

## 13. IRELAND

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

#### 13.1.1 National Legislation concerning CDW

In Ireland, legislation concerning the management of CDW forms part of the general waste legislative framework and is supported by:

- Policy Documents issued by the Department of Environment, Community and Local Government (DECLG)
- Regional Non-Hazardous Waste Management Plans prepared by local authorities
- National Hazardous Waste Management Plans published by the Environmental Protection Agency (EPA)
- Planning Guidelines for Future Developments published by DECLG
- Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects published by DECLG
- Industry Support Documentation published by the Training and Employment Authority (FAS) and the Construction Industry Federation (CIF)

Ireland has transposed the revised EU Waste Framework Directive 2008/98/EC on Waste (WFD 2008/98/EC) into national law in 2011. More specifically, the European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) amended the Waste Management Act 1996 (No. 10 of 1996) and subsequent amendments in order to bring Irish legislation in line with WFD 2008/98/EC (from [122] to [130])

Additional key waste regulations that have an impact on CDW management are given below:

#### *Industrial Emissions Licenses*

The European Union (Industrial Emissions) Regulations 2013 (S. I. No. 138 of 2013) and EPA (Industrial Emissions) (Licensing) Regulations 2013 (S. I. No. 137 of 2013) placed a number of additional waste activities (such as biological and thermal treatment facilities above a certain capacity) under the licensing regime of EPA. However, these regulations have a limited impact on CDW management ([131] - [132]).

#### *Waste Licenses*

The Waste Management (Amendment) Act 2001 (No 36 of 2001) [130] and the Waste Management (Licensing) Regulations 2004 (S.I. No. 395 of 2004) [133] provide the legal framework under which Waste Licenses are obtained and maintained. CDW facilities governed by the above acts and regulations include landfills and material reclamation facilities which are capable of handling more than 50000 tonnes of non-hazardous waste per year.

#### *Waste Facility Permits and Certificates of Registration*

Waste Management (Facility Permit and Registration) Regulations 2007 (S.I. No. 821 of 2007) and subsequent amendments provide the legal framework under which Waste Facility

Permits or Certificates of Registration are issued by local authorities. Waste Facility Permits are issued either for CDW facilities where concrete and brick crushers are being used to recover up to 50000 tonnes of inert CDW per year or CDW materials reclamation facilities which are capable of handling less than 50000 tonnes of non-hazardous waste per year. Finally, Certificates of Registration are issued for small scale CDW material reclamation facilities which are processing less than 10000 tonnes per year and generating less than 15% of residual waste ([134]e [135]).

### *Hazardous Waste Regulations*

The following list of regulations transposed a number of EU directives related to asbestos waste, batteries and accumulators, lead, mercury, polychlorinated biphenyls (PCBs), waste oils, and general hazardous waste into national law.

- Waste Management (Hazardous Waste) Regulations 1998 (S.I. No. 163 of 1998) and subsequent amendments ([136]e [137])
- Fluorinated Greenhouse Gas Regulations 2011 (S.I. No. 279 of 2011) [138]
- Control of Substances that Deplete the Ozone Layer Regulations 2011 (S.I. No. 465 of 2011) [139]
- Persistent Organic Pollutants (POPs) Regulations of 2010 (S.I. No. 235 of 2010)[140]
- European Union (Installation and Activities using Organic Solvents) Regulations 2012 (S.I. No. 565 of 2012 ) [141]
- European Union (Paints, Varnishes, Vehicle Refinishing Products and Activities) Regulations 2012 (S.I. No. 564 of 2012 ) [142]
- Safety Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013) [143]
- European Communities (Metallic Mercury Waste) Regulations (S.I. No. 72 of 2013) [144]

### *European List of Wastes*

From 1 June 2015 waste classification in Ireland is based on the European List of Wastes (Commission Decision 2000/532/EC) as it was amended by Commission Decision 2014/955/EU. Chapter 17 of the list deals with CDW (including excavated soil from contaminated sites). ([145]e [146])

### *Landfill Levy*

A levy of €15/tonne on waste deposited to landfills was introduced in 2002 under the Waste Management (Landfill Levy) Regulations 2002 (No. 86 of 2002). The Landfill Levy was gradually increased between 2008 and 2013. It is currently set at €75/tonne in accordance with the Waste Management (Landfill Levy) Regulations 2015 (No. 189 of 2015). The Landfill Levy applies to CDW deposited at authorized and unauthorized landfills. It excludes non-hazardous CDW materials (such as concrete, bricks, tiles and road plannings) with particle sizes of up to 150 mm and excavation soil (such as clay, sand, gravel or stone) which are used for landfill site engineering, restoration or remediation purposes ([147]e [148]).

