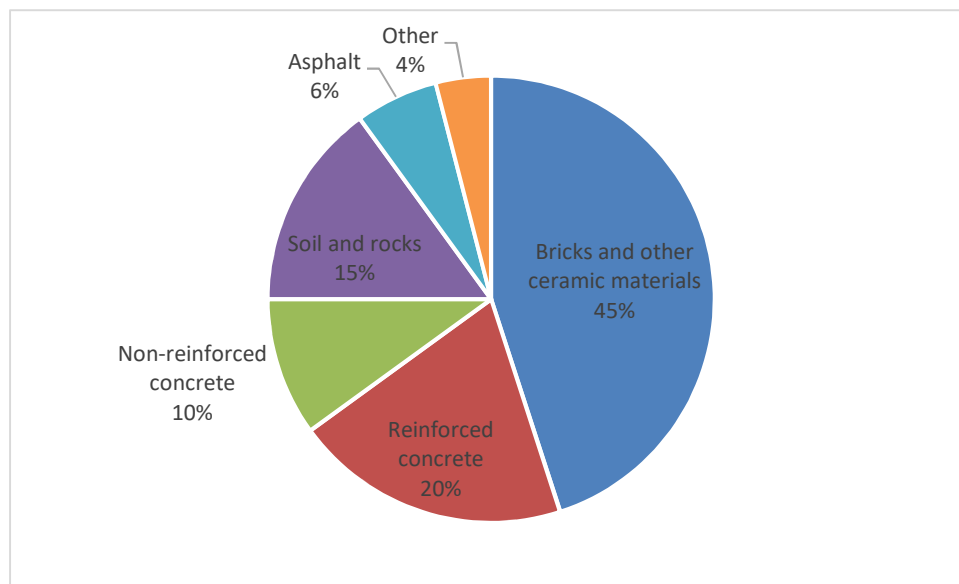


Figure 15. CDW Inert fraction composition at recycling plans – ANPAR 2012

In renovation, inside of which demolitions is more than 90%, almost exclusively bricks and other ceramic materials (remakes of roofs, displacement of internal partition walls, replacement of coatings, etc.) are produced. In the whole demolitions, instead, the concrete equals the percentage of bricks. Concrete represents 30% of the total debris, while the remaining 25% is made up of asphalt, soil and excavation rocks and other scraps.

#### *Recovery techniques*

As results from previous paragraphs, possible destinations for inert waste are:

- Recovery on site mobile plant
- Recovery of stationary treatment plant
- Disposal landfill for inert.

At recovery facilities, inert CDW and of those from other assets, are shredded and prepared for use in the construction industry. The CDW recovery plant should be able to split the incoming material basically into three streams:

- Re-usable stone material (95%);
- metal fraction (0.1%);
- Junk fraction (paper, plastic, wood, impurities, etc.).

Stationary plans are characterized by the greater complexity, due to the simultaneous presence of different grinding systems able to produce different particle sizes of material.

Stationary plans are generally equipped with transport systems to tape the different fractions into defined areas of the plant.

As regards the plant organization, the layout must identify:

- waste, distinct from those entering the plant and those produced by;
- worked in the characterization pending before their final qualification of “Materia Prima Seconda” (MPS)
- secondary raw materials qualified as MPS after characterization;
- the placement areas of the equipment and used machinery;
- the movement areas (if present) of loading / unloading;
- the emission / discharge points.

The phases necessary to obtain a good quality product are:

- quality control of incoming material;
- Preliminary separation of the fine fraction, which is not relied upon to crushing;
- size reduction (crushing);
- separation of metals;
- refining;
- removing the light fraction.

Mobile plans, deriving from traditional crushing plants aggregate quarry and cost-effective in large scrap yards, typically have simple reduction in volume of the individual elements entered in the system; It is to be checked case by case basis, if with appropriate technological features, it can be ensured an adequate granulometric assortment of materials in output to the treatment, and the elimination of non-inert fractions. This type of system provides a substantial advantage as the ability to shoot down any shipping costs in the case of on-site reuse of the material to be used to grind, but it's necessary to review their product characteristics, in order of their reintegration in the production cycles.