### *Planning Regulations*

Based on the Planning and Development Act 2000 (No. 30 of 2000) [149], planning authorities have the power (when they think it is appropriate) to impose conditions related to management of CDW to new developments which require planning permission. In addition, they are required by the Protection of the Environment Act 2003 (No. 27 of 2003) [150] to pay careful attention to the Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects[125] and ensure that all necessary measures are taken for CDW to be recycled or managed correctly. The above obligation extends to include record keeping, tracking of waste flows, waste audits and the submission of summary audit reports to the relevant local authority [151].

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

The National Hazardous Waste Management Plan (NHWMP) was published by EPA in 2014. It covers a six year period (2014-2020) and sets out the priorities that should be undertaken within its lifetime. These are prevention of hazardous waste, improved collection rates for certain types of hazardous waste, steps that are required to improve Ireland's self-sufficiency in hazardous waste management and the continued identification and regulation of legacy issues (such as risk assessment and regulation of historic unregulated waste disposal sites) ([152]).

The National Waste Prevention Programme (NWPP) was published by EPA in 2004. The latest version of the NWPP has the title Towards a Resource Efficient Ireland and covers a period of six years (2014-2020). The programme gives a strong emphasis on resource efficiency and waste prevention. Its main objectives are (a) to implement EU and national waste legislation, (b) promote sustainable waste management, (c) reduce waste rates including hazardous waste, (d) manage hazardous waste through efficient regulation and (e) encourage the transition from a waste management orientated economy to a green circular economy ([153]).

Regional Non-Hazardous Waste Management Plans prepared by local authorities were first introduced in 1998. For the purposes of non-hazardous management planning, Ireland is divided into 3 regions. These are: Connacht-Ulster, Easter-Midlands and Southern. The plans cover the following 8 areas of strategic interest: policy and legislation, prevention, resource efficiency, coordination, infrastructure planning, enforcement and regulation, protection and other wastes. The current status of CDW management (including backfilling and pre-treatment infrastructure of CDW as well as authorization of waste facilities which also handle CDW) in each region is described in each of the Regional Non-Hazardous Waste Management Plans (0 - 0).

The National Construction and Demolition Waste Council (NCDWC) was established in 2002 as a voluntary construction industry initiative. Its role was to assist in achieving a target of 50% recycling by the end of 2003, which would be followed by a progressive increase to 85% by 2013 (See Section 13.1.4). This included setting up 5 sub-committees to recommend improvements to CDW management based on (a) infrastructure and facilities (b) markets for

recycled materials and specifications, (c) project best practice and waste management, (d) review of the regulatory framework and (e) information, public awareness and funding. NCDWC run a number of successful waste prevention programmes when it was in operation. However, no CDW programmes are known to be active at present ([151] - [154]).

The Green Public Procurement (GPP) Action Plan: Green Tenders published in 2012 by DECLG aims to assist public authorities to successfully plan and implement green public procurement by highlighting existing best-practices and actions which boost green public procurement. It recommends that during the procurement process for public infrastructure projects all construction materials should be assessed for environmental impact (embodied energy, CO<sub>2</sub> etc.), resource use, responsible sourcing, durability, recyclability, construction waste and disposal. The above policy was further strengthened in 2014 by the GPP Action Plan: Guidance for the Public Sector published by EPA ([155] e [156]).

### 13.1.3 Legal framework for sustainable management of CDW

According to the Construction and Demolition Waste Management in Ireland Report [151] existing pieces of legislation which promote the sustainable management of CDW are listed as follows:

#### *National/Regional Obligation for Selective Demolition*

No specific National/Regional Obligation for Selective Demolition exists.