#### *Environmental and economic impacts of CDW waste management*

In Italy CDW recovery has been in the past considerably slowed due to multiple factors, including: a territory very rich in natural building materials and cutting stones that have historically fed almost all of the requirements; the reduced cost for the landfill; a broadcast of interventions of micro-demolition; poor culture of recycling. However, even in Italy, on the basis of CDW production and management data of the last years, the percentage of the preparation for reuse and recycling of CDW appears more than 75% today.

To facilitate the market penetration of these important recycling products appears the approach of Green Public Procurement (GPP), or green purchasing for public works for which it will need to have the use of a significant percentage, more than 30 % of recycled materials. In this regard the "Minimum Environmental Criteria" are being developed at the Environmental Ministry, for purchases related to certain product categories including construction and maintenance roads, street furniture, construction: the supply of recycled materials will become so short decisive for the award of tenders in the public sector.

The current recycling management requires, always more often, the selective separation of waste in the demolition phase, the collection and temporary storage, and the transport to the treatment plants and CDW process for the production of recycled inert materials. Sorting and recycling provide an important alternative to the traditional landfill and an obvious choice in terms of environmental sustainability.

From the comparative analysis of the recycle processing operations with respect to the processing of natural aggregates, it is possible to identify an obvious environmental advantage, connected to an increasingly widespread practices of CDW recovery and recycling, summarized in the following points:

- A significant reduction of the exploitation of non-renewable raw materials, replaced for multiple fields of application of recycled aggregates with equal technical performance,
- A reduction of energy consumption, water and CO<sub>2</sub>,
- Reducing the ecological footprint for specific construction waste such as ceramics, mortar, concrete and bricks,
- An improvement of an increasingly important factor in economic and environmental terms as the "land use": the increase in the CDW recycling rates allows for a significant limitation of the landfill contributions by making the potential use of portions of territory to the noblest purposes.

Increasing the percentages of recycled material means contribute substantially to the slaughter of the impacts and an overall enhancement of natural resources with a view to better and better environmental sustainability and economic opportunity in full compliance with the Community objectives.

#### *Drivers / barriers to increase recycling*

See Section 14.4.2

#### 14.5.2 Recycled materials from CDW

D.M. 2/5/98 (as amended by Decree of 4/5/06 n.186) contains all the instructions for carrying out the CDW recovery activity in a simplified regime. In particular, paragraph 7.1.4

specifies what may be the characteristics of raw materials and/or obtained products: secondary raw materials for the construction industry with characteristics according to Annex C of the Circular of the Minister of Environment and Territory Protection of 15/07/2005 n.5205, depending on their intended use:

C1: Body of detected;

C2: road foundations;

C3: layers of foundation (of the transport infrastructure and of civil and industrial yards);

C4: environmental recoveries, fills, filled;

C5: layers accessories having antifreeze functions, capillary, drainage, etc..

The parameters that give more problems and affect the quality of the final products are:

- Quality of fine fractions (it is estimated by the sand equivalent): the presence of dirty fine fractions, such as silt and clay, responsible of plastic behavior of the mixture;
- shape index: presence of elongated granules;
- resistance to fragmentation (Los Angeles test): presence of soft elements, such as eg. the bricks, important parameter for the determination of the variability of the particle size of the recycled material.

Most of the recycled building products, obtained from the recycling of polymers, rubber, glass, paper, wood and aggregates consists of coatings for floors and for thermal and acoustic insulation and of vertical closures coatings. The construction market offers a large number of recycled products, which tends to grow steadily over time.

With regard to aggregates for concrete, to the above must be added the stipulations contained in D.M. 14/1/2008 "Approval of new technical standards for buildings".

#### 14.5.3 Market conditions / costs and benefits

No data found