#### *National/Regional Sorting Obligation (on-site or in sorting facility)*

No specific National/Regional Sorting Obligation (on-site or in sorting facility) exists. However, Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects [125] state that “special attention should be paid to the sorting/segregation arrangements employed to separate the demolished structure into individual material fractions”.

#### *National/Regional Separate Collection Obligation for Different Materials (such as iron, steel, plastic and glass)*

No specific National/Regional Separate Collection Obligation for Different Materials (such as iron and steel, plastic and glass) exists.

#### *Obligation for Separate Collection and Management of Hazardous CDW*

Waste Management (Hazardous Waste) Regulations 1998 (S.I. No. 163 of 1998) and subsequent amendments impose an Obligation for separate collection and management of some hazardous CDW (such as batteries and accumulators, PCB's etc.) ([136]e [137])

#### *Related Green Public Procurement Requirements*

No specific legislation exists. However, the GPP Action Plan: Green Tenders [155] sets a non-mandatory target of 50% of public contracts for construction projects to use its criteria.

#### 13.1.4 Targets

According to the Construction and Demolition Waste Management in Ireland Report [151] existing pieces of legislation which promote the sustainable management of CDW are listed as follows:

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No specific National/Regional Separate Collection Obligation for Different Materials (such as iron and steel, plastic and glass) exists.

##### *Obligation for Separate Collection and Management of Hazardous CDW*

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

At present, no End of Waste (EoW) criteria exist in Ireland. However, Article 6 of the WFD 2008/98/EC [127] has been transposed into national law by Article 28 of the European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) [128]. According to the above two documents, in the absence of EoW criteria at Community level, member states (i.e. EPA of Ireland) may decide case by case whether certain waste has ceased to be waste taking into account the applicable case law. An application under Article 28 for EoW

status for crushed rubble (also known as builders fill) was made in 2012. This material seems to be suitable as general filler and for construction of unbound haul roads. However, no decision by EPA has been made to date [151].

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

Non legislative instruments in Ireland dealing with CDW include:

- Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects published by DECLG in 2007. Their main aim is to promote an integrated approach to CDW management, during the whole duration of a construction project. According to the above document, when an old building or structure requires demolition as part of a new construction project, a Demolition Plan must be prepared. This will form part of the overall Waste Management Plan for the project [125].
- Introduction to Site Waste Management and Environmental Awareness Training Course developed in 2002 by the Construction Industry Federation of Ireland. It aims to help construction companies and contractors to better manage their CDW. The course covers all issues in relation to managing CDW, its impact on the environment and the problems caused by bad practice. Legal compliance with environmental policy and waste management is also addressed [158].
- EPA Viewpoint on the use of European Waste Catalogue (EWC) Chapters 17 and 19 (12 codes) published in 2014 [159]. It provides guidance on 12 codes from Chapters 17 and 19 of the EWC ([145][146]).
- Guidelines for the Management of Waste from National Road Construction Projects published by the National Roads Authority (NRA) in 2008. This document provides guidelines which ensure the effective management of waste throughout the duration of such projects [160].
- Building Research Establishment Environmental Assessment Method (BREEAM) published by the Building Research Establishment of UK (last updated in 2014). It has specific topics related to CDW which include requirements to have a waste management plan, set waste targets and divert waste from landfill [161].
- Leadership in Energy and Environmental Design (LEED) [162] is one of the most widely used green building certification programmes all over the world. It was developed by the United States Green Building Council (USGBC) and it has a number of rating systems for the design, construction, operation and maintenance of green buildings. The Materials and Resources Section of the latest version (Version No. 4) directly addresses source reduction, recovery and re-use, recycling and re-buying of CDW material strategies as

these are described by the United States Environmental Protection Agency (USEPA) [163].

- Design out Waste: A design team guide to waste reduction in construction and demolition projects published by the Waste Resources Action Programme (WRAP) of UK in 2015. This document provides information on the five key design principles (re-use and recovery, off site construction, materials optimization, waste efficient procurement and deconstruction and flexibility) that should be used during the design process and how these can be applied to minimise waste [164].

### 13.3 CDW management performance – CDW data

#### 13.3.1 CDW generation data

In Ireland, up to and including 2011 CDW collection data (not generation data) was obtained on an annual basis. From 2012 onwards, CDW generation data is obtained on a biennial basis in accordance with Regulation EC No. 2150/2002 On Waste Statistics [165]. According to the Construction and Demolition Waste Management in Ireland Report [151] CDW generation data for 2012 has been obtained and its reporting to the Statistical Office of the European Union (EUROSTAT) is under way. However, the National Waste Report for 2012 [166] published by EPA does not contain any information on CDW.

CDW collection or generation data is obtained by EPA or the Central Statistics Office (CSO) through surveys. More specifically, EPA is responsible for obtaining data from authorised waste facilities and local authorities. In addition, EPA is responsible for obtaining data from authorised industrial facilities which may generate CDW that is re-used or recovered on-site. These are known as Pollutant Release and Transfer Register (PRTR) surveys. Finally, CSO is responsible for obtaining data from enterprises. It should be noted, that not all enterprises on CSO's register are surveyed. Initially, data for a sample of enterprises is obtained and then statistical analysis is used to estimate the figures for the whole population.

CDW generation data for the period (2008-2011) is shown in Table 46.

#### 13.3.2 CDW treatment data

In Ireland, up to and including 2011, CDW treatment data was obtained on an annual basis. From 2012 onwards, CDW treatment data is obtained on a biennial basis in accordance with Regulation EC No. 2150/2002 On Waste Statistics [165]. According to the Construction and Demolition Waste Management in Ireland Report [151] CDW treatment data for 2012 has been obtained and its reporting to the Statistical Office of the European Union (EUROSTAT) is under way. However, the National Waste Report for 2012 [166] published by EPA does not contain any information on CDW.

CDW treatment data is obtained by EPA through surveys. More specifically, EPA is responsible for obtaining data from authorised waste treatment facilities, local authorities

and landfill facilities. In addition, EPA is responsible for obtaining data from authorised industrial facilities which may generate CDW that is re-used or recovered on-site. These are known as Pollutant Release and Transfer Register (PRTR) surveys.

There is an ongoing discrepancy between the reported quantity of CDW collected and the reported quantity of CDW managed (i.e. recovered or landfilled) as shown in Table 46 (based on data published by EPA ([167]- [170])). In 2011, this discrepancy was 21% for the soil and stones fraction and 7% for the non-soil and stones fraction (i.e. metal, wood, plastic, glass, gypsum-based waste, rubble and mixed or other waste). According to EPA, part of the gap between the reported CDW collected and the reported CDW treated (recovered/landfilled) may be attributed to a less than 100% reporting rate of authorised waste treatment facilities. Lack of full compliance of the sector to its obligation for providing accurate data to the local authorities on an annual basis (including lack of attention to maintenance of good records) may also contribute to the above described gap.

According to the National Waste Report for 2011 [170], a recovery rate of 98% was reported for soils and stones. This did not include an estimated 11987 tonnes of CDW in storage at the end of 2011 and an estimated 92870 tonnes of CDW treated at non reporting waste permitted facilities. A recovery rate of 97% was reported for Other CDW. This did not include an estimated 45968 tonnes of CDW in storage at the end of 2011. It should be noted that these extremely high recovery rates do not take into account the above mentioned discrepancies.

Table 46. CDW Collection and treatment data in Ireland for years 2008 to 2011 (Based on National Waste Reports from 2008 to 2011 [[167]- [170]] published by EPA)."

Official CDW Data (tonnes)	Year			
	2008	2009	2010	2011
CDW (Soils and stones) Collected	10.500.000	3.770.549	2.517.194	1.975.844
CDW (Soils and Stones) Recovered	8.366.060	4.371.833	1.685.658	1.400.472
CDW (Soils and Stones) Disposed	229.013	39.092	34.811	33.574
CDW (Soils and stones) Managed (Recovered + Disposed)	8.595.073	4.410.925	1.720.469	1.434.046 <sup>(3)</sup>
Discrepancy	1.904.927	-640.376	796.725	436.941
Recovery Rate	79% <sup>(1)</sup>	99% <sup>(2)</sup>	98% <sup>(2)</sup>	98% <sup>(2)</sup>
Other CDW Materials Collected	3.000.000	1.323.117	947.489	1.027.847
Other CDW Materials Recovered	1.852.853	727.477	847.796	934.841
Other CDW Materials Disposed	1.215	16.833	9.811	25.202

Other CDW Materials Managed (Recovered + Disposed)	1.854.068	744.310	857.607	960.043 <sup>(4)</sup>
Discrepancy	1.145.932	578.807	89.882	67.804
Recovery Rate	62% <sup>(1)</sup>	98% <sup>(2)</sup>	99% <sup>(2)</sup>	97% <sup>(2)</sup>
<b>Total CDW collected</b>	<b>13.500.000</b>	<b>5.093.666</b>	<b>3.464.683</b>	<b>3.003.691</b>
<b>Total CDW managed (recovered/landfilled)</b>	<b>10449141</b>	<b>5.099.310</b>	<b>2.578.046</b>	<b>2.498.946</b>
<b>Discrepancy</b>	<b>3050859</b>	<b>5.644</b>	<b>886.637</b>	<b>504.745</b>

<sup>1</sup> Calculation was based on quantity recovered divided by quantity collected.

<sup>2</sup> Calculation was based on quantity recovered divided by quantity managed.

<sup>3</sup> Excludes 11987 tonnes in storage at the end of 2011 and 92870 tonnes treated at non reporting waste permitted facilities.

<sup>4</sup> Excludes 45968 tonnes in storage at the end of 2011.

### 13.3.3 CDW exports/imports data

In Ireland, most of the generated CDW is treated within its borders. Metals, contaminated soil and asbestos are the main exceptions. Metals are pre-treated and sorted in Ireland. Next, they are exported abroad (mainly in the UK) for further treatment. According to the Construction and Demolition Waste Management in Ireland Report 388 a relatively small quantity of metals from CDW (approximately 330000 tonnes) were exported in 2011.

ENVA Ireland Limited Facility at Portlaoise is the only facility in Ireland licensed to treat contaminated soil. It has a licensed capacity of 40000 tonnes per year and in 2012 received 4246 tonnes of contaminated soil (54% of the total reported contaminated soil). The remaining reported contaminated soil of 3610 tonnes was exported to Germany (3621 tonnes) and the Netherlands (17 tons) [166].

Currently, in Ireland there is no dedicated hazardous waste landfill facility in operation. As a result of this, 4255 tonnes of asbestos and 252 tonnes of other hazardous CDW were exported in 2012 [166].

### 13.3.4 CDW treatment facilities data

In Ireland, a number of landfills have closed prematurely over the last eight years due to the current financial climate. Currently, there are eight operational landfill facilities authorised to accept non-hazardous and/or inert CDW. All eight of them are licensed and regulated by EPA. Their current combined total remaining consented capacity (including CDW) is estimated to be 14829000 tonnes. CDW is commonly used as a recovery material on these landfills (i.e. rubble for temporary haul roads, woodchips for daily cover or bedding for temporary works and inert fine material for daily cover).

Currently, there is enough treatment capacity to treat non-hazardous CDW in Ireland. An estimated 5.1 million tonnes of authorised and mainly active backfilling capacity for the recovery of soil and stones exists, from which 1.1 million tonnes (22%) are utilised. In

addition, an estimated 4.25 million tonnes of backfilling capacity have been authorised but are not currently available.

For other non-hazardous CDW materials estimates are more difficult to obtain. This is due to the fact that these materials are often treated at pre-treatment facilities and in many cases are mixed with similar materials from municipal and non-municipal waste. An estimated authorised pre-treatment capacity of 10 million tonnes exists [151].

Finally, there is a lack of treatment capacity when it comes to treatment of contaminated soil. As a result, Ireland has to export significant quantities abroad.

### 13.3.5 Future projections of CDW generation and treatment

Currently, there is no reliable data on future projections of CDW generation and treatment. This is due to the fact that CDW generation data is directly related to the performance of the construction and development industries. These have been severely affected by the economic recession of 2008. Financial data for 2014 shows an increase in construction activity. However, this is still significantly lower when compared to pre-2008 levels [151].

### 13.3.6 Methodology for CDW statistics

From 2012 onwards, the methodology used for collecting data on CDW generation and treatment complies with EUROSTAT guidelines [151].

## 13.4 C&D waste management in practice

### 13.4.1 CDW management initiatives

Based on published literature the following initiatives were identified:

- STRIVE (Science, Technology, Research and Innovation for the Environment Programme 2007-2013) Report Series No. 26 (Development of An Audit Methodology to Generate Construction Waste Production Indicators for the Irish Construction Industry) authored by Kelly and Hanahoe and published by EPA [171] recommended the integration of an audit tool into CDW management plans. This would provide a basic methodology for measuring waste performance on-site. In addition, the report recommended submission of the audited data to the local authorities during the construction phase in fulfillment of planning requirements.
- EPA Research Programme (2014-2020) Report No. 146 (A Review of Design and Construction Waste Management Practices in Selected Case Studies-Lessons Learned) authored by Kelly and Dowd [172] developed a waste reduction toolkit for design teams. It includes: (a) principles for designing out waste, (b) procurement and tendering for waste reduction, (c) materials optimisation and standardisation, (d) off-site and modern

methods of construction, (e) CDW re-use and recycling opportunities and (f) deconstruction and flexibility.

- DEMCON 20/20 project was a local initiative established in 1998 by Cork City Council. Its aim was to establish a recycling facility for CDW at a local landfill site (Kinsale Road landfill), develop new markets for recycled CDW, reduce landfill deposits of CDW in the Cork region and build a new local amenity centre. The recycling facility has been successfully constructed and operated during the time-span (1998-2002) of the project. However, a target of 650000 tonnes of CDW diverted from the Kinsale Road landfill during the project's time-span was not achieved due to the relatively high percentage (70%) of poor quality soil, for which there is limited demand [173].
- Ballymun Regeneration was a local initiative established in 2001 by Dublin City Council. Its aim was to recycle and recover at least 50% of the 300000 tonnes of rubble arising from the demolition of 36 tower blocks built in 1960's [174].
- Mullingar Civic Amenity Centre was a local initiative by the Westmeath County Council. The aim of this project was to build a facility located in the area of Mullingar, where local residents can bring (for a small fee) their recyclable waste. A high amount of recycled CDW material was used during its construction. More specifically, 4200 m<sup>3</sup> of recycled crushed concrete were used for the construction of sub-base and capping layers, while 24 m<sup>3</sup> of recycled asphalt planings were used for the construction of the surfacing layer. Finally, 24 tonnes of crumb rubber were used as part of the landscaping. The facility became operational in 2012 [206].
- Wise Project is a local initiative (worth €3.6 million) established in 2015 by Rediscovery Centre and Dublin City Council. Its aim is to redesign and retrofit the old Boiler House building located in Ballymoun area by using best practice energy standards. This will transform the original building (constructed to dissipate heat and associated with an inefficient district heating scheme) into a national prevention, re-use and recycling educational centre [207].

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

Factors which act both as drivers and barriers for increasing CDW recycling include legislation and regulation, number of regional treatment facilities, landfill levy, construction work contracts, statistical data and recycling process and techniques. More specifically:

- Ambitious national and regional targets for re-use, recycling and recovery of CDW set in 1998, implementation of these targets prior to the adoption of WFD 2008/98/EC [127] targets, introduction of the Landfill Levy in 2002 and an obligation to prepare CDW management plans for projects above a certain level acted as a driver for increasing CDW recycling. However, the use of recycled materials from CDW is not adequately supported by public procurement. In addition, certification of construction projects using recycled materials from CDW acts as a barrier [151].

- Currently, it is relatively easy to obtain a license for CDW backfilling operations in Ireland. However, future regulation is expected to get tougher on CDW backfilling operations following the publication of the Regional Non-Hazardous Waste Management Plans( 0- 0). It will require from contractors to demonstrate the suitability of potential sites. In addition, they will have to provide evidence that backfilling operations will have a limited impact on the environment [151].
- The landfill levy proved to be a powerful instrument for encouraging recovery and recycling of CDW. However, the costs associated with sorting, recovery, recycling and development of new construction materials from CDW act as a barrier [151].
- Publication of the GPP Action Plan: Guidance for the Public Sector [156] document which includes recommendations for waste management acted as a driver for increasing CDW recycling. However, waste management only forms a small part of the tender process and is often ignored. In addition, preliminary studies on CDW material management and pre-audits on demolition sites are rarely performed. Finally, lack of control of the recycling rate on which the winner of the contract is committed also acts as a barrier [151].
- Compliance with national and European legislation on data collection regarding CDW generation and treatment acted as a driver for increasing CDW recycling. However, ongoing discrepancies between CDW collection/generation and treatment data suggest that there are still barriers for increasing CDW recycling [151].

The main factor which acts as barrier for increasing CDW recycling is the amount of resources allocated to legislation enforcement. There are no resources specifically allocated for enforcement of CDW legislation. In addition, due to the low levels of construction activity over the last eight years, enforcement of CDW legislation has not been given high priority compared to other forms of waste such as End of Life Vehicles (ELV's) [151].

### 13.5 CDW sector characterization

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

##### *Product description and applications*

In Ireland, CDW is mainly used as a recovery material on landfills. More specifically, rubble is used for temporary haul roads, inert fine material is used as daily cover and woodchips are used either as daily cover or as bedding for temporary haul roads [151].

##### *Quantitative analysis*

In 2012, 629554 tonnes of CDW were accepted for recovery at 18 landfills. This represented an increase of 76855 tonnes (14%) from 552669 tonnes accepted at 14 landfills in 2011.

##### *Recovery techniques*

The recovery technique used in Ireland during demolition projects is described by Byrne and O'Regan [208] as follows: Soft striping (i.e. removal of materials that can be salvaged such as doors, windows, plumbing and sanitary components) is performed. If these materials have a market value they are re-used. Next, metals and timber are removed and handed to specialist recycling facilities. Metals are separated from timber and then exported abroad for further treatment and processing, while most of timber is re-used in Ireland. The remaining mixed waste is sent to recycling facilities for processing. Plastics such as High-Density Polyethylene (HDPE) or Polyvinyl Chloride (PVC) are recovered, packed and sold as plastic grade. HDPE in particular can be reprocessed in Ireland and used in the production of new plastic pipes and drains. Finally, building rubble (i.e. mix of concrete, masonry, bricks and tiles) is either crushed on-site and re-used as backfill material or sent to landfills.

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

During the last 15 years considerable changes in the management of CDW took place in Ireland. This has led to a more sustainable system of CDW management as opposed to the previous over reliance on landfilling. Most of CDW is now either separated on-site or pre-treated to separate it into various fractions, which are then either recovered, exported for treatment or disposed. In 2011, only 2% of the total CDW managed was disposed. When it comes to hazardous CDW 100% of asbestos, 100% of other hazardous CDW and 46% of contaminated soil were exported for treatment. However, there are some concerns related to illegal activities such as dumping of CDW fines as well as sales of CDW materials due to the ongoing discrepancies in data between the reported quantity of CDW collected and the reported quantity of CDW managed [151].

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

Please refer to Section 13.4.2.

#### 13.5.2 Recycled materials from CDW

In Ireland, the market for CDW materials such as concrete, bricks, metals, plastics and glass is well developed. However, use of these materials is still quite low. The use of recycled aggregate in construction industry is also quite low with most of it used for backfilling operations. This is mainly due to lack of confidence in its use and the large supply of low cost good quality virgin aggregate, for which demand has significantly dropped over the last years [208]. The cost of recycled aggregate is estimated to be €1/tonne compared to €3.5/tonne for virgin aggregate [151].

A number of infrastructure projects in which recycled aggregate was used during their construction are reported below [151]:

- A section of the M50 motorway
- Mullingar Civil Amenity Site
- Edenderry Civic Amenity Site

- Civic Amenity Site at Kyletalesha Landfill
- The Aviva Stadium which has a capacity of approximately 52000 spectators

### 13.5.3 Market conditions / costs and benefits

#### *Market conditions*

The Landfill Tax has encouraged the recycling and recovery of CDW in Ireland. However, it was not introduced as an environmental tax like in UK, but as a way to fund the repair of residential buildings affected by pyritic heave [209].

#### *Costs and benefits*

There is no published data on the costs (perceived/actual) and benefits of recycling and recovery of CDW in Ireland. Although, it is generally accepted that CDW is a problem (especially when it comes to unfinished or unoccupied housing developments that may have to be demolished in the near future), its recycling and recovery are considered to be a low priority due to the associated cost, time and quality of recycled products ([151],[209]).